State: IDAHO
City: IDAHO FALLS
IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/05/1991
Operable Unit: 05
ROD ID: EPA/ROD/R10-92/036

Media: Sediment

Contaminant: Metals, Inorganics, Radioactive Materials

Abstract: SITE HISTORY/DESCRIPTION: The Idaho National Engineering Laboratory (INEL), located 32 miles west of Idaho Falls, Idaho, occupies 890 square miles of the Eastern Snake River Plain. Land use at the INEL is industrial and mixed use, with a surrounding 500 square mile buffer zone used for cattle and sheep grazing. The 7,700 INEL employees use the Snake River Plain Aquifer that underlies the site, as a drinking water source. The aquifer has been proposed as a sole-source aquifer pursuant to the SWDA. The TRA contains high neutron flux nuclear test reactors. The Warm Waste Pond is located 200 feet east of the test reactor area. The Warm Waste Pond is composed of three wastewater infiltration/evaporation ponds. Over the past 40 years, the Warm Waste Pond received discharges of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange columns. As a result of an investigation conducted in 1988, it was revealed that a release of radioactive and/or hazardous contaminants to the Warm Waste Pond had resulted in contamination of the pond sediment and subsurface water. The INEL is divided into 10 Waste Area Groups (WAGs), which are further subdivided into operable units to facilitate characterization and remedy selection for similar or unique contamination issues. This ROD addresses the interim remedy for the Warm Waste Pond sediment that are part of the WAG 2 group that includes the TRA.

Other OUs are associated with this interim action and will address perched water below TRA. Contamination of the Snake River Plain Aquifer and complete evaluation of risks associated with the Warm Waste Pond will be addressed in separate investigations and remedial actions, as necessary. The contaminants in the perched water, currently being evaluated in an ongoing RI/FS, will be addressed in future remedial actions. The primary contaminants of concern affecting the sediment are metals, including hexavalent chromium; other inorganics; and radioactive materials. PERFORMANCE STANDARDS OR GOALS: Federal and state clean-up standards for cesium-37, cobalt-60, and chromium have not been established at this time. Clean-up objectives for cesium37 are based on a 10[-4] to 10[-6] range for cancer risk to human health. Because this action does not constitute a final remedy for this operable unit, subsequent actions will fully address risks posed by the Warm Waste Pond sediment and associated contamination. INSTITUTIONAL CONTROLS: Deed restrictions will be implemented to prevent human exposure to site contaminants and provide site security.

Remedy: SELECTED REMEDIAL ACTION: The selected remedial action for this site includes onsite physical separation of large and fine-grained materials, followed by treatment of 20,700 cubic yards of very-fine grained contaminated sediment onsite by chemical extraction with an acidic solution to remove cesium-137, cobalt-60, and chromium, followed by recovering contaminants from the acidic solution using ion exchange, precipitation or distillation; testing residuals, and treating tomeet applicable storage and/or disposal criteria, then storing the waste onsite temporarily until final disposition can be determined; returning larger grained materials to the pond and along with the treatment process residuals, and backfilling and revegetating the area; conducting pilot studies to optimize the extraction process; and implementing institutional controls including deed restrictions. The estimated capital costs for this remedial action are $7,195,000, with an estimated O&M cost of $300,000 over 18 months.

Text: Full-text ROD document follows on next page.

Text:

DECLARATION FOR THE WARM WASTE POND AT THE TEST REACTOR AREA AT THE IDAHO NATIONAL ENGINEERING LABORATORY

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Warm Waste Pond sediments
Test Reactor Area
Idaho National Engineering Laboratory

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Warm Waste Pond sediments, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

The State of Idaho concurs with, and the Environmental Protection Agency approves, the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment, due to the radioactively-contaminated sediments of the Warm Waste Pond.

Description of the Selected Remedy

This Record of Decision addresses the contamination of the sediments of the Warm Waste Pond at the Test Reactor Area (TRA) at the Idaho National Engineering Laboratory (INEL). TRA is one of ten Waste Area Groups at the INEL which are under investigation pursuant to the Federal Facility Agreement/Consent Order (FFA/CO). The selected remedy is a combination of physical separation and chemical extraction to recover contaminants from the Warm Waste Pond sediments, followed by the backfilling of the Warm Waste Pond. The remedy addresses the significant potential risks associated with the site: external exposure to radiation, and inhalation and ingestion of contaminated sediment.

The major components of the remedy are:

- Treatability studies to optimize the extraction process,

- Excavation of the sediments which are contaminated above the specified criteria,

- Physical screening of the excavated sediment to remove the large criteria,

- Classification to further separate the fine-grained particles,

- Chemical extraction of cesium-137, cobalt-60, and chromium using an

acidic solution,

- Recovery of the contaminants from the acidic solution using ion exchange, precipitation, or distillation, if the residuals cannot be processed by the Idaho Chemical Processing Plant,

- Treatment of the waste residuals to be returned to the Warm Waste Pond, if needed, to meet the specified criteria,

- Backfilling the Pond to grade and vegetation, and
  ù Storage until final disposal of the product residuals.

Statutory Determination

ù Storage until final disposal of the product residuals.

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and is thus in furtherance of that statutory mandate, by utilizing permanent solutions and alternative treatment technology, to the maximum extent practicable given the limited scope of this action. Because this action may not constitute the final remedy for the Warm Waste Pond, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as the principal element, although partially addressed in this remedy, will be addressed at the time of the final response action. Subsequent actions may be necessary to address fully the principal threats posed by the site. Because this remedy will result in substances remaining on site, the effectiveness of the interim action as a final action will be evaluated in the comprehensive Waste Area Group Remedial Investigation/Feasibility Study and reviewed within five years of the initiation of the remedial action.

The comprehensive Remedial Investigation/Feasibility Study for Waste Area Group 2 will succeed this interim action, which encompasses TRA in its entirety and will evaluate additional actions for TRA, including the Warm Waste Pond.

Signature sheet for the foregoing Warm Waste Pond at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

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ACRONYMS

AEA	Atomic Energy Act
ALARA	As low as reasonably achievable
ARARs	Applicable or relevant and appropriate requirements
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCA	Consent Order and Compliance Agreement
CWA	Clean Water Act
DOE	Department of Energy
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement/Consent Order
HWMA	Hazardous Waste Management Act
ICPP	Idaho Chemical Processing Plant
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
LDR	Land Disposal Restrictions
nCi/gm	nanocuries per gram
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
OSHA	Occupational Health and Safety Administration
OU	Operable Unit
pCi/gm	picocuries per gram (1/1000th of nCi/gm)
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TBCs	to-be-considered
TCLP	toxicity characteristic leaching procedure
TRA	Test Reactor Area
WAG	Waste Area Group

DECISION SUMMARY

I. SITE DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls, Idaho and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The Test Reactor Area (TRA) is located in the southwestern portion of the INEL (see map this page). The Warm Waste Pond is located approximately 200 feet east of TRA and consists of three wastewater infiltration/evaporation cells comprising approximately 4 acres (see map next page).

The area around TRA is relatively flat. Elevations range from 4,907 to 4,945 feet above sea level from the bottom of a pond to the top of a rubble pile. Generally, the land surface slopes slightly from southwest to northeast. Elevation in the Warm Waste Pond ranges from 4,908 to 4,913 feet. Current land use at the INEL is classified as industrial and mixed use by the Bureau of Land Management and has been designated as a National Environmental Research Park. The developed area within the INEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing.

Approximately 7,700 people are employed at the INEL, with approximately 580 employed at TRA. The nearest off-site populations are in the cities of: Atomic City (13 miles southeast of TRA), Arco (17 miles west), Howe (14 miles north), Mud Lake (32 miles northeast), and Terreton (34 miles northeast).

The INEL property is located on the northern edge of the Eastern Snake River Plain, which contains a substantial volume of silicic and basaltic volcanic rocks with relatively minor amounts of sediment. Underlying TRA are a series of basaltic lava flows interbedded with sediments. The basalts immediately beneath the site are relatively flat and covered by 40 to 50 feet of alluvium. The Snake River Plain Aquifer underlies the INEL and has been proposed as a sole source aquifer pursuant to the Safe Drinking Water Act.

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 inches per year, with estimated evapotranspiration of 6 to 9 inches per year. Twenty distinctive vegetative cover types have been identified at the INEL, with big sagebrush the dominant species, covering approximately 80 percent. The variety of habitats on the INEL supports numerous species of reptiles, birds, and mammals.

TRA covers approximately a 1,700 by 1,900 foot area and is surrounded by a double security fence. Located inside of the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, and roads. Located outside of the fences are parking areas, a helicopter landing pad, a sewage treatment plant, a stack, a storage area, and four waste disposal ponds. Also located around TRA are unpaved roads, groundwater monitoring wells, andrubble piles.

The Warm Waste Pond consists of three cells; one excavated in 1952 with bottom dimensions 150 by 250 feet and a depth of 15 feet, one excavated in 1957 with bottom dimensions of 125 by 230 feet and a depth of 15 feet, and one excavated in 1964 with bottom dimensions of 250 by 400 feet and a depth of 6 feet.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

TRA is located in the southwestern portion of the INEL north of the Big Lost River (Figure 1). The facility houses high neutron flux nuclear test reactors. The TRA Warm Waste Pond is located approximately 200 feet east of TRA, outside the security fence (Figure 2). In the past, the Warm Waste Pond has received discharges of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange columns.

The release of radioactive and/or hazardous contaminants to the Warm Waste Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action requirements of the July 1987 DOE-ID/EPA Consent Order/ Compliance Agreement (COCA).

The INEL was proposed for listing on the National Priorities List (NPL) on July 14, 1989 [54 FR 29820]. The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response,

Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The final rule which listed the INEL on the NPL was published on November 21, 1989 in 54 FR 44184.

One of the reasons for the NPL listing was the release to groundwater of contaminants from facilities at the TRA. These contaminants, mainly chromium and radionuclides, were released to the environment at the WarmWaste Pond and other locations at TRA. Use of chromium as a cooling tower corrosion inhibitor was discontinued in 1972.

Based on the characterization data available in the Administrative Record for the sediments of the Warm Waste Pond, a significant potential risk to human health and the environment has been identified. The Warm Waste Pond was proposed for an interim action under the Federal Facility Agreement/Consent Order (FFA/CO). This Record of Decision documents the decision to perform that interim action and the remedy selected. The Warm Waste Pond interim action will be evaluated for adequacy as a final remedial action in the Waste Area Group 2 (WAG 2) Comprehensive Remedial Investigation/Feasibility Study (RI/FS) scheduled to begin in 1996. WAG 2 encompasses TRA and the immediately surrounding area.

The Warm Waste Pond sediments have been sampled several times. In 1983, one sample was collected for RCRA Appendix VIII analysis. In 1987, six sediment samples were collected for RCRA Appendix VIII analysis. In 1988, eighty eight samples were collected to depths over 10 feet below the top of the sediments for the Preliminary Investigation conducted under the COCA. In 1990, twenty six samples were collected from the upper two feet of sediment following CERCLA protocol. Evaluation of the data from these sampling efforts and the preliminary risk evaluation performed based on those data served as the basis for this interim action. The contaminants which were mainly found in highest concentrations in the upper two feet of the sediments are shown in the following table.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A series of five public informational meetings were held in late June 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow to explain how the CERCLA process works and to introduce the Warm Waste Pond cleanup project to the public. These informational meetings were announced via the INEL Reporter newsletter distributed to 11,700 INEL employees as well as 2100 of the general public, newspaper and radio advertisements, and an INEL press release. Personal phone calls were made to key individuals, environmental groups, and organizations by the INEL field offices in Pocatello, Twin

Falls, and Boise. The Community Relations Plan Coordinator made calls to Idaho Falls and Moscow. Each of the meetings were videotaped.

The Notice of Availability for the Proposed Plan was published July 28, 1991 in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Idaho Statesman (Boise), and Idahoan (Moscow). A similar newspaper advertisement appeared in the same newspapers the following week repeating the public meeting locations and times. Personal phone calls, as noted above, were made to inform key individuals and groups about the comment opportunity.

The Proposed Plan for the interim action of the TRA Warm Waste Pond sediments was mailed to the public on July 26, 1991. The Proposed Plan was mailed to 2,100 individuals on the INEL mailing list with a cover letter from the Director of the Environmental Restoration Division of the DOE Field Office, Idaho urging citizens to comment on the Plan and to attend public meetings. Copies of the Plan and the administrative record are available to the public in six regional INEL information repositories: INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Copies of the administrative record file for the Warm Waste Pond Sediments Interim Action were placed in the information repositories sections or at the reference desk in each of the libraries on July 26, 1991.

The public comment period was held from July 29, 1991 to August 28, 1991. No extension requests were made. Public meetings were held on August7, 8, 13, 14, and 15, 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow respectively. At the meetings in Idaho Falls and Pocatello, representatives from DOE, EPA and IDHW discussed the project, answered questions, and received public comments. At the meetings in Twin Falls, Boise, and Moscow, DOE and IDHW were represented. Verbatim transcripts were prepared by a court reporter of each public meeting. Each was recorded on audio tape and the Twin Falls and Boise meetings were videotaped as well. Written comment forms were distributed at each of the meetings.

A Responsiveness Summary has been prepared as part of the Record of Decision. All verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

In general, there were two predominant public opinions on the preferred alternative as described in the Proposed Plan; the opinion that it was too expensive, or agreement that it was the best of the alternatives presented. Other issues raised were: adequacy of characterization data; operations at TRA, e.g., the continued use of the Pond; adequacy of the risk assessment process; remedial alternatives, including use of the Idaho Chemical Processing Plant (ICPP) for treatment of residuals from the interim action; ability to implement the proposed action and disposition of the residuals created; research of remedial technologies; degree of oversight of DOE and its contractors in performing the remedial action; community relations; and NEPA.

IV. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the Federal Facility Agreement/Consent Order (FFA/CO) the INEL is divided into ten Waste Area Groups (WAGs). The WAGs are further subdivided into operable units. TRA has been designated WAG 2, and the Warm WastePond sediments have been designated Operable Unit 2-10 (OU 2-10), one of the thirteen operable units at TRA. As is commonly done on many Superfund sites, similar or unique problems at a site are grouped into operable units

to make characterization and remediation activities more efficient. In this case, existing characterization data were available to identify the Warm Waste Pond sediments as a significant threat to human health and the environment and select a remedial technology. Therefore, the Warm Waste Pond sediments were designated as an operable unit to expedite an interim action.

Two of the thirteen operable units at TRA are related to this interim action: OU 2-12 and OU 2-13. OU 2-12 consists of the contaminated perched water below TRA. Some of the contaminants of concern in the perched water resulted from disposal of wastewater to the Warm Waste pond. The perched water is currently being evaluated in an ongoing RI/FS. OU 2-13 is the final, overall evaluation of all characterization and remediation activities in WAG 2, which encompasses all of TRA and the immediately surrounding area. All actions conducted at TRA will be considered in the OU 2-13 RI/FS, from the perspective of TRA as a whole to ensure that all issues have been addressed adequately. Conducting this interim action is part of the overall site strategy and is expected to be consistent with any planned future actions. The interim action is, therefore, intended to reduce the risks associated with the Warm Waste Pond sediments. Contaminants in the perched water and their effect on the Snake River Plain Aquifer in the vicinity of TRA will be evaluated in the OU 2-12 RI/FS, and remedial action undertaken, as necessary. A complete evaluation of all risks associated with the Warm Waste Pond will be conducted as part of the final comprehensive OU 2-13 RI/FS.

V. SUMMARY OF SITE CHARACTERISTICS

The Warm Waste Pond consists of three wastewater infiltration cells, which have been used for the disposal of reactor cooling water, radioactivewastewater, and regenerative solutions from ion exchange. From 1952 until 1962, all liquid wastes from TRA, except sanitary sewage, were discharged to the Warm Waste Pond. Wastewater from the demineralization plant went to the Pond until 1962. Other non-radioactive wastewater, including water from the cooling towers, was disposed of in the Pond until 1964. Since 1964, the Warm Waste Pond has received only radioactive wastewater. The volume of wastewater discharged to the Warm Waste Pond has ranged from over 200 million gallons per year from 1958-1963 and 1969-1976 to less than 20 million gallons per year from 1987 to the present. Contaminant levels in the wastewater discharged to the Pond have decreased significantly in the past 12 years. However, these past disposal practices have resulted in contamination of the pond sediments.

The Warm Waste Pond was sampled several times between 1983 and 1990. Due to the types of wastewater discharged to the Pond, the contaminants are mainly of two types: inorganics and radionuclides. The inorganics, primarily metals, mainly resulted from the nonradioactive wastewater sources. The contaminant in the highest concentration, and therefore the largest total mass, is chromium which was used (in hexavalent form) until 1972 as a corrosion inhibitor in the cooling towers. The hexavalent chromium in the Pond sediments has undergone chemical reduction to trivalent chromium, which is less toxic and less mobile than hexavalent chromium. The total estimated volume of trivalent chromium in the Pond sediments is over 26,000 pounds with an average concentration of 338 parts per million (ppm). In addition to chromium, some of the other metals (with their corresponding average concentration in the upper two feet of sediment and total weight in the Pond) are: zinc, 143 ppm, 4,085 pounds; lead, 18 ppm, 819 pounds; arsenic, 5 ppm, 631 pounds, and mercury, 3 ppm, 139 pounds. The Pond sediments are not RCRA characteristic or listed hazardous waste.

Radionuclides have been discharged to the Warm Waste Pond fornearly 40

years. Cumulatively, over 5 billion gallons of wastewater was discharged into the Pond. Peak volumes of over 200 million gallons annually were discharged between 1958-1963 and 1969-1976. In recent years, the radionuclide content of the wastewater has dropped significantly. From 1979 to 1987, the total activity of the wastewater going to the Pond was reduced by over 90 percent. Therefore, the radioactive contaminants which are now of greatest concern are those of greatest quantity disposed or radionuclides that have not naturally decayed to levels resulting in acceptably reduced risk. In addition, those radionuclides which were not trapped by the sediments, for example tritium, will be addressed in a separate operable unit. Based upon the combination of total quantity discharged, half-life, and ability of the Pond sediments to capture the radionuclide, the predominant radionuclides at the present time are (with total curies disposed, radioactive decay half-life, and average current concentration): cesium-137, 157 curies, 30.2 years, 11.5 nCi/gm; cobalt-60, 471 curies, 5.3 years, 4.6 nCi/gm; and strontium-90, 99 curies, 29.1 years, 0.5 nCi/gm. Nineteen radionuclides have identified in the Pond sediments and most are present in very small amounts. The cesium-137 and cobalt-60 are associated with the fine-grained sediments in the upper two feet of the Pond.

VI. SUMMARY OF SITE RISKS

Introduction

A preliminary risk evaluation was prepared to determine the risks to human health and the environment posed by the Warm Waste Pond sediments. A future use scenario was evaluated in addition to the present case to ensure the consideration of the long-term adequacy of the remedial alternatives. The preliminary evaluation consisted of two parts, human health and ecological, and was utilized to determine if unacceptable risks are present. The final Record of Decision (i.e., the comprehensive WAG 2 RI/FS) which addresses this operable unit will evaluate the effectiveness of this interim action based upon a quantitative risk assessment.

Preliminary Human Health Risk Evaluation

Potential present and future risk(s) posed by the Warm Waste Pond sediments were assessed in a preliminary risk evaluation using the standard procedures and default parameters established in EPA guidance documents to determine if the risk justified a remedial action. In addition, a future use scenario was evaluated so that remedial alternatives could also be considered in terms of potential future risk(s).

Present Risk(s)

Since the Warm Waste Pond is currently under the institutional control of INEL site security and is surrounded by a fence which approximates the boundary of the contaminated area, the potential exposure scenarios, based on the present condition of the pond, were occupational scenarios. The hypothetical receptor was assumed to be located at the boundary of the operable unit as defined by the institutional controls (the fence). Two exposure pathways were analyzed: inhalation of airborne, contaminated dust, and external exposure to radiation. Several exposure conditions, ranging from 40 percent of the day, every day for 40 years to 5 hours per week for one year, were evaluated. A toxicity assessment was conducted to determine the health effects associated with the identified contaminants. Noncarcinogenic and carcinogenic toxicity values were identified or derived to perform the risk evaluation. Risks were quantified for the selected contaminants of concern (individually), for multiple substances, and for multiple pathways (for radionuclides). Noncarcinogenic effects were evaluated based on the hazard quotient/index of toxicity. Carcinogenic risks

were evaluated and compared to the accepted NCP target risk range of 10[-4] to 10[-6] excess incidence of cancer.

The preliminary evaluation of noncarcinogenic effects showed that all hazard quotients were less than one for individual chemicals. The hazard index which sums the potential effects was also less than one, indicating that no adverse health effects (noncarcinogenic effects) are expected from the contaminants for the pathways evaluated. Carcinogenic risks for the inhalation pathway were found to be in the range of 3 x 10[-10] to 6 x 10[-7] for chemical and 3 x 10[-8] to 7 x 10[-5] for radionuclides. The NCP target risk range was not found to be exceeded for the inhalation of chemical or radionuclides. Carcinogenic risks for the external exposure pathway for radionuclides were found to be in the range of 7 x 10[-4] to 3 x 10[-1], and therefore exceeded the NCP target risk range. For both pathways, cesium-137 and cobalt-60 are the primary risk drivers due to their higher concentrations. Therefore, the risk due to external exposure represents an unacceptable risk which must be reduced in this interim action.

Future Risk(s)

In addition to the present occupational scenarios described above, ingestion of contaminated soil was evaluated as a potential future risk. One potential scenario selected for evaluation consisted of a residential receptor (a farming family with children) which is assumed to reside at the operable unit starting in 100 years (2091), which is assumed for calculation purposes to be the end of institutional controls. One hundred years is the DOE/NRC standard for closure of low-level radioactive waste facilities, and for the preliminary evaluation was assumed to be a reasonable time to expect institutional controls to be maintained. The concentrations of contaminants used in the evaluation were based on sampling data which was then corrected for radioactive decay to establish contaminant concentrations after 100 years. The exposure assessment followed EPA guidelines for default exposure parameters.

All hazard quotients for the evaluated chemicals were less than one, which indicate that no adverse health effects (noncarcinogenic effects) are expected from the ingestion of soil for the residential receptor. The noncarcinogenic hazard index (combined chemicals) is also below the level of concern for noncarcinogenic effects. The carcinogenic risks for the chemicals was 3 x 10[-5] and radionuclides was 4 x 10[-5], which are within the NCP target risk range. However, when combined with the inhalation pathway the risks do exceed the NCP target range. In each case, cesium-137 is the primary risk driver.

Summary

The external exposure scenario based on an occupational receptor with the present condition of the Warm Waste Pond is above the NCP target risk range and an interim action is warranted. As mentioned, the Warm Waste Pond is currently under institutional controls, and DOE procedures are to reduce personal radiation exposure to as low as reasonably achievable (ALARA). The inhalation scenario, based on the occupational receptor under the present conditions, and the ingestion scenario, based on a future residential scenario of the Warm Waste Pond beginning in 100 years, are both within the calculated target range. However, cumulatively, the inhalation and ingestion scenarios are above the NCP target risk range and should be reduced. This interim action will reduce the current risk posed by the radiation field of the Warm Waste Pond and reduce potential future concerns.

The calculated risk values carry some uncertainties inherent in the risk

evaluation process. The calculated risk values represent estimates of potential effects and do not represent characterization of absolute risks. The risk measurements are conditional estimates dependent on a number of assumptions about exposure and toxicity. However, the preliminary risk evaluation is believed to be a reasonably protective estimate of risk andsupports the need for an interim action.

Ecological Concerns

Ecological concerns will be addressed in the Remedial Investigation/Feasibility Study for the WAG-wide Record of Decision. Since the major exposure routes are expected to be the same as human exposures, the risk reduction realized due to this interim action should achieve a significant reduction in adverse ecological effects.

VII. DESCRIPTION OF ALTERNATIVES

Potential technologies which would achieve significant risk reduction while the final remedy is developed were identified from the available literature. The technologies evaluated for this interim action were temporary capping, stabilization, and a combination of physical separation and chemical extraction. In addition, the no action alternative was evaluated.

Alternative 1: No Action

The no action alternative was evaluated in accordance with EPA guidance. Under the no action alternative, the current institutional controls which restrict access to the Warm Waste Pond would be maintained. As is shown in the comparative analysis of alternatives, the no action alternative was found to be unacceptable because it does not provide overall protection of human health and the environment.

Alternative 2: Temporary Capping

Capping involves backfilling the Pond and covering the site with a barrier to prevent biological (plant and animal) and precipitation intrusion. Cap design and construction would consider: the need to attenuate the gamma radiation associated with the Pond sediments; minimization of long-term water infiltration through the contaminated material; maintenance minimization; and drainage and erosion. A typical cap design for the Warm Waste Pond wouldinclude:

- Backfilling the Pond to above grade with locally available materials (if within design standards),
- A three-foot layer of clay to prevent precipitation infiltration,
- A one-half foot layer of sand to provide drainage,
- A two-foot thick layer of cobbles acting as an antibiointrusion layer, and
- A three-foot thick layer of soil to allow vegetation.

Estimates of capital costs, including design and construction, for capping are $2,786,000. Operational and maintenance costs would be approximately $50,000 annually which includes monitoring and maintenance of institutional controls. A cap would take approximately nine months to construct following five months of design and review.

Temporary capping has the advantages of ease of application, the fact that

it is a well known technology, and high reliability if maintained properly. Capping has relatively low capital costs. Soil characteristics are not as critical for capping as other technologies and soil is an excellent gamma radiation shield. The greatest disadvantage of capping is that it does nothing to eliminate the contaminants, it simply impedes releases by shielding. All contaminants remain in the Pond area. Plant roots, excavations for various purposes, such as utilities repair, and unwitting penetrations (e.g., post holes) could result in significant breaches in the cap. Building construction is a clear threat to a cap. In addition, long-term maintenance costs for a cap can be significantly higher than for a permanent remedy over time. However, as capping is a temporary measure, significant additional costs may be realized at final remedy selection.

Alternative 3: Stabilization

Solidification is a process which creates a monolithic block of immobilized waste with high structural integrity in which the contaminants are mechanically, but not chemically, bonded with the solidification agents and matrix. By adding chemical reagents, and thereby chemically binding the contaminants, solidification becomes stabilization which further limits solubility and mobility of the contaminants. Common reagents applicable to the Warm Waste Pond sediments and proven to be effective in many cases include portland cement, pozzolanic fly ash, bitumen, and lime. Stabilization is done one of two ways: the reagent is injected and mixed with the sediments in place or the sediment is dug up and machine mixed with the stabilization agent which is then re-deposited on or off site. A pilot-scale study would be required prior to remedial design to optimize the reagent concentration, mixing rate, and other process variables. The estimated capital cost of stabilization, including the pilotscale study, design, and construction, is $5,296,000. Stabilization would take approximately one year to implement following seven months of design and review, some of which could be concurrent with the pilot-scale study. The stabilized soil and contaminants would remain in the Pond and actually increase the volume of contaminated sediment.

The advantages of stabilization are that the release and mobility of the contaminants are reduced or eliminated. Stabilization can also facilitate transportation and off-site disposal, especially where volume reduction or extraction techniques have been applied previously. Stabilization may be effective in binding chemical contaminants in addition to the radionuclides. Among the disadvantages of stabilization is the fact that its longterm effectiveness is unknown. Also, stabilization traps the contaminants, but does not remove or eliminate them. All contaminants remain in the Pond and capping may be necessary to minimize exposure. Some chemicals, particularly organics, may interfere with the stabilization process. Alternative 4: Separation/Extraction

The separation/extraction alternative consists of a combination of two technologies: physical separation and chemical extraction.

Physical Separation

Based on sampling of the Pond sediments, the radioactive and chemical contaminants in soils are commonly associated with the fine-grained soil particles. Separation of the fine-grained soil particles concentrates the contaminants and therefore reduces the volume of soil for further treatment or disposal. Physical separation utilizes mechanical methods for separating heterogeneous mixtures of solids to obtain a concentrated form of the contaminants. Chemical agents may be added to enhance the separation process. The different types of physical separation are typically most effective in dealing with a specific size range of soil particles and a combination can be used to isolate the size fraction desired. There are

four major categories of separation technology applicable to soil remediation: screening, classification, flotation, and gravity concentration. Screening is the separation of particles on the basis of size by passing the particles through a uniformly perforated surface. Classification is the separation of particles according to their settling rate in water. Flotation is concentration of the contaminants in the froth which collects on a liquid. Gravity separation is separation of particles based on density, shape, weight, and size.

Based on the results of the bench-scale treatability study of the Warm Waste Pond sediments, the particles which are larger than 1/16th of an inch consist of more than 60 percent of the volume. Therefore, screening would be the first part of any treatment system for the Pond sediments. Further isolation of finer grained materials would likely be done with classification or gravity separation. The large and relatively uncontaminated particles would be returned to the Pond. The advantages of physical separation are: it is an inexpensive method for separating coarse and fine materials, high continuous processing capabilities are possible, and they are well proven in the mining industry. The disadvantages are: screens are subject to plugging, soils with large amounts of fine-grained materials are difficult to process, and to achieve a high level of separation of a particular size particle requires longer processing times.

Chemical Extraction

Chemical extraction uses chemicals to extract the cesium, cobalt, and chromium from the sediment. The most common chemicals used for extraction are water, inorganic salts, mineral acids, and complexing agents. Other chemical extraction methods include precipitation, solvent extraction, and ion exchange. There are notable differences in the extractability rates of each of the methods caused by the types of soil.

Bench-scale testing indicates that using acids as the extracting agents is effective in extracting cesium, cobalt, and chromium from the Warm Waste Pond sediments. Chromium removal will be maximized even though it was not shown to pose a risk in the preliminary risk evaluation. The advantages of extraction with acids are: a high percentage of radionuclides can be removed, a relatively small liquid-to-solids ratio is required, requiring less pumping power and smaller tanks and equipment, and the acids can likely be recycled. The disadvantages of using acids for the extracting agents are the possibility of increased costs due to the use of relatively expensive reagents, higher operating temperatures, and stainless steel vessels and pipes. It is possible that undesirable byproducts, such as characteristic mixed (radioactive and hazardous) waste, could be produced which would be subject to RCRA regulatory requirements.

Separation/Extraction

For the contaminated sediments of the Warm Waste Pond, predominantly in the upper two feet, a combination of physical separation followed by chemical extraction is proposed. The interim action will be preceded by a pilot scale treatability study focusing on the chemical extraction portion of the remedy. The purpose of the pilot treatability study will be to determine if the extraction efficiencies which have been demonstrated in the bench scale treatability study can be achieved on a larger scale. Specifically, the pilot study will evaluate whether an average of 90 percent removal of cesium, cobalt, and chromium can be achieved with no RCRA-hazardous wastes generated which cannot be treated to be non-characteristic. The estimated capital cost of the separation/extraction remedy, including the pilot study, design, construction, and storage of the product residuals is $7,195,000. The separation/extraction unit would be operated for approximately one year,

followed by backfilling and grading. Design will be completed following treatability study work, which will take nearly ten months to complete following issuance of the Record of Decision.

Separation/extraction reduces the risks by removing much of the cesium-37 and cobalt-60 from the Pond sediments. These radionuclides would be concentrated as the product of the treatment process and would be further treated and stored on site such that it could be visually monitored, either directly or indirectly, until its final disposal can be determined in the comprehensive WAG RI/FS. Following the separation/extraction process and return of the residuals to the Pond, the Pond would be backfilled. Backfilling will provide additional reduction of potential external exposure from remaining contamination. The remaining risk of the Pond sediments will be evaluated in the comprehensive WAG RI/FS. The selected remedy is described in Section IX.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires that each remedial alternative beevaluated according to specific criteria. The purpose of the evaluation is to determine the advantages and disadvantages of each alternative, and thereby guide selection of the remedial alternative offering the most effective and feasible means of achieving the stated cleanup objectives. While all nine CERCLA criteria are important, they are weighted differently in the decision making process depending on whether they describe a required level of performance (threshold criteria), technical advantages and disadvantages (balancing criteria), or review and evaluation by other entities (modifying criteria). The four remedial alternatives described in Section VII were evaluated according to the following CERCLA criteria:

- Threshold criteria
  - Overall protection of human health and the environment
  - Compliance with ARARs
- Balancing criteria
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost
- Modifying criteria
  - State acceptance
  - Community acceptance.

Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the Record of Decision. The threshold criteria must be met for a final remedial action, and this

interim action is intended to meet those criteria, if possible. The effective of this remedial action will be evaluated as a final remedy in the WAG-wide RI/FS.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment requires evaluation of how well the remedial alternatives eliminate, reduce, and control the identified risks. This overall assessment of protection of human health and the environment draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. For an interim action, the present risk(s) to human health and the environment must be reduced. If this interim action is successful, potential risks will be reduced to acceptable levels, and further remedial action may be unnecessary. The interim action will be followed by a final remedial action either in the WAG -wide RI/FS, or the perched water RI/FS, if necessary.

All of the remedial alternatives which were considered, except the no action alternative, provide short-term protection of human health and the environment by reducing the radiation field and therefore the potential risk due to external exposure. All of the alternatives except the no action are therefore acceptable as interim actions.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with Federal and State laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable, but are relevant andappropriate; in other words, requirements that pertain to situations sufficiently similar to those encountered at a Superfund site such that their use is well suited to the site. Combined, these are referred to as applicable or relevant and appropriate requirements (ARARs). State ARARs are limited to those requirements which are more stringent than Federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, location-, and action-specific ARARs or justification for a waiver; and whether the remedial alternative considers other criteria, advisories, and guidelines.

A waiver for interim measures may be applicable when a remedial action is only part of a total set of measures as is the case for the Warm Waste Pond sediments. This waiver may be granted if complete measures that will attain all ARARs will follow the interim action within a reasonable period of time. In this case, all ARARs will be addressed by the WAG-wide Record of Decision, if not already attained in the interim action. An interim measure should not complicate nor delay the overall site cleanup and should be consistent with it. The granting of ARARs waivers should not present an immediate threat to public health and the environment.

Chemical-Specific ARARs. Chemical- (and radionuclide-) specific ARARs are standards for allowable levels of certain contaminants in the environment and are generally issued pursuant to the Federal Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA; chemical, but not radionuclides), the Atomic Energy Act (AEA; radionuclides, but not chemicals), and state and local counterpart requirements.

When a chemical- or radionuclide-specific ARAR exists and is considered to be protective of human health and environment, it becomes a specific cleanup goal. For the Warm Waste Pond sediments, chemical-specific ARARs for cleanup

standards are available for water and air only. No specific cleanup levels for chemicals in soils are available. Guidance provided under the authority of the AEA includes numerical criteria for air and water for radionuclides. DOE has not established radionuclide-specific criteria for soil, but has established performance-based standards for soil contamination at operating and decommissioned facilities. If a chemical-or radionuclide-specific ARAR does not exist or is not adequately protective, the health-based risk assessment performed under the RI would determine the appropriate cleanup goal.

The SDWA is generally used as the ARAR for appropriate cleanup standards for contaminated groundwater that is or may be used as drinking water. The CWA provides guidelines to determine water quality standards of surface receiving waters. Since this interim action addresses the external exposure concerns for the Warm Waste Pond sediments and does not address groundwater or surface water, the SDWA and CWA are not ARARs, for this limited action.

RCRA provides chemical-specific ARARs in the areas of groundwater monitoring, cleanup standards, and treatment standards. The standards apply if the waste is a listed or characteristic waste under RCRA, and either (1) the waste was treated, stored, or disposed after the effective date of RCRA requirements under consideration, or (2) the CERCLA activity constitutes treatment, storage, or disposal as defined by RCRA. The Hazardous Waste Management Act (HWMA) establishes the State of Idaho's authorization to implement the RCRA program.

In the case of the Warm Waste Pond, the sediments are not RCRA hazardous wastes based on tests conducted in 1990. In addition, no RCRA wastes were disposed in the Pond after 1972, prior to the promulgation of RCRA. Therefore, RCRA is not applicable for establishing cleanup or treatment standards for this action. If the remedy creates RCRA-hazardous waste, that waste will be subjectto the requirements of RCRA and Land Disposal Restrictions (LDRs) requirements may be triggered.

Requirements under the AEA are applicable to the procurement, use, and disposal of all source, byproduct, and special nuclear material at the INEL. Regulations governing operations of the DOE facility are contained in 10 CFR 200 et seq, and are implemented through DOE Orders, Directives, and Notices that specify policy, standards, and guidance for all DOE facilities. Although DOE Orders are not ARARs since they are not promulgated requirements, all of the requirements of DOE Orders are to be considered (TBCs). DOE Orders which may apply to CERCLA activities include DOE 5480.11 and DOE 5820.2A. DOE 5480.11, "Radiation Protection for Occupational Workers," establishes radionuclidespecific criteria to protect workers from hazard of exposure to ionizing radiation and radioactive materials. DOE 5820.2A, "Radioactive Waste Management," establishes standards for "external exposure to the waste and concentration of radioactive material which may be released into surface water, groundwater, soil, plants, and animals results in an effective dose equivalent that does not exceed 25 mrem/year to any member of the public... and assures that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/year for a continuous exposure or 500 mrem/year for a single acute exposure." Capping, stabilization, and separation/extraction as described all meet this standard.

The CAA establishes national standards and goals for air pollution control. For less common air pollutants that can have acute effects on public health, such as radionuclides, EPA establishes National Emission Standards for Hazardous Air Pollutants (NESHAP). Specific NESHAP regulations apply to allowable off-site radionuclide doses to the public from emissions at DOE

facilities. Due to its location within the INEL, over fifteen miles from the nearest city, the small scale of the processing plant, and the engineering controls used to limit air emissions, the activities at the Warm Waste Pond should not result in additional off-site exposure to the public.

Action-Specific ARARs. Certain design, performance, or actionspecific ARARs could affect this interim action.

If the requirements of RCRA LDRs apply to the residual waste, treatment technologies meeting those restrictions will have to be employed or treatability variances sought.

Engineering controls will be used to the extent possible to eliminate or minimize air emissions and will be described in the remedial design. The substantive requirements of the Idaho Rules and Regulations for the Control of Air Pollution will have to be met if the extraction procedure would result in the release of gases, vapors and/or fugitive emissions.

Location-Specific ARARs. Location-specific requirements include ordinances or rules and regulations as well as restrictions or guidance contained in major Federal and State environmental programs.

Idaho Water Quality Standards are issued on a basin-by-basin basis and are therefore location-specific, but are only applicable to a remedial action if it involves a point-source discharge to surface or ground waters, and therefore is not applicable to any of the alternatives.

Although the National Historic Preservation Act would be applicable to CERCLA actions, there are no places of historic significance which will be affected by remediation activities at the Warm Waste Pond. Since no threatened or endangered species or habitat have been identified at the Warm Waste Pond, the Endangered Species Act is not an ARAR.

Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Each alternative is evaluated using each of the balancing criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: long -term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Each criterion is further explained in the following sections.

Long-Term Effectiveness and Permanence

In evaluating long-term effectiveness and permanence, the magnitude of residual risks as well as the adequacy and reliability of controls must be examined.

The magnitude of remaining risks is evaluated by assessing the residual risk associated with untreated waste and the treated residual. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

Adequacy and reliability of controls is evaluated by assessing the containment and/or institutional controls to determine if they are sufficient to ensure that any exposure to residual risks to human health and the environment is within protective levels. It includes consideration of the potential need to replace technical components of the remedial action, such as a cap, and the potential exposure pathway and risks which could be

posed should the technical components degrade over time.

For capping, the remaining risks are associated with the buried contaminants, all of which remain in the Pond sediments. Capping reduces the potential risk due to external exposure, inhalation, and ingestion to the extent that the integrity of the cap and backfilled material can be assured untilsuch time that the radioactive contaminants of concern have decayed to an acceptable level. It is estimated to be 400 years until the cesium-137 in the Warm Waste Pond will decay to an acceptable level. Caps have a design life of 100 years and require maintenance throughout the use of the cap. Therefore, capping cannot be considered as permanent as separation/extraction.

Stabilization meets the criterion for long-term effectiveness by binding up the contaminants in the cement/sediment matrix, thereby reducing residual risks. Unfortunately, the permanence of stabilization technology is unproven for the length of time needed for the cesium-137 to decay to acceptable levels and like capping is not as permanent as separation/extraction.

Separation/extraction reduces the potential risks associated with the cesium, cobalt, and chromium in the Warm Waste Pond sediments by removing the contaminants of concern by placing the treated residuals in a controlled environment, thereby permanently reducing the risks associated with the Warm Waste Pond. The treated material could present a risk due to its radioactive content, but will be treated, containerized, and stored in such a way as to be monitored, either directly or indirectly. Institutional controls will be maintained until its final disposal.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Evaluation of alternatives based on the reduction of toxicity, mobility, or volume through treatment requires analysis of the following factors: the treatment process used; the toxicity and nature of the material treated; the amount of hazardous material destroyed or treated; the irreversibility of the treatment; the type and quantity of treatment byproducts; and the statutory preferencefor treatment as a principal element.

Capping does not involve any treatment and therefore does not satisfy the statutory preference for remedial actions involving treatment. While not reducing the toxicity or volume of the contaminants within the sediment matrix itself and thereby eliminating exposure, capping can isolate the contaminants of concern from the environment.

Stabilization reduces the toxicity and mobility of the contaminants of concern by binding them in the cement/sediment matrix. However, stabilization increases the volume of contaminated material due to the addition of the binding agents. Stabilization could interfere with future remedial actions, if determined to be necessary.

Separation/extraction offers the greatest reduction of toxicity, mobility, or volume of the cesium, cobalt, and chromium in the Warm Waste Pond sediments of the alternatives evaluated. The toxicity and mobility of cesium, cobalt, and chromium are reduced by removing an adequate amount of contaminants. The volume of contaminated material is significantly reduced in the separation/extraction process. The separation process removes the large-grained materials which make up over 60 percent of the volume of contaminated materials. The contaminants of concern are then leached from the fine-grained materials. That concentrated residual would contain most

of the cesium-137 and cobalt-60 from the Pond sediments. The process will be further evaluated in the pilotscale treatability study.

Short-Term Effectiveness

The evaluation of alternatives based on short-term effectiveness requires an evaluation of the effectiveness of protection for the community and workers during remedial actions, environmental impacts during implementation, and the amount of time required for remedial action objectives to beachieved.

During implementation of any of the alternatives, protection of workers from radiation exposure would be an important element of the remedial design. Since the Warm Waste Pond is a radiologically controlled area, all personnel entering the area must have training for hazardous substances, radioactive substances, and respirators. Health physics personnel will be on site at all times when work is ongoing to monitor and control personnel radiation exposure. Every person entering the working area at the Pond will wear appropriate personal protective equipment, including a dosimeter to record the radiation received. DOE has ALARA (as low as reasonably achievable) radiation dose goals for personnel which will be met.

By using engineering controls, such as a protective enclosure, and access restrictions, the remedial action will not be a risk to the community. Access to visitors and others not working on the project will be strictly limited to those meeting the same training requirements as the workers.

The remedial actions would begin in 1992. Stabilization and separation/extraction would require a pilot-scale treatability study to refine design parameters during the remedial design phase, which would be completed in the spring and summer of 1992. Upon completion of the pilot-scale treatability study, final remedial design could be completed, with the remedial action initiated. Capping could be implemented without testing.

Implementability

The implementability criterion has three factors requiring evaluation: technical feasibility; administrative feasibility; and the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. The ability to coordinate actionswith other agencies is the only factor for evaluating administrative feasibility and is not a concern for this project. The availability of services and materials requires evaluation of the following factors: availability of treatment, storage capacity and disposal services; availability of necessary equipment and specialists; and availability of prospective technologies.

The technical feasibility of capping is well established. Cap design and construction is a readily available technology which has been in common use for a number of years. Capping is reliable to the extent that the integrity of the cap can be maintained. In this case, only a temporary cap would be installed as this is not the final remedial action. The cap is expected to provide interim protection until the final remedial action was implemented. A cap is easily removed, although additional material will become contaminated increasing the amount of material which must be dealt with in any future remedial actions.

Stabilization is a rapidly emerging technology for treating contaminated soils. Several companies have developed equipment for mixing the stabilization agents with the soil in place, and the equipment and personnel

are available. Stabilization would require a pilot-scale treatability study to determine the best stabilization agents, mixing rate, mixing speed, etc... Two concerns with stabilization are the reliability of the technology and the ease of undertaking additional remedial actions should it be necessary in the future. The technology is unproven for the length of time required for the cesium-137 to decay to acceptable levels, therefore additional remedial action may be required at a future time. The solid, stabilized mass could make it very difficult to pursue additional remedial actions. The stabilized material would also require backfilling to reduce the potential radiation exposure.

Physical separation and chemical extraction are well developed technologies which have been used in the mining industry for extraction of radionuclides from ores. Physical separation is an easily implemented technology, in this case simply requiring separation of the sediment into different grain size fractions using screens or sieves. Chemical extraction has not been used to remediate a cesium-contaminated site, but bench-scale testing for this interim action on the Warm Waste Pond sediments indicates that nearly 90 percent of the contaminants of concern can be removed from the fined-grained material in the Warm Waste Pond after it has been separated from the coarse material, which comprise over 60 percent of the total volume. A pilot scale treatability study would be required to determine the best operating parameters, such as reagent strength, holding times, and flow-through rates. The pilot treatability study would also be used to ensure that no RCRA-hazardous wastes are generated. An additional treatment process within the plant may be required for this purpose. All of the components of the pilot-plant and the final remedial treatment plant are available. The separation/extraction process generates a concentrated residual containing a large percentage of the contaminants of concern. In this case, that residual is expected to be low-level radioactive waste. Although storage and/or disposal facilities are available at the INEL, the State, as a condition of concurrence, requires that any low-level waste residuals will be stored and visually monitored, either directly or indirectly, until final disposition.

Cost

In evaluating project costs, an estimation of capital costs, operation and maintenance costs, and present worth costs are required. Capital costs include design, construction, equipment, buildings, startup, and contingency costs. Operating and maintenance costs include labor, power, disposal of residuals, administration, and periodic review. Actual costs are expected to be no more than 50 percent over, or 30 percent under, the cost estimate. Capital costs for capping are estimated at: design - $250,000; construction - $2,113,000; 20 percent contingency - $423,000; total - $2,786,000. Maintenance and operation are estimated to be an additional $50,000 annually.

Capital costs for stabilization are estimated at: design $400,000; construction - $3,480,000, 20 percent contingency - $696,000; pilot-scale treatability study - $720,000; total - $5,296,000. No operating and maintenance costs have been identified for the stabilization option.

Capital costs for separation/extraction are estimated at: design $500,000; construction -$4,704,000; 20 percent contingency - $941,000; treatability studies - $750,000; storage of product residuals - $300,000; total $7,195,000. The only operating and maintenance costs identified for the separation/extraction alternative is that associated with the storage of the treatment process wastes not returned to the Pond. Those costs are estimated to be $300,000 for a temporary storage facility and storage containers.

All of the alternatives would be implemented and completed within the same time frame, with a maximum difference of duration of 18 months. Therefore, all costs are in 1991 dollars.

Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state acceptance and community acceptance. For both of these criteria, the factors which are considered include the elements of the alternatives which are supported, the elements of the alternatives which are not supported, and the elements of the alternatives which have strong opposition.

State Acceptance

This assessment evaluates the technical and administrative issues and concerns the state may have regarding each of the alternatives.

The State of Idaho prefers the separation/extraction alternativebecause it takes the contaminants of concern from an uncontrolled situation to a controlled situation. If separation/extraction is implemented, the State prefers that the storage of the residuals be conducted such that they can be visually monitored, either directly or indirectly, until their final disposition is determined.

Community Acceptance

This assessment evaluates the issues and concerns the public may have with each of the alternatives.

Capping was preferred by some citizens due to its lower cost and the possibility of improved technologies which may be developed in the near future. Other citizens categorically reject capping because it is not a cleanup and wanted the contaminants removed from the sediments.

Stabilization received the least amount of public comment of the alternatives, although some citizens did not consider it to be a cleanup.

Separation/extraction was preferred by those citizens who felt that only by removing the contaminants from the sediments could a cleanup be realized, although those same citizens expressed concern that no final disposition for the residuals has been determined. Other citizens felt that separation/extraction was too expensive.

IX. THE SELECTED REMEDY

The selected remedy consists of physical separation followed by chemical extraction and includes the following steps: excavation, screening, classification, chemical extraction, recovery, residuals treatment, storage and/or disposal. The successful implementation of the selected remedy depends upon the success of the pilot-scale treatability study, a demonstration project. If the goals of the pilot-scale project are not met, the Warm Waste Pond sediments will be addressed in an amendment to this Record of Decision or in a subsequent final action. The pilot-scale demonstration will be a smaller-scale version of the proposed facilities which will be used to fine-tune the design of the classification, chemical extraction, and recovery systems.

First, the sediments must be excavated to be input to the pilot plant. Two excavation techniques are being considered: hydraulic and heavy machinery.

Hydraulic excavation consists of the use of a water-jetting and suction system. The sediments are excavated using a water stream which is sucked into the input side of the screening system. The advantages of hydraulic excavation are the lack of dust produced and the fact that the large-grained materials can be left in the Pond if the system is adjusted properly. Hydraulic excavation will be considered in the pilot-scale demonstration project. Heavy machinery excavation is the use of bulldozers, backhoes, front-end loaders and other similar equipment to remove the sediments and load them into the input side of the screening plant. Either excavation technique, or a combination of the two, will be used.

An average of two feet of sediment will be excavated from the Pond. Field screening with portable gamma detecting instruments and/or sampling will be conducted during the excavation to ensure that all of the contaminated sediments above the removal criteria are being excavated and input to the treatment plant. The removal criteria is based upon risk reduction to within the NCP target range. Based upon the preliminary risk evaluation, it is estimated that a level of cesium averaging below 690 pCi/gm in the Pond sediments will adequately reduce the potential risks. Therefore, that has been established as the removal criteria. The total volume of excavated material will be approximately 20,700 yd[3] based on a surface area (including banks) of 280,000 ft[2] and an average depth of 2 feet. The estimated weight of the material, assuming all grain sizes are excavated, that will be input to the screening plant is 44,000 tons with an assumed feed rate of 5 tons per hour.

Screening is the first portion of the treatment plant. The screen plant will separate the large-grained material from the fine-grained material. Based upon the bench-scale treatability study, at least a 60-percent volume reduction in contaminated material is expected following screening. Water is likely to be used during screening to wash the large-grained materials, as well as keep dust to a minimum. The larger material will be returned to the Pond. It is estimated that wet screening will separate 29,000 tons of largegrained material to be returned to the Pond.

It is likely that classification will follow screening to further separate very fine-grained material from fine-grained material. Hydrocylones or similar equipment will be used to further reduce the volume of material input to the chemical extraction unit. The larger material will be returned to the Pond. An additional 20-percent reduction in volume of contaminated material is expected following classification, resulting in 12,000 tons of very finegrained material to be input to the chemical extraction system, assumed to be fed at the rate of 1.5 tons per hour.

The very fine-grained material resulting from the physical separation processes is input to the chemical extraction unit. The fine-grained material is mixed with acid and held in a tank to allow maximum leaching of the contaminants. The strength and type of acid as well as the holding time will be evaluated in the treatability studies, but hydrochloric acid or aqua regia (a mixture of nitric acid and hydrochloric acid) appear to work most effectively. The extraction system is expected to be a two stage system. The chemical extraction process results in two products: the waste residuals which are removed from the liquid and an acidic liquid which contains the contaminants of concern. The waste residuals will be combined with backfill materials and returned to the Pond. The mixture of residuals and backfill materials will meet the removal criteria. The Pond will be backfilled to above grade following completion of processing of the sediments.

The acidic liquid is input to the recovery system which removes the contaminants of concern. The preferred recovery system is ion exchange,

although chemical precipitation or filtration may prove more cost effective. Ion exchange produces less sludge than chemical precipitation or filtration, but has not proven as efficient in bench-scale tests. The liquid can then be recycled and reused in the chemical extraction system. It is likely that the cesium, cobalt, and chromium can be removed individually from the acidic liquid. It may be possible to treat the cesium and cobalt liquid waste stream at the Idaho Chemical Processing Plant (ICPP) at the INEL. The residual would be processed in the residual treatment portion of the treatment plant.

The residuals will be tested to determine the radioactive and chemical constituents and treated, if necessary, to meet all applicable storage and/or disposal criteria. For example, if the residuals are RCRAhazardous due to leaching using the TCLP test, they will be treated to reduce the leachability to ensure that all storage and disposal criteria are met. If the residuals contain any liquids they will have to be dried. If separate residuals are created by separating the cesium, cobalt, and chromium individually, each will be tested and treated as necessary.

The residuals will then be stored in containers such that they can be visually monitored, either directly or indirectly, to verify the integrity of the storage containers until the final disposition of the residuals is determined. The disposition of the residuals will be determined no later than the WAG-wide Record of Decision scheduled to begin in 1996. The storage criteria will be finalized following the pilot-scale treatability study from which the characteristics of the waste will be determined. The waste is expected to be low-level radioactive, non-RCRA hazardous waste, and if so, the residuals will be stored within a radioactive storage area. The expected criteria for selection of storage containers and controls is the radioactive field due to the residuals and the associated restrictions and requirements. The storage containers likely to be used are concrete boxes, which provide radiological protection and can be stored such that the integrity of the containers can be monitored. One of the goals of the pilot study is to minimize the amount of waste created.

Pilot-Scale Treatability Study

As the proposed remedial alternative is an innovative technology and has not been used for the remediation of radiologically-contaminated soils, testing of the processes involved will be required. Bench-scale testing has indicated that the required removal efficiency of the contaminants of concern can be achieved using a combination of separation and extraction. Additional bench-scale testing will be conducted to optimize the extraction efficiency. The pilot study is to demonstrate that the processes which have been proven in the laboratory can be replicated in a scaled-up processing plant.

The goals of the pilot study are:

- Verify the 60+ percent reduction in volume by screening,

- Evaluate whether an average of 90 percent removal of cesium, cobalt, and chromium can be achieved,

- Maximize the efficiency of the classification process to minimize the amount of materials input to the chemical extraction unit,

- Determine the parameters in the chemical extraction unit which will amount of materials input to the chemical extraction unit,
  the smallest amount of residuals,
  ù Minimize the waste produced by the recovery system,

- Minimize or eliminate any characteristic which makes the waste RCRA

- Minimize the waste produced by the recovery system,

- Provide design information for the remedial action, particularly in the area of geometry of components to minimize potential exposure to workers.

The primary goal of the pilot plant is to demostrate the removal efficiency of cesium-137, cobalt-60, and chromium. Although cobalt-60 presents a potential risk due to the radiation field associated with it, its relatively short half-life of 5.3 years effectively eliminates it in the future use scenarios beginning in 100 years. A design goal for the cesium-137 removal was established based upon reduction of potential risks to within the NCP target range. Backfilling of the Pond following the separation/extraction reduces the risk due to external exposure and will reduce or eliminate the present potential risk due to inhalation. Based upon these assumptions, a preliminary estimate of the cleanup level for cesium-137 of 1385 pCi/gm would achieve a calculated risk of one in 10,000 increased incidence of cancer. Therefore, the pilot study will maximize the cesium-137 removal efficiency. The removal/backfill criteria established at an average concentration of 690 pCi/gm would put the estimated calculated risk in the range of one in 100,000. Higher removal efficiency will be utilized if possible and the adequacy of the interim action as a final action will be assessed in the comprehensive WAG RI/FS.

X. STATUTORY DETERMINATION

CERCLA remedy selection is based on the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the regulations contained in the National Contigency Plan (NCP). SARA requires that the EPA utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and attainment of ARARs.

Protection of Human Health and the Environment

As described in Section IX, the selected remedy will eliminate or reduce identified risks at the Warm Waste Pond by treating the Pond sediments to the extent necessary. The remedy will reduce the cumulative carcinogenic risk due primarily to external exposure to within the 10[-4] to 10[-6] range as required by the NCP. Storage and/or disposal of the concentrated residuals will meet all applicable acceptance standards.

Compliance with ARARs

The selected remedy will comply with the substantive requirements of all ARARs. ARARs are discussed in Section VIII.

Cost Effectiveness

Although the estimated cost for the selected remedy is higher than that for the other alternatives, separation/extraction provides a long-term solution that compensates for the additional costs by removing the majority of the contaminants of concern and thereby providing potentially permanent protection of human health and the environment. It also removes these contaminants from the Pond making them unavailable for potential leaching into the underlying soils and groundwater.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy meets the statutory requirements to utilize permanent solutions and treatment technologies to the maximum extent possible, for this interim action. The Agencies prefer a potential permanent solution whenever possible and in the case of the Warm Waste Pond, it is possible to meet the objectives of an interim action and provide a potentially permanent treatment solution. The selected remedy significantly reduces the volume ofcontaminated material. In addition, it will reduce the volume of contaminants in the Pond sediments. Based on the evaluation of the CERCLA remedial alternative criteria, and in particular the five balancing criteria, separation/extraction is the clear choice if seeking a long-term solution which reduces the toxicity, mobility or volume of the contaminants. The criteria which was the determining factor was long-term effectiveness. Utilizing separation/extraction will increase the likelihood that no future remedial actions will be required for the Warm Waste Pond.

Preference for Treatment as a Principal Element

The statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element is met by the use of separation/extraction, which provides a permanent reduction in toxicity, mobility, and volume of the contaminated material at the Warm Waste Pond.

XI. EXPLANATION OF SIGNIFICANT DIFFERENCES

A significant change from the Proposed Plan set forth in the Record of Decision is the elimination of the contingency remedy. In the Proposed Plan, it was stated that if the pilot study of the physical separation/chemical extraction was unsuccessful, a contingency remedy, capping, would be implemented. Upon reevaluation, it was determined that since the primary purpose of a cap is to prevent infiltration of precipitation and that the need for such infiltration prevention has not been determined, the need for a cap has not been established. If the need to prevent infiltration of precipitation is identified in the perched water RI/FS or the comprehensive WAG RI/FS, a cap would be evaluated as an option at that point. As part of the interim action, the Pond would be backfilled to above grade, which would reduce the radiation field and mitigate the potential for blowing dust. In the event the goals of thepilot-scale project are not met, a soil cover will be placed over the Warm Waste Pond to reduce the radiation field and mitigate the potential for blowing dust.

Another change from the Proposed Plan is the possibility of shipping the cesium and cobalt residual for treatment at the ICPP which is located at the INEL.. This option had not been considered in the Proposed Plan, but was suggested by a commentator at a public meeting. The treatability studies will determine if the use of ICPP for treatment is possible and cost effective.

RESPONSIVENESS SUMMARY

Overview

The sediments of the Warm Waste Pond at the Test Reactor Area (TRA) are the first operable unit to be addressed through a Record of Decision at the Idaho National Engineering Laboratory (INEL). A Proposed Plan was released on July 25, 1991 with a public comment period from July 29 to August 28, 1991. The Proposed Plan recommended a combination of physical separation and chemical extraction to remove cesium-137 and cobalt-60 from the Pond

sediments.

Nearly all of the comments were verbal comments received at the public meetings held at five locations around the State of Idaho. Only fifteen sets of written comments were received from 10 individuals.

In general, there were two predominant public opinions on the preferred alternative as described in the Proposed Plan; it was too expensive or it was the best alternative of the alternatives presented. Those who felt the preferred alternative was too expensive usually expressed concern that a large sum of money was being spent to reduce potential risks which did not reflect the actual risks posed by the Pond. Many felt capping, the least expensive alternative, should be the implemented action. The other predominant reasoning was that of the alternatives evaluated in the Proposed Plan, onlythe preferred alternative was actually a "cleanup," given that each of the other alternatives leaves the contaminants in the ground.

Other issues raised were: adequacy of characterization data; operations at TRA, the continued use of the Pond; adequacy of the risk assessment process; remedial alternatives; ability to implement the proposed action and disposition of the residual created; research of remedial of technologies; degree of oversight of DOE and its contractors in performing the remedial action; community relations; and NEPA.

Background on Community Involvement

A series of five public informational meetings were held in late June 1991 to explain how the CERCLA process works and to introduce the Warm Waste Pond cleanup project to the public. These informational meetings were announced via the INEL Reporter newsletter, newspaper and radio advertisements, and an INEL press release. Phone calls were made to key individuals, environmental groups, and organizations by the INEL field offices in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator made calls to key individuals in Idaho Falls and Moscow. Each of the meetings were videotaped.

The Notice of Availability for the Proposed Plan was published July 28, 1991 in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Idaho Statesman (Boise), and Idahoan (Moscow). A similar newspaper advertisement appeared in the same newspapers the following week repeating the public meeting locations and times. Personal phone calls as noted above were made to inform key individuals and groups about the comment opportunity.

The Proposed Plan for the interim action of the TRA Warm Waste Pond sediments was mailed to the public on July 26, 1991. The Proposed Plan was mailed to 2,100 individuals on the INEL mailing list with a cover letter fromthe Director of the Environmental Restoration Division of the DOE Field Office, Idaho urging citizens to comment on the Plan and to attend public meetings. Copies of the Plan and the administrative record are available to the public in six regional INEL information repositories: INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. The Administrative Record file for the Warm Waste Pond Sediments Interim Action was placed in the information repositories sections or at the reference desk in each of the libraries on July 26, 1991.

The public comment period was held from July 29, 1991 to August 28, 1991. No extension requests were made. Public meetings were held on August 7, 8, 13, 14, and 15, 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow respectively. At the meetings in Idaho Falls and Pocatello, representatives from DOE, EPA and IDHW discussed the project, answered

questions, and received public comments. At the meetings in Twin Falls, Boise, and Moscow, DOE and IDHW were represented. Verbatim transcripts were prepared by a court reporter of each public meeting. Each was recorded on audio tape and the Twin Falls and Boise meetings were videotaped as well. Written comment forms were distributed at each of the meetings.

Summary of Comments Received During Public Comment Period

Comments and questions raised during the Warm Waste Pond interim action public comment period on the Proposed Plan are summarized briefly below. The comment period was held from July 29 to August 28, 1991. Many questions were answered at the public meeting as reflected in the transcripts in Appendix A. Comments and questions on a variety of subjects not specific to the Warm Waste Pond were recorded. Those subjects included nuclear arms production, dose reconstruction, diversion of cleanup funds, references to unrelated documents, etc., and are not responded to in this Responsiveness Summary. Additionalinformation on these unrelated subjects can be obtained from the INEL Public Affairs Office in Idaho Falls or at the local INEL offices in Pocatello, Twin Falls, and Boise. The questions on the Warm Waste Pond not addressed at the meetings, and comments, are categorized below.

Characterization Data

Many questions at the public meetings concerned the characterization data, including monitoring, geological and hydrogeological information used as the basis for the proposed action. Unless specifically addressed below, that information is available in the administrative record report.

1. Two commentors expressed concern that the analyses for radionuclides was incomplete.

Response: A standard set of radiological analyses were conducted on the Pond sediments, including I-129, Pu-238, Pu-239, and Pu-240. The I-129 analysis was not discussed in the Proposed Plan, but averages approximately 0.3 pCi/gm, and does not pose an unacceptable risk.

2. One commentor felt that the Warm Waste Pond as an operable unit allowed for inadequate characterization or confused the public concerning the number of sites at TRA.

There are thirteen operable units at TRA encompassing 49 sites. All of the operable units will be, or are being, evaluated as described in the FFA/CO, which also includes a description of the breakout of the Warm Waste Pond as an operable unit. Other operable units include the MTR canal, the Retention Basin and associated piping, and the perched water.

Operations at Test Reactor Area

3. Many commentors felt the current use of the Pond is inappropriate, if not illegal, and were concerned with the effects of leaching contaminants, perched water, and fugitive dust. Response: The use of the Warm Waste Pond has always met the laws and regulations in effect at the time, including its use at the present time. Most of the contaminants in the Pond sediments are the result of past disposal practices, not current discharges. The volume and levels of contaminants in the wastewater have decreased over 90 percent in the last 10-15 years. The wastewater discharged to the Pond, as well as the sediments in the Pond, are not hazardous as defined by RCRA. The contaminants present in the sediments are largely insoluble and are not easily leached. Information from investigations show that the more soluble contaminants have migrated to layers below the ponds into the perched water

and the aquifer. The water discharged to the Pond contributes to the perched water system. The impact of the perched water system on the Snake River Plain Aquifer, is currently being evaluated in an RI/FS. The Warm Waste Pond is scheduled to be replaced by a lined evaporation pond in 1992, and therefore for all of the alternatives the potential leaching of contaminants would be reduced. An acrylic-copolymer dust suppressant has been sprayed on the Pond to reduce fugitive dust and will be reapplied as necessary.

4. Three commentors expressed concern that the lined evaporation pond which will replace the Warm Waste Pond could leak or asked about the cost and/or schedule for the new pond.

Response: The proposed action addresses cleanup of the sediments which may pose a threat to workers/visitors due to the radiological hazard primarily from cesium and cobalt. The elimination of future discharges to the Pond is being evaluated in the perched water RI/FS. The new lined evaporation pond is subject to operating and regulatory requirements which are beyond the scope of this document. Information on subjects like the new evaporation pond can be directed to the INEL Public Affairs Office.

Risk Assessment

Many commentors had questions or concerns regarding risk assessments.

5. Many commentors felt that the preliminary risk assessment process is flawed and the scenarios evaluated were inappropriate, in that institutional controls were adequate to prevent the calculated estimated risk.

Response: National risk assessment guidance was used for the evaluation of risks to human health and the environment. This guidance applies to all publicly or privately owned facilities. As is often the case, there are a wide variety of opinions on the degree of risk which is acceptable and the scenarios which should be evaluated to determine that risk. Institutional controls are not included in the evaluation as they may not continue indefinitely. The preliminary risk evaluation considered several scenarios to assess the potential threat to human health and the environment.

6. Several comments concerned the interpretation of the risk assessment of the interim action.

Response: The results of the preliminary risk evaluation for the interim action, which is in the administrative record, are summarized in Section VI of the Decision Summary of this Record of Decision. The risks associated with external exposure to radiation, and inhalation and ingestion of contaminated soil were evaluated. The risks due to ingestion of contaminated water below the Pond will be evaluated in the perched water RI/FS. The uncertainties associated with the risk evaluation process are addressed in the preliminary risk evaluation report. The target treatment level established for the pilot study, when implemented in the remedial action, will reduce all of the identified risks to within the target risk range.

Remedial Alternatives

7. Concerns were raised that not all appropriate technologies were considered, particularly vitrification. Response: For an interim action, it is sufficient to select a remedial technology which reduces the present potential risk and therefore, the evaluation of only one remedial alternative may be adequate. In this case, EPA guidance documents (which are in the administrative record) were consulted to determine the

technologies most appropriate for the cleanup of radiologically contaminated soils. Only two technologies had been

they can be visually monitored until the final disposition of the waste has been determined. The final disposition of the residuals must be determined prior to or in the WAG-wide Record of Decision. Therefore, at this time the residuals will be stored in containers in a controlled manner at or near the site of the Warm Waste Pond. Final disposition of the residuals will be determined at a later date with State concurrence. If necessary, transportation of the residuals will be in compliance with all INEL and DOT requirements, which base the packaging, labelling, etc... on the type and degree of hazard posed by the shipment. The ability and cost effectiveness of the ICPP to process the product residual will be evaluated in the pilot study.

Research Applications

12. Concerns and questions arose about research in waste management and remedial technologies and their applicability to INEL.

Response: Research has always been a major part of the INEL's mission, and in recent years research in waste management and remedial technologies has expanded. Technologies which involve treatment are preferred under CERCLA, although cleanup is not delayed until new technologies are developed. Testing of a technology may be part of the remedial design or remedial action, as is the case in this Record of Decision. Although not a consideration in the selection of the remedial alternative for the Warm Waste Pond, proving the use of separation/extraction as a remedial alternative for radiologically contaminated soils will make it a more viable option for future remedial actions nationwide. Remote cleanup methods may be utilized where the hazards posed by the site make it more efficient.

Agency Involvement

13. Several commentors felt the identification of sites, prioritization of cleanups, coordination of activities, and the standards set for cleanups were unclear.

Response: Environmental restoration at the INEL and most other DOE facilities is conducted under agreements with state and federal agencies. At the INEL, this agreement was the Consent Order/Compliance Agreement (COCA) with the EPA. Following public comment, the FFA/CO will supersede the COCA, thereby giving the State of Idaho and EPA equal say in establishing environmental restoration priorities at the INEL. Coordination among DOE facilities is managed by DOE Headquarters. As new sites are identified, through process knowledge, employee interviews, or field detection, they are prioritized by the Agencies. All cleanups must meet federal and state requirements, which require sites which present an unacceptable risk to be evaluated using the nine CERCLA criteria and cleaned up. Other CERCLA requirements include a timetable for remedial activities following a ROD and community relations activities.

14. Several commentors felt that DOE and/or EG&G should not be responsible for cleaning up sites which it had contaminated.

Response: As a result of inclusion on the National Priorities List (NPL), the INEL must follow the requirements of CERCLA, the Superfund law. CERCLA has clear requirements for characterization, risk assessment, remedial technology selection, and community involvement. DOE, with the State of Idaho and EPA oversight, will proceed with characterization and cleanup of the INEL following the requirements of CERCLA.

Community Relations

15. Several commentors felt that the meetings were poorly attended because of inadequate media coverage or notice, the Proposed Plan was inadequate, or that comments may not impact the decision process anyway.

Response: Community relations activities, including newspaper, radio, and television advertisements and stories are described in Section III of the Decision Summary and Section 2 of this Responsiveness Summary. Since no extension of the public comment period was requested, it appears adequate time was allowed for comments. Local television and radio stations were notified of each meeting in advance. Written comment forms were available at each public meeting and written comments were encouraged at the meetings, in the Proposed Plan, and in the cover letter. All comments, verbal or written, and all unanswered questions pertaining to the Warm Waste Pond are addressed in this Responsiveness Summary. The transcripts of each meeting and copies of each written comment are in the Information Repositories. Comments are indexed to the number of the response which addresses them in the Responsiveness Summary. An example of the positive impact of public comment in the decision process for this Record of Decision was the incorporation of the suggestion that the ICPP be evaluated for treatment of the extracted contaminants. The Proposed Plan is not meant to be an all-encompassing document, but rather a concise summary of the preferred alternative and the information leading to its recommendation.

NEPA

16. Several commentators questioned whether NEPA requirements were being met by the interim action.

Response: This Record of Decision addresses CERCLA requirements. The requirements of NEPA of this action are being evaluated separately.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 06/02/1992
Operable Unit: 23
ROD ID: EPA/ROD/R10-92/040

Media: Soil, Debris

Contaminant: Organics, Inorganics, Natural Decomposition Products

Abstract: SITE HISTORY/DESCRIPTION: The U.S. DOE Idaho National Engineering Laboratory (INEL), established in 1949, is located 32 miles west of Idaho Falls, Idaho. The facility occupies 890 square miles, and land use in the area is predominantly industrial. The Snake River Plain Aquifer, which underlies the INEL, has been designated as a sole source, Class I, aquiferpursuant to the Safe Drinking Water Act. Within the INEL is a 270-square- mile area, formerly known as the Naval Proving Ground (NPG), which was used prior to World War II for naval artillery testing, explosives, storage bunker testing, and ordnance disposal. Investigations by site personnel have resulted in the discovery of numerous unexploded ordnance devices, such as 3 -to 16-inch artillery shells, partially exploded 125- to 2,000-pound bombs, anti-tank mines, and depth charges. This ROD addresses OU23, which covers six locations on the site: the CFA gravel pit, the storage bunkers north of Idaho Chemical Processing Plant, the National Oceanic and Atmospheric Grid, CFA Building 633 Zone, Fire Station II Zone, and Power Line Road. Unexploded ordnance has been found on the ground surface in most of these areas. It is estimated that 150 unexploded ordnance will be found and detonated during this remedial action. Areas of soil are also contaminated with explosive compounds at the ground surface, or will become contaminated by detonation activities. This interim ROD addresses ordnance in the six NPG areas and associated soil contamination. Future RODs will address remaining ordnance

areas for which insufficient information exists at this time, final remedies for soil contamination, and all of the Waste Area Group 10 (WAG 10) at the INEL site. The primary contaminants of concern affecting the soil and ordnance debris are organics; inorganics; and natural decomposition products. PERFORMANCE STANDARDS OR GOALS: Action levels for soil were determined based on health-based criteria and include TNT 44 mg/kg and RDX 18 mg/kg. A screening level for DNT has not been developed as it is a breakdown product of TNT. Soil at or above these screening levels will be excavated, containerized, and transported to an offsite incinerator. Any resultant ash will be disposed of by the incinerator facility. Containerized soil will be sampled and analyzed for TCLP analytes to determine whether they should be classified as a RCRA waste. INSTITUTIONAL CONTROLS: Not provided.

Remedy: SELECTED REMEDIAL ACTION: The selected interim remedial action for this site includes conducting soil sampling of the detonation areas; excavating, containerizing, and transporting an estimated 185 cubic yards of soil exceeding action levels offsite for treatment using incineration, with offsite disposal of residuals; researching historical records pertaining to ordnance activities at INEL; conducting a field search of the six NPG areas for unexploded ordnance; controlled onsite thermal treatment (detonation) of any identified ordnance, with onsite disposal or recycling of any residual metal debris; and posting signs where the public has access to ordnance areas. The estimated present worth cost for this remedial action is $2,359,500. No O&M costs are associated with this remedial action.

Text: Full-text ROD document follows on next page.

Text:
Declaration of the Record of Decision

Site Name and Location

Ordnance Interim Action
Operable Unit 10-05
Waste Area Group 10
Idaho National Engineering Laboratory

Statement of Basis and Purpose

This decision document presents the selected alternative for interim remedial action of six identified ordnance locations at the Idaho National Engineering Laboratory (INEL), Operable Unit 10-05. This alternative was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the information in the administrative record for the site, which is indexed in Appendix C, and applicable guidance.

The lead agency for this decision is the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) approves of this decision and, along with the State of Idaho Department of Health and Welfare (IDHW), has participated in the evaluation of interim action alternatives. The State of Idaho concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment due to the presence of unexploded ordnance and ordnance compounds in the soil. Description of the Selected Remedy

This Record of Decision addresses the cleanup of portions of the INEL contaminated with unexploded ordnance and explosives residues. Operable Unit 10-05 includes only those areas which have been identified for interim action in order to remove the immediate risks associated with unexploded ordnance. These areas are near facilities which are frequented by INEL site personnel and therefore pose an unacceptable risk which needs to be eliminated. The selected remedy addresses the significant potential risks associated with these sites: explosive hazards, and inhalation, ingestion, and dermal absorption of explosive residues.

The major components of the selected remedy are:

- In-depth search of U. S. Navy and Department of Defense (DOD) historical records pertaining to activities at the Naval Proving Ground (NPG) and other suspected ordnance locations at the INEL;

- Search for unexploded ordnance using both visual and geophysical methods, followed by marking of locations;

- Controlled detonation of unexploded ordnance, confirmation of complete detonation, and disposal of nonhazardous solid waste;

- Soil sampling of detonation areas and other areas of suspected

detonation, and disposal of nonhazardous solid waste;

- Removal and containerization of contaminated soils;

- Shipment of contaminated soils to an off-site incineration facility for treatment and disposal.

Declaration

The remedy selected for this interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for the scope of this action, and is costeffective. Although not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, the selected remedy does utilize treatment and thus is in furtherance of that mandate. This interim action may not constitute the final remedy for this operable unit, but the selected remedy does meet the statutory preference for remedies that employ treatment that reduces toxicity mobility, or volume as a principal element. The comprehensive Remedial Investigation/Feasibility Study (RI/FS) for Waste Area Group (WAG) 10, which encompasses the entire INEL site, will succeed this interim action. The WAG 10 RI/FS will evaluate the need for any additional action at the INEL, including the ordnance areas cleaned up under this interim action. Because this is an interim action Record of Decision review of this operable unit and of this remedy will be ongoing as DOE, EPA, and the State of Idaho continue to develop final remedial requirements and alternatives for WAG 10.

Signature sheet for the foregoing Record of Decision for Operable Unit 10-05 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the State of Idaho Department of Health and Welfare.

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DECLARATION OF THE RECORD OF DECISION

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DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls, Idaho and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. Within the INEL boundary is an area of approximately 270 square miles that was formerly known as the Naval Proving Ground (NPG) (Figure 1). The NPG was utilized primarily during the World War II era, prior to inception of the INEL in 1949.

Numerous unexploded ordnance devices have been discovered at the INEL by Site and subcontractor personnel. The ordnance are primarily a result of past activities associated with the former NPG. These activities included naval artillery testing, explosives storage bunker testing, and ordnance disposal. Unexploded ordnance have been found to be more concentrated in areas where these activities are known to have occurred. Ordnance found to dateinclude: 3- to 16-inch artillery shells, partially exploded 125 to 2,000 pound bombs, anti-tank mines, depth charges, smokeless powder and dummy bombs with spotting charges.

Also, there are three suspected ordnance areas outside the NPG that have been identified at the INEL. The approximate locations of these areas are also shown in Figure 1. Two of these areas were used in the 1940s for aerial bombing practice by the U.S. Army Air Corps, flying out of Pocatello, Idaho. The third area was used at a later date by the U.S. Navy for naval artillery testing. The Navy fired artillery from a facility known as the Naval Ordnance Test Facility toward the north slope of the Big Southern Butte. At this time, the types of ordnance used at these sites, size of the areas potentially impacted, or targets used are not known.

Six ordnance areas within the NPG have been identified for cleanup for this interim action. These areas contain known types of unexploded ordnance and are near or in areas frequented by INEL personnel. Each of these locations is described in detail in Section 5.0. The approximate locations of the six ordnance locations are illustrated in Figure 1.

Current land use at the INEL is classified as industrial and mixed use by the Bureau of Land Management. The INEL has been designated as a National Environmental Research Park. The developed area within the INEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing.

Approximately 11,700 people are employed at the INEL. The nearest major off-site population centers are in the cities of: Arco (22 miles west), Blackfoot (38 miles southeast), Idaho Falls (49 miles east), and Pocatello (67 miles southeast).

The INEL property is located on the northern edge of the Eastern Snake River Plain. This portion of the Eastern Snake River Plain contains a substantial volume of silicic and basaltic volcanic rocks with relatively minor amounts of sediment. Underlying the INEL are a series of basaltic lava flows

interbedded with sediments. The basalt layer immediately beneath the INEL is relatively flat and covered with 20 to 30 feet of alluvium. The Snake River Plain Aquifer underlies the INEL and has been designated as a sole source aquifer pursuant to the Safe Drinking Water Act (SDWA).

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 inches per year. Twenty distinctive vegetation cover types have been identified at the INEL, with big sagebrush the dominant species, covering approximately 80 percent of the area. The variety of available habitats on the INEL support numerous species of reptiles, birds, and mammals.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Federal Government established the Nuclear Reactor Testing Station in 1949. The name was later changed to the INEL to better reflect the missions of the facility. Prior to 1949, approximately one third of the area now encompassed by the INEL was used by the U. S. Navy for testing naval artillery and other activities. This naval facility became known as the NPG. Other areas now within the INEL boundary were also used by the U.S. Army Air Corps for practice bombing at about the same time.

Two of the ordnance locations identified for cleanup by this interim action were first listed under the Consent Order and Compliance Agreement (COCA) signed by the Environmental Protection Agency (EPA), Department of Energy (DOE), and the U. S. Geological Survey in July 1987. The COCA identified two locations at the Central Facilities Area (CFA), CFA-09 (gravel pit) and CFA-11 (French drain), where ordnance were suspected. No other ordnance areas were listed in the agreement.

The INEL was proposed for listing on the National Priority List (NPL) on July 14, 1989 [54 Federal Register (FR) 29820]. The listing was proposed by the EPA under the authorities granted to the EPA by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The final rule which listed the INEL on the NPL was published on November 21, 1989 in 54 FR 44184.

In 1991, the EPA, DOE, and the State of Idaho signed the Federal Facility Agreement and Consent Order (FFA/CO). This agreement provided the process and schedule to facilitate cleanup of the areas identified in the FFA/CO Action Plan, in accordance with CERCLA, Resource Conservation and Recovery Act (RCRA), and the State of Idaho Hazardous Waste Management Act. The FFA/CO Action Plan lists three Operable Units (OUs) pertaining to ordnance areas: OU 4-01, OU 10-03, and OU 10-05. Operable Unit 4-01, as indicated in the FFA/CO, is included in the OU 10-05 interim action.

This Record of Decision (ROD) documents the decision to perform an interim action on OU 10-05 and the remedy selected. The OU 10-05 interim action will be evaluated for adequacy as a final remedial action in the Waste Area Group (WAG) 10 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), which is scheduled to begin in 1998 and is the final RI/FS scheduled for the INEL. In the interim, RI/FS investigations at the other WAGs will be completed according to the schedule in the FFA/CO Action Plan and lead to the final comprehensive RI/FS for WAG 10. By starting the interim action process now, cleanup activities on ordnance locations will begin much earlier than if following the RI/FS schedule in the FFA/CO Action Plan.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Notice of Availability for the Proposed Plan was published January 4 and 5, 1992 in the Moscow-Pullman Daily News, January 5, 1992 in The Post Register (Idaho Falls), The Idaho State Journal (Pocatello), Twin Falls Times News, Idaho Statesman (Boise), The Lewiston Morning Tribune, South Idaho Press (Burley), and January 6, 1992 in the Idaho Press Tribune (Nampa). A similar newspaper advertisement was published January 30, 1992 in The Post Register (Idaho Falls), The Idaho State Journal (Pocatello), Twin Falls Times News, Idaho Statesman (Boise), Idaho Press Tribune (Nampa), and the South Idaho Press (Burley) repeating the public meeting locations and times. Personal phone calls were made to inform key individuals and groups about the comment opportunity.

The public comment period was initially scheduled from January 13, 1992 to February 12, 1992. Three public meetings were held on February 4, 5, and 6, 1992 in Idaho Falls, Boise, and Burley, respectively. Representatives from the DOE, EPA, State of Idaho, and EG&G Idaho, Inc. were present at the public meetings to discuss the Proposed Plan, answer questions, and receive both written and oral official public comments. A court reporter was also present at each meeting to record verbatim the proceedings of the meetings. Copies of these records have been placed in each of the information repositories as part of the Administrative Record for public review.

A request for an extension of the public comment period was received and granted, therefore extending the comment period to March 13, 1992. A notice of the extension was published February 17 or 18, 1992 in The Post Register, The Idaho State Journal, Twin Falls Times News, Idaho Statesman, The Lewiston Morning Tribune, Idaho Press Tribune, South Idaho Press, and Moscow -Pullman Daily News.

All verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Recordfor the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary (see Appendix A) addresses each comment. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD. Public comments received on the Proposed Plan were considered during the development of this ROD. This decision document presents the selected remedial action for Operable Unit 10-05, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the information in the Administrative Record for this operable unit.

4. SCOPE AND ROLE OF OPERABLE UNIT

Under the FFA/CO the INEL is divided into ten WAGs. The WAGs are further divided into OUs. The ordnance areas have been assigned to WAG 10 since they are not associated with an identified facility. Operable Unit 1005, which also includes OU 4-01, includes the six areas (see Section 5.0) which have been identified for this interim action. The intent of this interim action is to reduce the immediate risks associated with the six unexploded ordnance areas and expedite overall site cleanup. These six locations are in or near areas frequented by INEL site personnel and therefore pose a more immediate unacceptable risk to human health which needs to be reduced in the near-term. The principal risk in these areas is the threat of uncontrolled detonation of unexploded ordnance. Also, exposure to soil contaminated with ordnance compounds above the action levels presents a potential risk to site personnel in these areas since these compounds have been identified by the EPA as potential human carcinogens.

Another Operable Unit, OU 10-03, has been identified in the FFA/CO Action Plan for the remaining ordnance areas for which insufficient information

exists to plan remediation at this time. In accordance with the FFA/COAction Plan, these areas will be addressed in the Fall of 1995. The historical record search identified as part of the selected remedy documented by this ROD will provide much of this information and enable possible future actions for OU 10-03 to be planned.

The final remedies for both OU 10-03 and OU 10-05 will be addressed in the WAG 10 RI/FS scheduled to begin in 1998. In the interim, RI/FS investigations at the other WAGs will be completed according to the schedule in the FFA/CO Action Plan and lead to the final comprehensive RI/FS for WAG 10. This interim action is consistent with any planned final action.

5. SUMMARY OF SITE CHARACTERISTICS

Operable Unit 10-05 consists of the six locations identified for cleanup in this interim action. These six locations are in or near areas frequented by INEL personnel. INEL personnel working in these areas are exposed to the risks associated with uncontrolled detonation of unexploded ordnance and soils contaminated with explosives compounds. The pathways for human exposure to the soil contaminants include: ingestion, inhalation, and dermal absorption. A description of the six locations is presented below.

(1) CFA Gravel Pit. One 5-inch artillery shell is buried by a slumped gravel pit wall. This location is within 500 ft. of a site proposed for future development and 250 ft. from a road that would be upgraded for that future project.

(2) Storage Bunkers North of Idaho Chemical Processing Plant (ICPP). At least two explosives storage bunkers at this location were destroyed in U.S. Navy tests resulting in the dispersal of 5-inch artillery shells, antitank mines, etc. in this area. This site poses a hazard to personnel in the vicinity. The approximate area is 10 acres.

(3) National Oceanic and Atmospheric Association (NOAA) Grid. Numerous 5-inch artillery shells and chunks of explosives have been found at this location. The area is periodically used by NOAA personnel for atmospheric tests and is within 2 miles of Test Reactor Area (TRA) and ICPP, two important operating facilities. The approximate area of this location is 5 acres.

(4) CFA Building 633 Zone. This area was used as a firing station for support of naval artillery tests. Many types of ordnance have been removed from this area. One 5-inch artillery shell is located in a 25 ft deep French drain that has been backfilled with soil and concrete capped. The area is currently used by INEL personnel. Some of the nearby buildings are scheduled for demolition. This location is approximately 20 acres in size.

(5) Fire Station II Zone. Numerous anti-tank mines and other ordnance debris have been found in this area near INEL Fire Station II. These ordnance apparently were dispersed as a result of tests performed at nearby locations at the NPG. This location is approximately 10 acres in size and is used periodically for training of INEL fire fighting personnel.

(6) Power Line Road. The power line road is located approximately 2 miles east of ICPP and Fire Station II and is frequently used by INEL and offsite workers during maintenance of the power line. Numerous 5-inch artillery shells have been found from this area. Approximately 10 miles of this access road lies within the former Naval artillery range. Clearing unexploded ordnance from a corridor 50 feet wide on both sides of this access road would result in an area of about 118 acres.

Unexploded ordnance have been found on the ground surface in most of these areas during routine work activities. Ordnance found to date at the INEL include: 3- to 16-inch artillery shells, partially exploded 125 to 2,000 pound bombs, anti-tank mines, depth charges, smokeless powder, dummy bombs with spotting charges, and chunks of explosives compounds. It is estimated that150 unexploded ordnance will be found and detonated during the implementation of this interim action.

In addition to unexploded ordnance in these locations, areas of soil are suspected of being contaminated with explosives compounds at the ground surface. Pieces of explosives compounds and discolored soil have been reported in these areas by INEL personnel. Also, controlled detonation of ordnance during this interim action may also release explosive contaminants to the soil. These contaminants potentially include picric acid, RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), TNT (2,4,6trinitrotoluene), and their numerous manufacturing contaminants and natural decomposition products. Contaminants, such as white phosphorus, metals and other military explosives, may also be present. The exact nature of the contaminants depends on the explosives used in the ordnance. TNT and RDX were the two most commonly used explosives during the World War II era.

Many of the ordnance compounds are considered to be potentially hazardous to human health. TNT and RDX are listed by the EPA as possible (group C) human carcinogens. The common TNT manufacturing contaminants, 2,4- and 2,6-dinitrotoluene (DNT), are listed as probable (group B2) human carcinogens by the EPA. Dinitrobenzene (DNB) and trinitrobenzene (TNB) are common products resulting from the natural breakdown of TNT. However, DNB and TNB are not listed by EPA as carcinogens. It is estimated that 185 cubic yards of soils contaminated with explosives would be remediated in this interim action.

6. SUMMARY OF SITE RISKS

Operable Unit 10-05 has been identified for interim action under the FFA/CO Action Plan for the INEL. This OU consists of six ordnance locations that have been identified for this interim action based on risks posed to site personnel, knowledge of the past activities that created the problem, and the hazards present. This interim action will provide the mechanism to actively search for and identify unexploded ordnance in these areas and remove the risks associated with the ordnance and soils contaminated with explosive compounds at these sites. A Baseline Risk Assessment has not been completed for OU 10-05 at this time, but will be included as part of the WAG 10 comprehensive RI/FS.

6.1 Explosive Risks

The main risk that has motivated this interim action is the potential explosive hazard associated with uncontrolled detonation of unexploded ordnance. Many of the known ordnance locations are in or near areas frequented by INEL personnel. Encounters with unexploded ordnance have occurred in the past and the potential remains for future encounters.

The CERCLA risk assessment methodology does not provide a mechanism to evaluate the risks posed by unexploded ordnance. Therefore, the risks associated with the six ordnance locations identified for this interim action were evaluated using the Department of Defense (DOD) Risk Assessment Code (RAC). The RAC methodology was developed for use at DOD sites where unexploded ordnance and contamination with ordnance compounds are a common problem. This methodology specifically addresses the risks associated with ordnance sites. The RAC was utilized for validation and confirmation of the unacceptable risks present at the six ordnance areas selected for this interim action.

The RAC method asks questions and assigns numerical values to the answers which are based on information available for the sites being evaluated. The result is a qualitative evaluation of the hazards present, the probability of those hazards resulting in an uncontrolled detonation, and recommendation for appropriate response. The results of the RAC evaluations performed on the six locations included in this interim action indicate that the hazards present warrant action to reduce the associated risks. This interim actionwill reduce those risks by finding and disposing of unexploded ordnance from the six areas identified for this interim action.

6.2 Contaminated Soil

Additional risks result from exposure to soils contaminated with explosive residues. Disposal and detonation of ordnance at the NPG have potentially released explosive residues to the adjacent soils. The detonation of unexploded ordnance for disposal, to be performed during this interim action, also has the potential to release contaminants to the soil.

No soil data exist to quantify concentrations of the contaminants of concern. For this reason, a risk analysis was performed using the risk assessment screening methodology currently used for FFA/CO investigations. This methodology provides a mechanism to derive acceptable levels of contaminants in soil or other media by back-calculation from the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) target risk range. The Track 1 methodology is reasonably conservative and uses humans as sensitive indicators for the environment. It focuses on major environmental pathways, receptors, and exposure scenarios to identify risk-based soil criteria for contaminants of concern. Modifications to the methodology included the evaluation of dermal contact as an additional pathway of exposure and the derivation of toxicity data when appropriate data was not available. Dermal exposure has been evaluated and found to be an important pathway at other Superfund sites involving cleanup of ordnance compounds.

The objective of the risk analysis was to determine soil concentrations that represent an acceptable risk for the contaminants of concern. Risk-based soil concentrations were back-calculated from the established NCP target risk range of 1 in 10,000 (10[-4]) to 1 in 1,000,000 (10[-6]) for carcinogenic contaminants and a Hazard Index of one for non-carcinogenic contaminants. Because the purpose of such an analysis is to obtain risk-based soil concentrations, the Track 1 methodology does not require sampling data. Instead, the procedure uses risk criteria to establish acceptable contaminant concentrations in the media of concern.

The selection of exposure scenarios for the risk analysis was based on the current Track 1 methodology. This conservative methodology uses hypothetical exposure scenarios, both present (occupational) and future (residential). The hypothetical occupational scenario evaluated a worker at the site assumed to be exposed to the contaminants in the soil. The hypothetical residential scenario evaluated exposures to individuals assumed to reside at the site in the future. A future residential scenario was considered for this risk analysis because it is possible that a residence could be built on the site in the event the INEL is eventually closed and vacated.

The major pathways for human exposure to the explosives compounds are through dermal absorption, ingestion, and inhalation of contaminated materials. Each of these pathways was evaluated for the two exposure scenarios, occupational and residential. The occupational exposure scenario resulted in the limiting soil contaminant concentrations.

Concentrations of soil contaminants above the 1 in 10,000 (10[-4]) risk-based soil levels as determined by the risk analysis are considered to pose an immediate risk, requiring cleanup. Therefore for this interim action, these concentrations have been selected as the screening action levels: TNT (440 mg/kg) and RDX (180 mg/kg). A screening action level for DNT has not been developed, since DNT is a manufacturing contaminant and natural breakdown product of TNT, normally making up approximately one percent by weight. The action level for TNT adequately provides for remediation of DNT and other natural breakdown products that may be present in the soil abovethe 1 in 10,000 (10[-4]) level. This is consistent with the approach taken at other CERCLA sites with similar contaminants. The cleanup standards selected for this interim action are the 1 in 100,000 (10[-5]) risk-based soil concentrations, 44 mg/kg for TNT and 18 mg/kg for RDX.

The action levels and cleanup standards selected for this interim action are protective against actual or expected exposures to the contaminants of concern. Based on the conservative nature of and the use of default values in the risk analysis, the 1 in 100,000 (10[-5]) risk-based cleanup level is protective of human health and the environment. The calculated non-carcinogenic concentration for TNT (26 mg/kg) was not selected for the cleanup level because the risk evaluation had substantially lower confidence levels than that for the carcinogenic risk evaluation. The 1 in 100,000 (10[-5]) risk-based cleanup concentration (44 mg/kg) selected for TNT is adequately protective of human health and the environment.

The action levels and cleanup standards selected for this action are appropriate for an interim action and are consistent with those selected at other Superfund sites contaminated with ordnance compounds. These levels will be re-evaluated as part of the WAG 10 comprehensive RI/FS to ensure that the cleanup remains protective considering cumulative effects.

This interim action will reduce the hazards associated with unexploded ordnance and soils contaminated with ordnance compounds at the six identified areas. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment due to the presence of unexploded ordnance and ordnance compounds in the soil.

6.3 Ecological Concerns

Ecological concerns will be more fully addressed in the WAG 10 comprehensive RI/FS ROD. Since the Track 1 risk evaluation methodology is conservative and the major ecological exposure routes are expected to be the same as for human exposures, the risk reduction realized due to this interim action should also achieve a significant reduction in adverse ecological effects.

7. DESCRIPTION OF ALTERNATIVES

The Proposed Plan presented four interim action alternatives: (1) no action; (2) placement of administrative barriers; (3) detonation and disposal on-site; off-site incineration of contaminated soil; and (4) detonation and disposal on-site, on-site composting of contaminated soil. These four alternatives are discussed below in greater detail.

7.1 Alternative 1 - No Action

No remedial action would be implemented under the no action alternative. The no action alternative was evaluated as required by CERCLA and the NCP. No immediate reduction of the explosive risk or risks from explosive

contamination would be accomplished. No significant costs would be associated with the no action alternative.

7.2 Alternative 2 - Placement of Administrative Barriers

This alternative would involve the place of administrative controls, such as signs and fences, at all identified areas where unexploded ordnance have been found. Administrative barriers would not meet cleanup requirements but would limit human exposure by informing personnel of the hazards present in the identified areas. However, this alternative would provide no guarantee of reducing the risk of uncontrolled detonation to site personnel and would not reduce the potential risk to site personnel or the environment from the release of explosive residues. Estimated total cost would be $182,600.

7.3 Alternative 3 - Detonation and Disposal On-site, Off-site Incineration of Contaminated Soil

This alternative involves a phased approach leading to controlled on-site detonation of unexploded ordnance by experienced personnel, followed by incineration of soils contaminated with explosive residues.

Phase I would first proceed with an in-depth record search of NPG and INEL historical records. This would include searching DOD record storage facilities located outside of the INEL and would encompass all identified and suspected ordnance areas at the INEL. The record search would provide the necessary background information to identify ordnance-related activities, target areas, and existing hazards in order to prepare plans, procedures and health and safety documentation to implement the cleanup. Additional ordnance areas identified through the record search which the FFA/CO Remedial Project Managers agree will pose an immediate unacceptable risk to site personnel or the public, and consist of limited additional magnitude and associated hazards, will be considered within the scope of this interim action. Ordnance areas evaluated during the record search, which are deemed to pose an immediate unacceptable risk and fall outside the current scope of this interim action could be addressed by amending the ROD for this interim action. Upon concurrence of the three FFA/CO Project Managers, a ROD amendment may be initiated and would involve another public comment period.

As part of this interim action, areas identified which are crossed by public roads will be posted with signs to warn of the potential hazards to the public presented by unexploded ordnance. Phase II would continue with a systematic search for surface and near-surface ordnance at the identified ordnance areas using visual and geophysical search methods. Unexploded ordnance and chunks of explosive discovered in this manner would be marked, identified, and investigated to determine ordnance types and whether explosives were contained within. These ordnance would then be detonated in place or, if necessary, moved to a safer location for detonation with other like devices by qualified explosive ordnance disposal technicians. The areas would then be policed for shrapnel and examined to insure complete detonation of explosive materials. Any pieces of explosive residue released due to incomplete detonation would be detonated again. Nonhazardous solid waste, such as shrapnel, resulting from detonation would be disposed in the INEL RCRA Subtitle D landfill at CFA and, to the extent possible, scrap metal would be recycled.

Phase III would involve systematic sampling of soils in areas where detonations occurred and areas suspected to be contaminated from past activities due to visible discoloration. Samples would be analyzed using field methods developed for explosives by the DOD with 10 percent of the samples sent to an off-site analytical laboratory for quality assurance and

confirmation of results. These data would be used to determine the volume of soil to be removed based on the cleanup action levels and standards presented in this ROD.

Phase IV would involve removal of soil contaminated with explosives above the action levels. Contaminated soils would first be sampled and analyzed using toxicity characteristic leaching procedure (TCLP) methodology to determine if RCRA requirements apply, and then taken to an off-site treatment/disposal facility for incineration and disposal. The $2,359,500 estimated total cost for this alternative assumes 185 cubic yards of soil will require treatment.

7.4 Alternative 4 - Detonation and Disposal On-site, On-site Comporting of Contaminated Soil

Alternative 4 involves the same phased approach as in alternative 3. The NAG record search, posting of signs, ordnance area search, detonation, and soil sampling (Phases I, II and III) would be the same for this alternative. However, remediation of soil contaminated with explosive residues(Phase IV) would utilize the innovative comporting technology currently being evaluated by the DAD and EPA for cleanup of soils contaminated with explosives at the Umatilla Army Depot Activity Superfund site in Oregon.

In this alternative, contaminated soil would be removed and mixed with nutrient-rich organic material (manure, etc.) and placed inside a containment structure where temperature and moisture could be controlled. This methodology utilizes native soil microorganisms, similar to municipal waste composting, to degrade contaminants and has been shown to successfully remediate mixed explosives in soil within 90 days. Treated soil would be sampled and analyzed for explosives to confirm successful remediation. Successfully treated soil would then be used for clean fill at the INEL.

The capabilities of INEL soil and associated native microorganisms to biodegrade ordnance compounds would first have to be evaluated in a pilotscale test. If this methodology is not proven to be feasible, alternative 3 would be selected as a contingency. Total cost estimated for this alternative is $2,075,500.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The CERCLA guidance requires that each remedial alternative be evaluated according to specific criteria. The purpose of the evaluation is to determine the advantages and disadvantages of each alternative, and thereby guide selection of the remedial alternative offering the most effective and feasible means of achieving the stated cleanup objectives. While all nine CERCLA criteria are important, they are weighted differently in the decision making process depending on whether they describe a required level of performance (threshold criteria), technical advantages and disadvantages (balancing criteria), or review and evaluation by other entities (modifying criteria). The four remedial alternatives described in Section 7.0 were evaluated according to the following CERCLA criteria:

- Threshold criteria
  - Overall protection of human health and the environment
  - Compliance with ARARs

- Balancing criteria
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability

- Cost

. Modifying criteria
  - State acceptance
  - Community acceptance

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). The threshold criteria must be met by the remedial alternatives for further consideration as potential final remedies for the ROD. It is the intent of this interim action to meet the threshold criteria. The effectiveness of this remedial action as a final remedy will be evaluated in the WAG 10 comprehensive RI/FS.

8.1.1 Overall Protection of Human Health and the Environment

The primary risks to be reduced are the safety hazard to INEL personnel due to the presence of unexploded ordnance and risk of ingestion, inhalation, or dermal contact with explosive residues present on-site. Alternatives 3 and 4 would remove the hazards associated with the unexploded ordnance and soil contaminated with explosive residues above the action levels, providing protection for human health and the environment. Alternative 2 could potentially reduce exposure to these risks but would not be as effective as alternatives 3 and 4 since the hazards remain in place. Alternative 1 would do nothing to reduce these risks.

8.1.2 Compliance with ARARs

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with Federal and State laws applicable to the action being taken. Remedial actions should also comply with the requirements of laws and regulations that are not directly applicable, but are relevant and appropriate. Combined, these are referred to as ARARs. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, location-, and action-specific ARARs or justification of a waiver; and whether the remedial alternatives consider other criteria, advisories, and guidelines.

8.1.2.1 Chemical-specific ARARs - Chemical-specific ARARs are standards for allowable levels of certain contaminants in the environment. Such standards are generally issued pursuant to the Federal SDWA, Clean Water Act, Clean Air Act, RCRA, Atomic Energy Act, and State counterpart requirements.

There are no chemical-specific ARARs governing clean-up levels for unexploded ordnance or explosive residues in soil. Therefore, based on knowledge to date, no chemical-specific ARARs have been identified. If chemicalspecific ARARs are identified as the development of Remedial Design/Remedial Action progresses, they will be complied with.

Federal and State water quality regulations are not applicable because the interim action does not deal with surface water or groundwater contamination. Water quality issues will be addressed in the WAG 10 site-wide, comprehensive RI/FS.

Unexploded ordnance are not classified as hazardous waste as described in RCRA. Explosives residues are classified as listed RCRA hazardous wastes if they are generated by a manufacturing or processing facility or may be characteristic RCRA hazardous wastes if they are reactive. The

concentrations of explosives in the contaminated soils are expected to be far below the 12 percentby weight cutoff that would make them reactive, based on research performed by DOD. However, any contaminated soils taken off-site for treatment/disposal would need to be sampled and analyzed using the RCRA TCLP methodology to determine waste handling and shipping requirements.

8.1.2.2 Action-specific ARARs - An air quality permit is not required for this interim action since it is a CERCLA onsite action. However, the substantive requirements of an air quality permit must be met. The Idaho Division of Environmental Quality will be informed of this action and provided with the appropriate information for their review prior to taking any action.

8.1.2.3 Location-specific ARARs - The National Historic Preservation Act is applicable to CERCLA actions. However, this interim action is not expected to impact areas with historic significance. Five of the six locations have been previously surveyed for cultural resources and the sixth location will be surveyed prior to the start of any actions. Also, no threatened or endangered species or habitats have been identified in these areas so the Endangered Species Act is not considered to be an ARAR for this interim action.

8.2 Balancing Criteria

Once a remedial alternative has been shown to satisfy the threshold criteria, five balancing criteria are used to evaluate other aspects of the potential alternatives. The balancing criteria are used in refining the selection of candidate alternatives for the proposed action. The five balancing criteria are: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Each criterion is further explained in the following sections.

The no action alternative was eliminated from further evaluation since it did not meet the threshold criteria described above. The remaining three alternatives are evaluated below against each of the five balancing criteria.

8.2.1 Long-term Effectiveness and Permanence

Alternatives 3 and 4 would provide long-term effectiveness and permanence by removing the potential explosive hazards and soil contaminated with explosive residues above the cleanup action levels. Alternative 2, placement of administrative barriers, provides some reduction of risk but its effectiveness and permanence would be limited. The hazards would remain in place and some personnel must enter these areas to perform their work in support of the continued operations of the INEL.

8.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions employing treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Evaluation of alternatives based on this criterion requires analysis of the following factors: treatment process used; toxicity and nature of the material treated; amount of hazardous material destroyed or treated; irreversibility of the treatment; type and quantity of treatment byproducts; and the statutory preference for treatment as a principal element.

Alternative 3 would remove the risk posed by unexploded ordnance through

controlled detonation. Under this alternative, contaminated soils with concentrations of contaminants above the cleanup action level would be incinerated off-site. The incineration process is irreversible, destroying the ordnance compounds, and producing a smaller volume of ash. The incinerator chosen for this action will be a facility approved by the EPA to receive CERCLA wastes and will be responsible for proper disposal of the ash depending on the nature of any residual contamination present. This alternativeoffers the greatest reduction of toxicity, mobility, or volume of wastes present at the ordnance locations identified in this interim action.

Alternative 4 would also remove the risk posed by unexploded ordnance through controlled detonation. Alternative 4 differs from alternative 3 in that soils contaminated with ordnance compounds above the cleanup action levels would be treated by composting on-site. This alternative would also potentially reduce toxicity, mobility or volume of wastes by degrading the ordnance compounds present in the soil. However, if other contaminants, such as heavy metals, are present, the treatment process could be compromised resulting in an increase in the residual waste volume, which could potentially require disposal at an off-site EPA approved facility. No soil sampling data exists to fully evaluate the nature of the soil contaminants.

Alternative 2, placement of administrative barriers, would provide no treatment and, therefore, would not fulfill the statutory preference for remedial actions involving treatment. The hazards associated with unexploded ordnance and contaminated soils would remain in place. No reduction of toxicity, mobility, or volume through treatment would be accomplished.

8.2.3 Short-term Effectiveness

The evaluation of alternatives based on short-term effectiveness requires an analysis of the effectiveness of protection for the community and workers during remedial actions, environmental impacts during implementation, and the amount of time required for remedial action objectives to be achieved.

Alternative 3 could be implemented relatively quickly using available technology. Additionally, this technology has been demonstrated in the past at the INEL and DOD facilities. Detonation of unexploded ordnance would remove the immediate safety hazard to INEL workers. Removal of contaminated soil would further reduce risks and cause minimal impacts to the environment. Remedial action objectives would be achieved within two years. Dust and noise would be produced by this alternative but these impacts would be mitigated through remedial design to minimize impacts to INEL workers and the environment. Remedial activities would protect workers by meeting the requirements of the Occupational Safety and Health Act (OSHA). Disturbed areas would be backfilled with clean fill as necessary and reseeded to match natural vegetation. No impact to the community is expected from this action.

Alternative 4 would require some lead time to design and perform a pilot-scale study before implementation. After this study demonstrated feasibility of the treatment, this alternative would be implemented. Remedial objectives could be achieved within two years. Alternative 4 could effectively remove the hazard of unexploded ordnance and risks associated with explosive residues in soil. Potential impacts to workers and the environment from detonation of ordnance and excavation of contaminated soils would be similar to those identified for alternative 3.

Alternative 2 could be completed quickly using existing resources. No significant impacts to the environment would be associated with this

alternative. However, this alternative would not eliminate risks associated with the ordnance sites, and therefore not meet the remedial action objectives.

8.2.4 Implementability

The implementability criterion has three factors that must be evaluated: technical feasibility; administrative feasibility; and the availability of services and materials. Technical feasibility requires evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. The ability to coordinate actions with other agencies is the only factor for evaluating administrative feasibility. This would include the substantive requirements of a State of Idaho air quality permit and any requirements for off-site disposal. The availability of services and materials requires evaluation of the following factors: availability of treatment, storage and disposal services; availability of necessary equipment and specialists; and availability of prospective technologies.

Detonation and incineration, alternative 3, has previously been implemented at many DOD facilities. However, these facilities brought an incinerator on -site for treatment of contaminated soil. Due to the low volume of contaminated materials expected, this action cannot justify the significant initial capital costs of bringing an incinerator to the INEL. Therefore, an offsite incinerator approved by the EPA to receive CERCLA wastes would be utilized. This alternative could be readily implemented using existing technologies.

Alternative 4 would require design and completion of a pilot-scale study prior to construction and implementation of Phase IV. Soils and contaminants specific to the INEL would be evaluated to insure success of the composting technology. However, this alternative is not readily implementable due to the unknown nature of the soil contaminants and the estimated small quantity requiring treatment. The presence of heavy metals, in particular, would make the composting technology infeasible.

Alternative 2, placement of administrative barriers, could be readily implemented following procurement of materials, minimal personnel training and planning. The time required to fabricate the signs and install signs and fences would be minimal compared to the other alternatives. However, administrative barriers are effective only if the integrity of the barriers is maintained, personnel acknowledge the hazards that are present, and a long-term commitment for maintenance and funding is provided. 8.2.5 Cost

Capital costs, operation and maintenance costs, and present worth costs must be estimated in order to evaluate total project costs. Capital costs include design, construction, equipment, buildings, startup, and contingency costs. Operation and maintenance costs include labor, power, disposal of residuals, administration, and periodic review. Actual costs are expected to be no more than 50 percent over, or 30 percent under, the cost estimate.

Alternative 2 costs ($182,600) are minimal and would also require minimal annual inspection and maintenance to ensure administrative barriers remain in place.

The costs of alternatives 3 and 4, $2,359,500 and $2,075,500 respectively, are significantly higher than the cost of alternative 2. However, both of these alternatives remove the immediate and long-term hazard and associated risks. These two alternatives assume that 150 unexploded ordnance will be detonated in a controlled manner. This assumption is based on previous

field searches and ordnance detonation at the INEL. Alternatives 3 and 4 also assume known acreage for each area and the volume of contaminated soil (185 yd[3]) to be remediated. This volume estimate is based on the cumulative area assumed to be potentially affected by the ordnance detonations. Deviation from the above assumptions would significantly affect estimated costs of the alternatives.

8.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. These two criteria must consider the following factors: the elements of the alternatives which are supported; the elements of the alternatives which are not supported; and the elements of the alternatives for which there is strong opposition.

8.3.1 State Acceptance

This assessment evaluates the technical and administrative issues and concerns the state may have regarding each of the alternatives.

The State of Idaho Department of Health and Welfare (IDHW) supports the selection of alternative 3, controlled detonation and on-site disposal, off-site incineration of contaminated soil. The State of Idaho has been involved in this project from the beginning, including preparation of the Proposed Plan and this decision document. Comments received from IDHW were incorporated into these documents and they have been issued with IDHW concurrence.

8.3.2 Community Acceptance

This assessment evaluates the issues and concerns the public may have with each of the proposed alternatives. The issues identified during the public comment period are more fully addressed in the attached Responsiveness Summary.

Alternative 2, placement of administrative barriers, was supported in combination with both alternatives 3 and 4.

Alternative 3, detonation and incineration, received moderate support. However, the public was concerned with the location of the incinerator and transportation of wastes off the INEL.

Alternative 4, detonation and composting, received the most support. The public especially preferred the idea of treating contaminants on-site. However, this technology is infeasible for this interim action since the composting technology is still being developed, the estimated volume of contaminated soil is low, and heavy metals may be present in the soil.

9. THE SELECTED REMEDY

Operable Unit 10-05, which also contains OU 4-01, includes the six areas which have been identified for this interim action. It is the intention of this interim action to reduce the immediate risks (see Section 6) associated with these six unexploded ordnance areas and expedite overall sitecleanup. The six locations have been identified for cleanup in this interim action because they are in or near areas frequented by INEL site personnel and contain unexploded ordnance, which pose an unacceptable risk to human health.

The selected remedy (alternative 3) for the interim remedial action of OU 10

-05 will cost an estimated $2,359,500 (present worth). The remedy includes the following actions: (1) a comprehensive search of historical records pertaining to the NPG and other suspected ordnance sites at the INEL, (2) posting of signs where the public has access to ordnance areas, (3) a field search of the six identified areas for unexploded ordnance, (4) controlled detonation of the ordnance, (5) field sampling of detonation areas and other areas suspected of contamination with explosive compounds, (6) excavation of contaminated soils exceeding action levels, and (7) off-site incineration and disposal of contaminated soils. This alternative is preferred because it best achieves the goals of the evaluation criteria given the scope of the action.

The selected remedy assumes an estimate of approximately 150 unexploded ordnance and 185 cubic yards of ordnance-contaminated soils to be remediated in the interim action. The estimates are based on previous field searches and ordnance detonation work at the INEL. This interim action is limited to the six identified areas or the estimated quantity of materials to be remediated.

The selected remedy for this interim action includes a search of historical records pertaining to ordnance activities at the INEL. The search will be comprehensive and will not be limited to the six areas identified for cleanup. This record search will provide information to enable possible future actions to be planned for remediation of unexploded ordnance at the INEL. Information from the record search will be evaluated by the agencies to determine whether any additional ordnance locations, other than the six identified, present an immediate unacceptable risk to INEL site personnel or the public.

Additional ordnance areas identified through the record search which the FFA/CO Remedial Project Managers agree will pose an immediate unacceptable risk to site personnel or the public, and consist of limited additional magnitude and associated hazards, will be considered within the scope of this interim action. Ordnance areas evaluated during the record search, which are deemed to pose an immediate risk and fall outside the current scope of this interim action could, upon concurrence of the FFA/CO Project Managers, be addressed by amending the ROD, or in another manner consistent with the FFA/CO process.

Another operable unit, OU 10-03, has been identified in the FFA/CO Action Plan for the remaining ordnance areas for which insufficient information exists to plan remediation at this time. In accordance with the FFA/CO Action Plan the remaining areas will be addressed in the Fall of 1995.

The final remedies for both OU 10-03 and OU 10-05 will be addressed in the WAG 10 RI/FS scheduled to begin in 1998. In the interim, RI/FS investigations at the WAGs will be completed according to the schedule in the FFA/CO Action Plan and lead to the final comprehensive RI/FS for WAG 10. This interim action is consistent with, and will not interfere with, any planned final action.

9.1 Historical Record Search

In Phase I, a comprehensive search of historical records pertaining to the former NPG and other suspected ordnance sites at the INEL will be completed. This search will include U. S. Navy, U. S. Army, DOE and other record repositories as necessary to sufficiently identify activities performed at the former NPG and other ordnance sites at the INEL. Specifically, the purpose of the record search is to identify the types of ordnance used, strategies and goals of the tests conducted, targets used, and other information that will aid in the planning of this and future cleanup

activities pertaining toordnance at the INEL.

9.2 Ordnance Search and Detonation

Signs would be posted at the borders of the suspected ordnance areas which are transected by public roads (see Figure 1) to warn the public of the possible presence of unexploded ordnance and the associated risks.

Phase II would continue with a systematic search for unexploded ordnance in the six identified ordnance areas in OU 10-05. These searches will employ both visual and geophysical sweeps of the areas in an effort to identify all ordnance within two feet of the surface. All ordnance identified in this manner will be marked, the location identified by coordinates, and logged into a field notebook to enable workers to relocate them. Areas suspected of soil contamination, due to discoloration or presence of chunks of explosives, will also be identified and marked for sampling in Phase III.

Phase II will continue with the controlled detonation of the unexploded ordnance and chunks of explosives located by the searches. Each ordnance would be detonated to initiate an explosion that would either destroy the ordnance and its associated explosive or expose the inside of the ordnance to determine its contents. Live ordnance would then be further detonated to destroy the ordnance compounds within. Metal debris produced would first be checked for complete detonation and then discarded as nonhazardous waste to the INEL RCRA Subtitle D landfill at CFA or, if possible, recycled as scrap metal.

9.3 Soil Sampling and Excavation

In Phase III, soil in detonation areas and other areas suspected of being contaminated with ordnance compounds will be systematically sampled using field analytical methods. Soil samples will be collected to determine if action levels have been exceeded due to the release of contaminants during ordnance detonations. The field analytical methods developed specifically for ordnance compounds by the U. S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory will be used for this interim action. These methods will analyze for both TNT and RDX, providing low detection levels, good reproducibility, and reliability. Detection levels are sufficiently low to detect these compounds at concentrations below the cleanup action levels. Other ordnance compounds and mixtures, such as Compound B, amitol, etc., contain TNT and/or RDX and will therefore be detected using these methods.

Ten percent of the soil samples collected will be sent to an offsite analytical laboratory for quality assurance and verification of field analytical results. These samples will be analyzed using EPA method 8330 for a suite of ordnance compounds, including: RDX, TNT, DNT, and numerous related compounds. These samples will serve as a quality check of the field analytical methods that will be used.

The screening action levels and cleanup standards for TNT and RDX have been selected based on results of the risk analysis discussed in Section 6.2 and information derived from cleanup actions at other ordnance sites. The action levels are 440 ppm for TNT and 180 ppm for RDX. These action levels were selected based on the NCP excess cancer risk of 1 in 10,000 (10[4]) for an occupational exposure scenario. The occupational scenario resulted in the lowest risk-based concentrations for the exposure pathways evaluated. The risk-based soil concentrations generated by the risk analysis closely parallel those used at other ordnance Superfund sites. Additionally, the risk evaluation used to derive these risk-based soil concentrations is a reasonably conservative methodology and has established action levels that

are protective of human health and the environment.

Soils with TNT and RDX concentrations determined to be over the screening action levels will be excavated and containerized for transportation to an off-site incinerator. Other ordnance contaminants potentially present in the contaminated soils would also be remediated as a result of their co-occurrence with TNT and RDX. For example, DNT is a manufacturing byproduct of TNT processing, making up approximately one percent by weight of the total TNT concentration. It therefore occurs with TNT as a contaminant and will be remediated simultaneously with soils that exceed the TNT cleanup action level. This will also be true for TNT degradation products and compounds similarly associated with RDX. Field analytical methods are not available that would quantify these other potential contaminants.

The cleanup standard selected for this interim action is based on the NCP excess cancer risk of 1 in 100,000 (10[-5]) for an occupational exposure scenario. The cleanup standards for TNT and RDX are 44 and 18 ppm, respectively. These risk-based soil concentrations were also derived in the risk analysis performed following the conservative Track 1 methodology. The cleanup standard represents the maximum concentration of soil contaminants allowed following completion of the interim action. The screening action levels and cleanup standards for this interim action are similar to those selected at other Superfund sites contaminated with ordnance compounds.

9.4 Off-site Incineration

Excavated soil will be containerized for transport off-site to an EPA approved incinerator, consistent with the EPA off-site disposal policy. The containerized soil will first be sampled and analyzed for TCLP analytes to determine whether it should be classified as RCRA waste. Excavated contaminated soils are expected to exhibit contaminant concentrations that would be less than the 12 percent by weight cutoff that would make them a reactive waste under RCRA. Transport of contaminated soil to the selected incinerator will follow all applicable laws regarding transportation of hazardousmaterials. The sampling results for the containerized waste will determine which transportation laws are applicable and help determine the final disposition of incinerator ash.

The interim action will conclude with off-site incineration of the contaminated soils and appropriate disposal of the ash by the incineration facility. The selected incinerator will be a facility approved by the EPA for off-site disposal of CERCLA wastes. The actual location of the incinerator will be selected during the remedial design phase of the interim action.

10. STATUTORY DETERMINATION

The responsibility of DOE and EPA, under CERCLA is to ensure that interim remedial actions will protect human health and the environment. Additionally, Section 121 of CERCLA, as amended by SARA, establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedy must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws unless a statutory waiver is justified.

The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The remedy should represent the best balance of tradeoffs among alternatives with respect to pertinent criteria. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume,

toxicity, or mobility of hazardous wastes as their principal element.

The selected interim remedial action for OU 10-05 at the INEL meets these statutory requirements. The selected remedy will reduce the immediate explosive risks in the six identified areas and reduce the risk of exposure to contaminated soil to within the NCP target risk range of 1 in 10,000 (10[-4]) to 1 in 1,000,000 (10[-6]). Implementation of the selected remedy will not pose an unacceptable short-term risk to human health or the environment or cause cross-media impacts.

10.1 Protection of Human Health and the Environment

The selected interim remedial action will protect human health and the environment through removal of the risks associated with unexploded ordnance. In addition, soils contaminated with ordnance compounds which pose an unacceptable risk will be removed and treated by incineration.

10.2 Compliance with ARARs

The selected remedy will comply with all Federal and State ARARs. The ARARs are presented below.

10.2.1 Action-specific ARARs

The substantive requirements of a State of Idaho Air Quality Permit will be met for this action. (IDAPA 16.01.01012)

10.2.2 Chemical-specific ARARs

There are no chemical-specific ARARs for this action.

10.2.3 Location-specific ARARs

There are no location-specific ARARs for this action.

10.3 Cost-Effectiveness

The selected remedy (alternative 3) is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $2,359,500. Although the cost of the selected remedy is higher than the other alternatives, controlled detonation and disposal on-site followed by off-site incineration of contaminated soil provides a long-term solution that is protective of human health and the environment. This alternative eliminates the risks posed by unexploded ordnance and soils contaminated with explosives compounds from locations in OU 10-05. The cost of alternative 4 is about the same as alternative 3, the effectiveness of alternative 4 is uncertain because the composting technology would be infeasible if heavy metals are present. Alternative 2, placement of administrative barriers, does not provide any treatment or removal of the hazards present and is not effective for the costs incurred.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The DOE, EPA, and the State of Idaho have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner for OU 10-05. The agencies prefer a permanent solution whenever possible and for this action it is possible to meet the objectives of an interim action and provide a potentially permanent solution. The selected remedy, detonation

and incineration, will reduce the hazards associated with unexploded ordnance and significantly reduce the volume of soil contaminants present at OU 10-05.

10.5 Preference for Treatment as Principal Element

The statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element is met by this action through incineration. Unexploded ordnance will be located and detonated for disposal thereby eliminating the explosive risks associated with the six areas identified in OU 10-05. Soils contaminated with ordnance compounds will be treated by incineration. This action provides a permanent reduction in toxicity, mobility, and volume of the contaminated soils at OU 10-05.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OU 10-05, ordnance interim action, was released for public comment in January 1992. The Proposed Plan identified Alternative 3, detonation of unexploded ordnance and disposal on-site and off-site incineration of contaminated soil, as the preferred alternative. DOE, EPA, and the State of Idaho have reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/28/1992
Operable Unit: 02
ROD ID: EPA/ROD/R10-92/045

Media: Ground Water

Contaminant: VOCs, Metals, Radioactive Materials

Abstract: SITE HISTORY/DESCRIPTION: The 890-square-mile U.S. DOE Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls, Idaho. The site, established in 1949, is operated as a nuclear reactor technology development and waste management facility by the U.S. Department of Energy. Land use in the area is predominantly industrial and mixed use. The site overlies a sole source Class I aquifer, the Snake River Plain Aquifer. A 10-mile-square area within the INEL complex, referred to as Test Area North (TAN), was built in the 1950's to support the Aircraft Nuclear Propulsion Program sponsored by the U.S. Air Force and Atomic Energy Commission. Within TAN, the Technical Support Facility (TSF-05) injection well was used to dispose of industrial and sanitary wastes and wastewatersfrom 1953 to 1972. Types of wastes disposed of in the well included low- level radioactive and process wastes, corrosive wastewater, ignitable wastes, chromium, lead, and mercury. Contaminants, including TCE, PCE, tritium and strontium-90, were first detected above MCLs in the ground water in 1987. Based on these results, a RCRA Corrective Action Program was subsequently developed to address ground water contamination at TAN, which included installation of an air sparging system in the water supply tank at the TSF to ensure that organic contaminant concentrations remain below regulatory levels. Ground water sampling and monitoring continued through 1990, and contaminated sludge from the lower 55 feet of the TSF-05 injection well was

removed and analyzed in 1990. Currently, the TSF-05 injection well is closed securely and locked, and the well head has been sealed against surface water intrusion. The INEL site is divided into 10 Waste Area Groups (WAGs). Two RODs in 1991 and 1992 addressed an interim remedy for Warm Waste Pond sediment in WAG 2 and an interim remedy for unexploded ordnance and soil contamination in WAG 10. This ROD provides an interim remedy for ground water contamination near the TSF-05 injection well (WAG 1). The primary contaminants of concern affecting the ground water are VOCs, including TCE and PCE; metals, including lead; and radioactive materials. PERFORMANCE STANDARDS OR GOALS: Chemical-specific ground water clean-up goals, which are based on SDWA MCLs, and include TCE 5 ug/l; PCE 5 ug/l; lead 50 ug/l; and strontium[-90] 300 pCi/l. Air emissions also will be monitored and will not exceed state air quality standards, which include TCE 0.00051 lb/hr, PCE 0.013 lb/hr, lead 1.5 ug/m[3]; and strontium[-90] 10 mrem/yd. INSTITUTIONAL CONTROLS: Institutional controls will be implemented at the site to restrict ground water use during these interim remedial activities.

Remedy: SELECTED REMEDIAL ACTION: The selected remedial action for this site includes pumping the contaminated ground water from the injection well and treating the ground wateronsite using filtration to remove suspended solids, followed by air stripping and carbon adsorption to remove organics, and ion exchange to remove inorganics and radionuclides; modifying the existing TAN onsite disposal pond to receive treated ground water and ensure that it does not exceed discharge limits; transporting any spent carbon offsite to a permitted facility for regeneration; installing two additional ground water monitoring wells within the contaminant plume; monitoring air emissions; and implementing administrative and institutional controls, including ground water use restrictions. The estimated capital cost for this remedial action is $7,715,000, with a total O&M cost of $3,194,000 for 2 years.

Text: Full-text ROD document follows on next page.

Text:
Record of Decision

Technical Support Facility (TSF) Injection Well (TSF-05) and
Surrounding Groundwater Contamination (TSF-23)

Operable Unit 1-07A
Waste Area Group 1
Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

TSF Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) Operable Unit (OU) 1-07A Waste Area Group 1 Idaho National Engineering Laboratory Idaho Falls, Idaho

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Technical Support Facility (TSF) Injection Well (TSF-05), and the groundwater surrounding the injection well (TSF-23) as described in the Federal Facility Agreement/Consent Order (FFA/CO). This action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

The State of Idaho Department of Health and Welfare (IDHW) concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This interim action is intended to prevent further degradation of the groundwater by reducing contaminants near the TSF-05 injection well and in the surrounding groundwater. The selected remedy will also not be inconsistent with nor preclude the implementation of the final response action scheduled to be determined in 1994.

The major components of the selected remedy include:

. Extract contaminated groundwater from the TSF-05 injection well and perhaps nearby groundwater monitoring wells that are capable of capturing contaminated groundwater.

. Install two groundwater monitoring wells within the contaminant plume to monitor the effectiveness of the interim action. These wells may also be used as extraction wells to expedite the removal of contaminated groundwater.
to monitor the effectiveness of the interim action. These wells may

- Install on-site groundwater treatment facilities to reduce contaminants of concern in the extracted groundwater to prescribed performance standards. The selected treatment system is air stripping, carbon adsorption, and ion exchange.

- Monitor the groundwater contaminant plume and the extraction/treatment system during groundwater extraction activities to track the effectiveness of the system and to ensure that performance standards are achieved.
system during groundwater extraction activities to track the
- Modify the existing Test Area North (TAN) disposal pond to receive the treated groundwater and ensure that discharge water quality does no further degrade the underlying Snake River Plain Aquifer above maximum contaminant levels.
treated groundwater and ensure that discharge water quality does no
- Implement administrative and institutional controls that supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.

Statutory Determinations

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action utilizes treatment and thus is in furtherance of that statutory mandate.

Although this is an interim action, it is intended to prevent further degradation of the groundwater until the final remedy for OU 1-07 is selected. Because this action does not constitute the final remedy for OU 107, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent investigations are planned to address the potential threats posed by the conditions at OU 1-07. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within two years after commencement of the remedial action. Because this is an interim action ROD, review of these sites and of this remedy will be continuing while developing final remedial alternatives for OU 1-07.

Signature sheet for the foregoing Operable Unit 1-07A TSF-05 injection well and surrounding groundwater interim action at the Test Area North at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Signature sheet for the foregoing Operable Unit 1-07A TSF-05 injection well and surrounding groundwater interim action at the Test Area North at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Signature sheet for the foregoing Operable Unit 1-07A TSF-05 injection well and surrounding groundwater interim action at the Test Area North at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

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ACRONYMS

- ù ANP — Aircraft Nuclear Program
- ù ARARs — applicable or relevant and appropriate requirements
- ù BDAT — Best Demonstrated Available Technology
- ù CERCLA — Comprehensive Environmental Response, Compensation, and Liability Act
- ù CFA — Central Facilities Area
- ù CFR — Code of Federal Regulations
- ù Ci — Curies
- ù CLP — Contract Laboratory Program
- ù COCA — Consent Order and Compliance Agreement
- ù CRP — Community Relations Plan
- ù DOE — Department of Energy
- ù EPA — Environmental Protection Agency

- ù FET Flight Engine Test facility
- ù FFA/CO Federal Facility Agreement/Consent Order
- ù FR Federal Register
- ù gpd gallons per day
- ù gpm gallons per minute
- ù HI Hazard Index
- ù ICPP Idaho Chemical Processing Plant
- ù IDAPA Idaho Administrative Procedures Act
- ù IDHW State of Idaho Department of Health and Welfare
- ù IET Initial Engine Test Facility
- ù INEL Idaho National Engineering Laboratory
- ù lb/hr pounds per hour
- ù LOFT Loss-of-Fluid Test Facility
- ù MCL maximum contaminant level
- ù mrem/yr millirem per year
- ù NA not applicable
- ù NCP National Oil and Hazardous Substances Pollution Contingency Plan
- ù ND non-detect
- ù NPL National Priorities List
- ù OU Operable Unit
- ù PCE tetrachloroethylene
- ù Pci/L picocuries per liter
- ù PPE personal protective equipment
- ù PWTU Portable Water Treatment Unit
- ù RCRA Resource Conservation and Recovery Act
- ù RFI RCRA Facility Investigation
- ù RI remedial investigation
- ù RI/FS remedial investigation/feasibility study
- ù ROD Record of Decision
- ù RWMC Radioactive Waste Management Complex
- ù SARA Superfund Amendments and Reauthorization Act
- ù TAN Test Area North
- ù TCE Trichloroethylene
- ù TCLP Toxicity Characteristic Leachate Procedure
- ù TSF Technical Support Facility
- ù USGS United States Geological Survey
- ù VOC Volatile Organic Compound
- ù WAG Waste Area Group
- ù WERF Waste Experimental Reduction Facility
- ù WRRTF Water Reactor Research Test Facility
- ù ug/gm micrograms per gram
- ù ug/L micrograms per liter
- ù ug/m[3] micrograms per cubic meter

DECISION SUMMARY

Introduction

The Idaho National Engineering Laboratory (INEL) was proposed for listing on the National Priorities List (NPL) on July 14, 1989 (54 Federal Register [FR] 29820). The listing was proposed by the United States Environmental Protection Agency (EPA) under the authorities granted EPA by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The final rule that listed the INEL on the NPL was published on November 21, 1989, in 54 FR 44184.

1. SITE NAME, LOCATION AND DESCRIPTION

The INEL is an 890-square mile Federal facility operated by the United

States Department of Energy (DOE) (Figure 1-1). The primary missions of the INEL are nuclear reactor technology development and waste management.

Current land use at the INEL is classified as industrial and mixed use by the United States Bureau of Land Management and the INEL has been designated as a National Environmental Research Park. The developed area within the INEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing. All livestock are kept approximately 12 miles away from the Test Area North (TAN) complex. However, wild species such as antelope, are allowed to roam freely within and across the INEL boundaries. These wild species are prevented from entering operational areas at the INEL by security fences.

Approximately 7,700 people are employed at the INEL, with an estimated 650 employed at the TAN. The nearest off-site populations are in the cities of: Terreton and Mud Lake (12 miles east); Arco (22 miles west); Blackfoot (38 miles southeast); Idaho Falls (49 miles east); and Pocatello (67 miles southeast).

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 inches per year, with estimated evapotranspiration rates of 6 to 9 inches per year. Twenty distinctive vegetation cover types have been identified at the INEL. Big sagebrush, the dominant species, covers approximately 80 percent of the area. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Underlying the INEL are a series of silicic and basaltic lava flows and relatively minor amounts of sedimentary interbeds. The basalts immediately beneath the site are relatively flat and covered with 20 to 30 ft of alluvium. The Snake River Plain Aquifer underlies the INEL and has been designated a sole source aquifer pursuant to the Safe Drinking Water Act.

The TAN complex is located in the northern portion of the INEL and extends over an area of approximately 10 square miles. Access to this area is controlled with fences and security patrols. TAN was built in the early 1950s to support the Aircraft Nuclear Propulsion Program sponsored by the United States Air Force and the Atomic Energy Commission. The Technical Support Facility (TSF) is centrally located within TAN (Figure 1-2), and consists of several experimental and support facilities for conducting research and development activities on reactor performance. The TSF covers an area of approximately 2,200 ft by 1,500 ft and is surrounded by a security fence. Located inside of the TSF fence are 38 buildings and 44 associated structures. The TSF-05 injection well is located in the southwest corner of TSF. Located outside of the fence are parking areas, a helicopter landing pad, rubble piles, a gravel pit, groundwater monitoring wells, surface drainage wells, and a number of roads.

Three other major test facilities are located nearby the TSF and are considered part of the TAN (Figure 1-2). These facilities are the Loss-ofFluid Test (LOFT) Facility, the Initial Engine Test (IET) facility, and the Water Reactor Research Test Facility (WRRTF). Most of the INEL is located in the Pioneer Basin, a poorly defined, closed drainage basin. The land surface at TAN is relatively flat except for volcanic vents (buttes) and unevenly surfaced and fissured basalt lava flows. TAN lies in a topographic depression between the base of the Lemhi range to the northwest, the Beaverhead Mountains to the northeast, and the Snake River drainage to the southeast (Figure 1-1). The elevation ranges from a low in this area of 4774 ft on the Birch Creek playa floor to a high of 5064 ft on top of Circular Butte.

The TAN site is at the terminus of the Big Lost River, downgradient of Birch

Creek, and upgradient of the terminus of the Little Lost River. These rivers drain mountain watersheds existing to the north and northwest of the INEL. In general, most of the flows from the Big and Little Lost Rivers and Birch Creek are diverted for irrigation purposes before reaching the INEL. On on occasion in the last 40 years Birch Creek actually flowed into the Birch Creek Playa and subsequently infiltrated into the ground. During years of high flow, the Little Lost River also flows on-site. Local rainfall and snowmelt during spring months contributes to recharge of the Snake River Plain Aquifer in the vicinity of TAN.

Two production wells supply water for all operations at the TSF. These wells are located in the northeast corner of the TSF and are identified as TAN-1 and TAN-2 in Figure 1-2. Sampling of the production wells during 1987 confirmed the presence of trichloroethylene (TCE) in concentrations that exceeded maximum contaminant levels (MCL). MCLs are standards established by the EPA and are designed to protect human health from the potential adverse effects of drinking water contaminants. To protect the workers at TAN, an air sparging system was installed in the water supply tank at the TSF to ensure that organic contaminant concentrations remain below regulatory levels (MCLs).

2. SITE HISTORY AND ENFORCEMENT ACTIONS

2.1 Site History

2.1.1 Disposal History of TSF-05 Injection Well

The TSF-05 injection well was completed in 1953 to a depth of 305 ft. The well has a 12-inch-diameter casing with perforations from 180 to 244 ft and from 269 to 305 ft below land surface. The well was used to dispose of TSF industrial and sanitary wastewaters into the Snake River Plain Aquifer which is encountered approximately 200 ft below land surface.

Historical records were reviewed and personnel interviews were conducted as part of previous investigations to determine former waste generation and disposal practices at TAN. These efforts identified six facilities that are potential sources for the groundwater contamination at TAN. Wastes from at least three of these facilities were apparently disposed in the TSF-05 injection well (Table 2-1). In addition, the TSF-05 injection well was also used in the late 1950s and early 1960s to dispose of concentrated evaporator sludges from the processing of low-level radioactive and process wastes at the TSF Intermediate-Level Waste Disposal System (TSF-09). Other types of wastes believed to have been disposed in the TSF-05 injection well include corrosive waste water, ignitable wastes, chromium, lead, and mercury.

The TSF-05 injection well was last used as a disposal site in 1972, after which waste waters were diverted to the southeastern portion of the TAN disposal pond. This well is now securely closed and locked, and the well head is sealed against surface water intrusion.

Previous investigations do not provide definitive information on the volumes of organic wastes disposed to the TSF-05 injection well or the specific processes by which they were generated. However, radioactivity released to the TSF-05 injection well can be estimated. The Radioactive Waste Management Information System contains estimates of curies by nuclide released to the TSF05 injection well for the period of 1971 through August 1972 (Table 2-2, column 2). Records regarding radioactivity released prior to 1971 are not as accurate. Estimates suggest the total radiation released to the TSF-05 injection well from 1959 to 1971 was approximately 45 curies (Ci); however information on the distribution by nuclide during this time period is not available. A rough approximation of nuclide distribution from 1959 to 1971 was calculated in Table 2-2 (column 3) assuming the same

distribution as known for 1971 through August 1972, and a total release of 45 Ci.

Potential sources of groundwater contamination at TAN, other than the TSF-05 injection well are not part of this interim action. These other potential sources will be investigated as part of the Waste Area Group (WAG)wide groundwater Remedial Investigation/Feasibility Study (RI/FS) [Operable Unit (OU) 1-07B] or the comprehensive WAG 1 RI/FS (OU 1-10).

2.1.2 Previous Groundwater Investigations

Contaminants in the TAN groundwater were first detected in April 1987. During groundwater sampling activities, TCE was detected in a sample collected for volatile organic compound (VOC) analyses from TSF production well TAN-1. Subsequent sampling of both production wells (TAN-1 and TAN-2 in Figure 1-2) for VOCs during September and November 1987 confirmed the presence of TCE in both wells and also identified tetrachloroethylene (PCE) in well TAN-1. In addition, independent groundwater sampling at TAN was performed by the USGS in 1987 and 1988. Results from these investigations indicate that well TSF-05 and a nearby observation well (USGS-24, Figure 5-3) were contaminated with TCE and PCE at concentrations in excess of MCLs. Samples from well TSF-05 and the two production wells (TAN-1 and TAN-2) were also tested for selected radionuclides during these sampling efforts. Tritium and Strontium-90 were detected at concentrations in excess of MCLs in samples from well TSF-05. Cesium-137, cobalt-60, americium-241, and plutonium were also detected in well TSF-05; however, there are no MCLs for these analytes.

On the basis of the results from these early sampling efforts, a Resource Conservation and Recovery Act (RCRA) Corrective Action Program was developed to address groundwater contamination at TAN. One of the first actions initiated was the installation of an air sparger in the water supply system in 1989 to keep organic contaminant

concentrations below safe drinking water levels.

A well drilling and groundwater sampling program from 1989 to 1990, was also initiated which included drilling and sampling 17 new wells (see Figure 5-3), plus sampling another 12 existing wells within 4 miles of the injection well. Additional sampling of production wells, new and existing monitoring wells, and the TSF-05 injection well for organic, inorganic, and radiological constituents occurred during 1989 and 1990 (See Table 5-1 and Figure 5-3). During this sampling period, four contaminants-TCE, PCE, lead, and strontium90-were consistently detected in more than one well at concentrations exceeding MCLs. These four contaminants are referred to as contaminants of concern, and are the focus of this interim action. Ranges of detected concentrations for the contaminants of concern in the TAN groundwater are presented in Table 2-3.

The USGS also sampled selected new and existing wells for organic and radionuclide constituents in 1989. Analytical results for TCE and PCE from this sampling effort were similar to those presented in Table 5-1, and discussed above. Concentrations of these compounds exceeded MCLs in all wells sampled, with the highest concentrations found in well TSF-05. Tritium concentrations exceeded the MCL in well TSF-05, but were less than the MCL in the other wells sampled. Concentrations of Strontium-90 exceeded the MCL in the TSF-05 injection well and a nearby well (TAN-D2). Elevated concentrations of Cesium-137 were also found in the TSF-05 injection well.

Another action, initiated in 1990, removed and analyzed contaminated sludge that had accumulated in the lower 55 ft of the TSF-05 injection well.

Moderate to high concentrations of radionuclides and organic compounds were detected in the sludge. (Table 5-3).

On the basis of the results of the groundwater sampling described above, and from analytical and radiological sampling results of sludge removed from the TSF-05 injection well in 1990 (see Section 5-3), the TSF-05 injection well was determined to be a primary source of groundwater contaminants at TAN.

2.2 Enforcement

A Consent Order/Compliance Agreement (COCA) was entered into between DOE and EPA pursuant to RCRA in August 1987. The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at INEL, and resulted in the RCRA Corrective Action Program mentioned in the preceding section.

As a result of the INEL's listing on the NPL in November 1989, DOE, EPA, and the State of Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent Order (FFA/CO) pursuant to CERCLA in December 1991. The FFA/CO superseded the COCA and established a procedural framework for agency coordination and a schedule for all CERCLA and RCRA corrective action activities conducted at the INEL. This interim action is undertaken in accordance with this FFA/CO.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

3.1 Community Relations Prior to the Interim Action

In accordance with CERCLA sections 113(K)(2)(b)(i-v) and 117, community interviews were conducted with local officials, community residents, and public interest groups to solicit concerns and information needs, and to learn how and when citizens would like to be involved in the CERCLA process. The information gathered during community interviews and other relevant information provided the basis for development of the INEL-wide Community Relations Plan (CRP). This INEL-wide CRP will continue to be implemented during this interim action to reflect the decision-making process under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and to ensure that appropriate public participation continues under the FFA/CO.

The presence of organic compounds in the groundwater at the TAN was first announced in a news release issued in November 1987. A second news release issued in September 1988, announced both the provision of an alternate source of drinking water for workers at TAN, and the scheduled installation of an air sparging system to remove volatile organic contaminants from the drinking water supply at TAN.

3.2 Community Relations to Support Selection of a Remedy

In accordance with CERCLA sections 113(K)(2)(b)(i-v) and 117, the public was given the opportunity to participate in the remedy selection process.

The Notice of Availability for the Proposed Plan was published January 5, 1992, in the following newspapers:

- The Post Register (Idaho Falls),
- The Idaho State Journal (Pocatello),
- Twin Falls Times News,
- Idaho Statesman (Boise),

- The Lewiston Morning Tribune,
- Idaho Free Press (Nampa),
  ù South Idaho Press (Burley),
- Moscow-Pullman Daily News.

ù South Idaho Press (Burley),

A similar newspaper advertisement was published January 30, 1992, in

- The Post Register (Idaho Falls),
- The Idaho State Journal (Pocatello),
- Twin Falls Times News,
- Idaho Statesman (Boise),
- Idaho Free Press (Nampa),
- the South Idaho Press (Burley).

These advertisements repeated the public meeting locations and times. Personal phone calls were made to inform individuals and groups about the comment opportunity. A "Dear Citizen" letter transmitting a copy of the Proposed Plan was mailed January 8, 1992 via a mailing list of 5,731 names of groups and individuals.

The public comment period was initially scheduled from January 13, 1992, to February 12, 1992. Three public meetings were held on February 4, 5, and 6, 1992, in Idaho Falls, Boise, and Burley. Representatives from the DOE, EPA, IDHW, and EG&G Idaho, Inc., were present at the public meetings to discuss the Proposed Plan, answer questions, and receive both written and oral public comments. For one hour prior to each meeting, INEL, EPA, and IDHW representatives were also available for informal discussions with the interested public. A court reporter was present at each meeting to record, verbatim, the proceedings of the meetings. Copies of the transcripts from the public meetings are available for public review in the Information Repositories (which are located at the public libraries in Boise, Twin Falls, Pocatello, Idaho Falls and the University of Idaho library in Moscow) as part of the Administrative Record for this interim action.

A request for an extension of the public comment period was received and granted, therefore extending the comment period to March 13, 1992. A notice of the extension was published February 18 and 19, 1992, in:

- The Post Register,
- The Idaho State Journal,
- Twin Falls Times News,
- Idaho Statesman,
- The Lewiston Morning Tribune,
- Idaho Free Press,
- South Idaho Press, and

. Moscow-Pullman Daily News.

On March 9, 1992, a technical briefing was conducted with the League of Woman Voters of Moscow via a conference call.

A Responsiveness Summary has been prepared to address public comments as part of this Record of Decision (ROD). All verbal comments given at the public meetings and all submitted written comments are repeated, verbatim, in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

In accordance with CERCLA section 113(K)(1), an Administrative Record was established to provide the basis for selection of the remedial action. The Administrative Record is available for public review at the INEL technical library in Idaho Falls. Copies of the Administrative Record are available for public review at the public libraries at Boise, Idaho Falls, Pocatello, and Twin Falls, and the University of Idaho Library in Moscow.

Persons on the mailing list will receive a notice of availability stating that the signed ROD is available. Copies of the ROD and the Responsiveness Summary will be placed in the Administrative Record and in the information repositories, and will be provided to the public upon request.

4. SCOPE AND ROLE OF THE OPERABLE UNIT

The INEL is divided into ten WAGs. The TAN has been designated as WAG 1, which is further divided into ten Ous. The TSF-05 injection well and surrounding groundwater contamination are one of the TAN Ous. It may be appropriate to implement an interim action for an OU before completing the RI/FS. Because sufficient data have been collected regarding the TSF-05 injection well, the OU was further subdivided into OU 1-07A (interim action) and OU 1-07B (TAN groundwater RI/FS).

OU 1-07A, the subject of this ROD, addresses the groundwater contaminants near the TSF-05 injection well. Thus, this interim action will help prevent further degradation of groundwater while the OU 1-07B RI/FS is being completed. During Remedial Design, the engineering phase that follows this ROD, technical drawings and specifications will be developed for the implementation of this interim remedial action.

To the extent practicable, this interim action will facilitate the OU 1-07B RI/FS by providing information about aquifer parameters based on data from the groundwater extraction and monitoring wells. In addition, this interim action will provide site-specific performance information that can be used for evaluating alternative technologies, determining process sizing, and estimating costs. Because this interim action is not the final remedy for the TSF-05 injection well and surrounding groundwater, subsequent investigations are planned to fully address the potential threats posed by the conditions at the site. This interim action will not be inconsistent with nor preclude the implementation of the final response action scheduled to be determined in 1994. In the event that continued operation of this limited scope remedy is determined to be appropriate, operational parameters will be defined in the OU 1-07B ROD. 5. SUMMARY OF SITE CHARACTERISTICS

5.1 Geology

The geology of TAN is characterized by a relatively thin layer (0 to 50 ft) of lacustrine sediments and playa deposits consisting of silts, clays, and minor sands. Underlying the surficial sediments is a thick sequence of basalt flows with sedimentary interbeds. The basalts exhibit a wide range

of lithologic textures and structures; from dense to highly vesicular basalt and from massive to highly fractured basalt. Individual flow units consist of a fractured/rubbly

flow top, a middle dense basalt, and a fractured/rubbly flow bottom. These flow units have a thickness of approximately 15 ft. Sedimentary interbeds occur within the basalt and consist of clay or silt. Interbeds that have been encountered to the maximum depth drilled include the P-Q and Q-R interbeds. Figure 5-1 is a cross-section through TAN. The location of the cross-section is shown in Figure 5-2. The P-Q interbed is discontinuous. The deeper interbed, Q-R, is interpreted to be continuous and slopes to the southeast. It has a variable thickness with a median thickness of approximately 4 ft. Interpretation of hydraulic head data indicates that this interbed could be a continuous, semi-confining layer. Both interbeds and the impact of the TAN geology on remedial alternatives will be evaluated in more detail in the OU 1-07B RI/FS.

5.2 Hydrogeology

The water table underneath the TSF facility averages about 4583 ft above mean sea level [at well United States Geological Survey (USGS)-24] or about 213 ft below land surface with a seasonal variation of about 4 ft. The water table also has a relatively flat horizontal hydraulic gradient (1 ft/mile). In general, the depth to groundwater immediately beneath the land surface at TAN is approximately 200 to 220 ft. The aquifer thickness could be greater than 900 ft. The groundwater flow velocity in the vicinity of TAN is generally south-southeast, and flow velocities range from 0.003 ft/day to 6.0 ft/day, with a median velocity of approximately 0.3 ft/day. Transmissivity estimates range from 400 to 800,000 ft[2]/day, with a median transmissivity of approximately 38,000 ft[2]/day.

The OU 1-07B RI/FS is investigating whether the Q-R interbed is continuous and creates semi-confining conditions.

Groundwater flow in the vicinity of TAN is south-southeasterly (Figure 5-3) and is influenced by groundwater recharge from the north, northwest, and northeast. Also, the local groundwater flow beneath TAN is affected by pumping from the TSF production wells northeast of the injection well.

5.3 Nature and Extent of Contamination

Although there may be other sources, past waste disposal in the TSF-05 injection well is considered to be the principal source of groundwater contamination at TAN. In general, the highest contaminant concentrations were detected in samples from well TSF-05 (Tables 5-1 and 5-2). TCE concentrations ranging from 24,000 ug/L to 35,000 ug/L were detected in groundwater samples collected from the TSF-05 well during 1987 through 1989. Then, in January and February 1990, sludge was removed from the lower 55 linear ft of this well. The sludge was analyzed for total metals, total organics, radionuclides, and Toxicity Characteristic Leachate Procedure (TCLP) metals, organics, pesticides, and herbicides. The concentrations of contaminants detected are presented in Table 5-3. On the basis of the high concentrations of organic and radiological constituents detected in the sludge, this material was considered to be a major source of groundwater contamination in the TSF-05 injection well and the surrounding groundwater. Although there are no additional data at this time, contaminant concentrations in the TSF-05 well are expected to have declined since the sludge was removed. Groundwater sampling associated with the interim action and the OU 1-07B RI/FS will determine current contaminant concentrations in the TSF-05 injection well and other wells at TAN. Also, potential sources of groundwater contamination at TAN other than the TSF-05 injection well

will be evaluated under the OU 1-07B RI/FS.

Preliminary interpretations regarding the extent of contamination at TAN are summarized below. These interpretations are based on the previous sampling results presented in Tables 5-1 and 5-2, and will be further evaluated (with new sampling data) as part of the OU 1-07B RI/FS. A groundwater contaminant plume extends generally southeastward from the TSF-05 injection well, which is consistent with the main direction of groundwater flow beneath TAN. Some contaminants have also been detected northeast of well TSF-05; contaminant migration in this direction is probably caused by localized shifts in groundwater flow directions resulting from pumping the TAN production wells (TAN-1 and TAN-2). As stated previously, the contaminants of concern for the interim action include TCE, PCE, lead, and strontium-90. These four contaminants have been detected at varying distances from the TSF05 injection well, apparently reflecting differing rates of migration through the groundwater. TCE is the most widespread constituent in the contaminant plume, having been found above MCLs as far as 1.5 miles southeast of the TSF -05 well. PCE has been detected in wells as far as 1 mile southeast of the TSF-05 well. Concentrations of strontium-90 and lead above their respective MCLs have only been regularly detected within 1/2 mile of the TSF-05 well.

The vertical extent of groundwater contamination at TAN is not yet clearly defined. Most wells at TAN are screened or open across the water table (which occurs at depths of approximately 200 ft or 4590 ft above mean sea level). The contaminant plume was detected primarily from groundwater samples collected from these wells. The deepest detected contamination was found in a sample from well TAN-12, which is screened at a depth of 362 to 382 ft; approximately 165 ft below the water table at an elevation of 4420 ft above mean sea level. However, there are relatively few wells at TAN which are screened only across deep intervals. Therefore, the vertical extent of contamination is largely unknown. There is no information, for example, to indicate whether contaminants have migrated below the Q-R interbed (Figure 5-1), which is interpreted to be a semi-confining bed beneath TAN. New wells will be installed as a part of the OU 1-07B RI/FS to help better define the vertical extent of the contaminant plume.

On the basis of the previous sampling data presented in Table 5-1 and discussed above, the contaminant plume beneath TAN is estimated to be approximately 1.5 miles in length, 0.5 miles in width, and 200 ft thick. Although there are numerous uncertainties associated with this estimate (particularly regarding the plume thickness), it is a sufficient initial characterization for interim action design purposes. As stated above, subsequent groundwater sampling for the interim action and the OU 1-07B RI/FS will further refine this initial characterization.

6. SUMMARY OF SITE RISKS

6.1 Human Health

Although this interim action does not use a completed baseline risk assessment, sufficient information is available to demonstrate the potential for risk and the need to take action.

Chemical-specific standards that define acceptable risk levels such as MCLs, may be used to determine whether an exposure is associated with an unacceptable risk to human health or the environment and whether remedial action is warranted. Four contaminants have been found to exceed their chemical-specific MCLs in more than one well and on a recurring basis in the vicinity of the TSF05 injection well and therefore are considered to be contaminants of concern. Table 6-1 identifies the contaminants of concern, their respective MCLs, and risk-based concentrations.

Both trichloroethylene and tetrachloroethylene have been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed at lower levels over long periods of time.

Lead can cause a variety of adverse health effects in humans. At relatively low levels of exposure, these effects may include interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children, slight deficits in the attention span, hearing, learning abilities of children, and slight increases in the blood pressure of some adults.

Strontium-90 is a fission product and a beta particle emitter. Strontium-90 accumulates in bone tissue and if taken internally, can damage the bone marrow and bone tissue which can cause cancer. Children are more susceptible to impacts from the strontium-90 because their bones are developing more rapidly than in an adult. Beta particles can penetrate the skin, so theseparticles can also damage the skin and eyes.

The potentially exposed populations include site workers and site visitors. The reasonable exposure pathways for each group are ingestion of contaminated groundwater and inhalation of volatiles. The immediate threat of exposure has been mitigated by the installation of an air sparger system in the drinking water supply. Although the air sparger reduces the risk of exposure, it does not address the source of groundwater contamination or the protection of future drinking water supplies. For a future residential scenario where people might live on part of the INEL, a drinking water well could draw contamination from a portion of the contaminant plume.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing this interim action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

A quantitative human health risk assessment will be included as part of OU 1 -07B RI/FS.

6.2 Ecological Risk Assessment

An ecological risk assessment was not performed for this interim action. A quantitative ecological assessment will be performed as part of the INEL-wide comprehensive RI/FS scheduled for 1998.

7. DESCRIPTION OF ALTERNATIVES

Four alternatives were considered for this interim action: (1) no action; (2) groundwater extraction and treatment by air stripping, carbon adsorption, and ion exchange; (3) groundwater extraction and treatment by carbon adsorption and ion exchange; and (4) groundwater extraction and treatment by chemical destruction and ion exchange. These four alternatives arediscussed in greater detail below.

7.1 Common Features

Each of the alternatives, except for the no action alternative, have the following common features:

- Will operate for a maximum of two years.
- Will pump at an average rate of approximately 50 gallons per minute

(gpm) and occasional rates of 10 to 100 gpm.

- Will achieve performance standards (given in Table 9-2) for contaminants of concern in the treated groundwater effluent.

- Groundwater monitoring wells within the contaminant plume will monitor the effectiveness of the interim action in reducing contaminant concentrations in the groundwater. These wells may also be used as extraction wells to expedite the removal of contaminated groundwater. the effectiveness of the interim action in reducing contaminant
- Include installing on-site groundwater treatment facilities to remove contaminants from the groundwater. The treated effluent will be discharged to the TAN disposal pond.

  contaminants from the groundwater. The treated effluent will be drinking water monitoring program will continue. New administrative and institutional controls will be implemented as appropriate to supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.

7.2 Alternatives

7.2.1 Alternative 1: No Action

The NCP requires that the "no-action" alternative be considered for every site to determine a baseline against which other remedial alternatives can be measured. Under this alternative, no remedial actions would betaken beyond those already in place such as the air sparging system. The monthly drinking water program would continue and groundwater monitoring would be implemented to evaluate changes in the contaminant plume.

7.2.2 Alternative 2: Groundwater Extraction and Treatment by Air Stripping, Carbon Adsorption, Ion Exchange

This alternative differs from the no action alternative because active measures would be taken to reduce the contaminants near the TSF-05 injection well and in the surrounding groundwater, which would reduce the threat to drinking water supplies and help prevent further degradation of groundwater while the OU 1-07B RI/FS is being completed. Alternative 2 employs well-established and widely used technologies.

Groundwater will be extracted from the TSF-05 injection well and perhaps nearby groundwater monitoring wells that are capable of capturing contaminated groundwater. The extracted groundwater would be pumped to an onsite facility comprised of: a filtration system to remove sediment, an air stripper equipped with a carbon scrubber to remove organic contaminants; and an ion exchange system to remove inorganics and radionuclides. The filtration system is a physical process that removes suspended solids from the groundwater. This system could be a tank where solids are allowed to settle out of the groundwater or a porous media such as sand or paper that captures the solid particles as the groundwater passes through the filter. Sediment would be analyzed for hazardous and radioactive contaminants and will be disposed of as identified in Table 9-1.

Air stripping is a mass transfer process in which volatile contaminants in water are transferred to gas. Air stripping is frequently accomplished in a packed tower equipped with an air blower. In this type of system, water flows down through a packing material that produces a large surface area for gas transfer, while air flows upward, and is exhausted through the top. Because volatile contaminants such as TCE and PCE have a relatively high vapor pressure, they readily leave the aqueous stream for the gas phase.

Air flowing through the top of the air stripper would pass through an activated carbon treatment system to capture the organic contaminants released from the groundwater. The activated carbon would selectively adsorb the contaminants by a surface attraction phenomenon in which the organic molecules are attracted to unsatisfied electrostatic charges on and in the pores of the carbon granules. Air from the air stripper may also be passed through a filter to remove solid particles, radioactive particles, and water mists that might be generated from the air stripper. Air emissions would be monitored for compliance with regulatory standards for air pollutants. The carbon treatment system would be monitored for contaminant breakthrough, and as necessary, the carbon would be replaced. The spent carbon would be regenerated at a facility operating in compliance with EPA's Revised Procedures for Planning and Implementing Off-Site Response Actions.

In addition to passing through the air stripper, the groundwater would also pass through one or more ion exchange columns. Ion exchange is a process whereby the dissolved metals and radionuclides are removed from the groundwater by being exchanged with relatively harmless ions held by the ion exchange material. Ion exchange resins are primarily synthetic organic materials containing ionic functional groups to which exchangeable ions are attached. Although specific ion exchange and sorptive resins systems must be designed on a site-specific basis, typical configurations include parallel columns to allow for one or more columns to be taken out for regeneration while the remaining columns would stay in service. Procedures for recovery or regeneration of the spent resins would be determined during remedial design. It is anticipated that the spent resins would be disposed of in available storage areas at the Radioactive Waste Management Complex (RWMC) at the INEL as low-level radioactive waste.

The treated effluent would be monitored for treatment efficiency prior to discharge to the TAN disposal pond, where the effluent would evaporate and percolate into the ground.

7.2.3 Alternative 3: Groundwater Extraction and Treatment by Carbon Adsorption and Ion Exchange

Although the purpose of this alternative is the same as Alternative 2, a different groundwater treatment system is proposed which uses activated carbon as the primary treatment technology for the removal of organic contaminants. The remedial objective, filtration, ion exchange, and effluent disposal systems remain the same, but an activated carbon system would replace the air stripper and associated offgas treatment system. Activated carbon is a technology that is adaptable for the removal of organic and inorganic contaminants from both air and aqueous wastes. Alternative 3 employs well-established and widely used technologies.

Following pretreatment by the filtration system, the contaminated groundwater would be passed through several carbon adsorption columns where the carbon would selectively adsorb the organic contaminants. In addition, the water would also pass through ion exchange columns to remove inorganic contaminants and radionuclides. Use of several carbon adsorption columns would provide considerable flexibility. Various columns could be arranged in series to increase service life between regeneration or in parallel for maximum hydraulic capacity. The piping arrangement would also allow for one or more beds to be regenerated while the other columns remain in service.

The disposal of the sediment and spent resins would be the same as for Alternative 2. Spent organic carbon under this alternative couldcontain organic and inorganic contaminants as well as radionuclides. In this instance, the spent carbon could be classified as a combustible mixed waste that would require disposal on-site at the Waste Experimental Reduction

Facility (WERF) or similar facility.

7.2.4 Alternative 4: Groundwater Extraction and Treatment by Chemical Destruction and Ion Exchange

Although the purpose of this alternative is the same as Alternatives 2 and 3, a different groundwater treatment system is proposed. The remedial objective, filtration, ion exchange, and effluent disposal systems remain the same, but a chemical treatment system would replace the air stripping or activated carbon systems.

Following pretreatment by the filtration system, the contaminated groundwater would be passed through a chemical treatment system to destroy the organic contaminants, and an ion exchange column to remove inorganic contaminants and radionuclides. The chemical treatment system would detoxify organic contaminants by actually changing their chemical forms from complex organic molecules to simple, more benign molecules by using ultraviolet light and either ozone or hydrogen peroxide. The ultraviolet light provides an energy source to break chemical bonds while the ozone or hydrogen peroxide provides an oxygen atom to form benign compounds.

The disposal of sediments and spent resins would be the same as Alternative 2. Treatment residuals contaminated with organic compounds would not be generated and would not need to be disposed.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives for the TSF-05 injection well and surrounding groundwater interim action were compared according to nine criteria developed on the basis of the statutory requirements of CERCLA Section 121 andthe NCP. These evaluation criteria are shown below and discussed in the following sections.

. Threshold criteria
- Overall protection of human health and the environment
- Compliance with applicable or appropriate and relevant requirements (ARARs)

. Primary balancing criteria
(ARARs)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

. Modifying criteria

- State acceptance
- Community acceptance.

A summary of the comparative analysis of alternatives is shown in Table 8-1.

8.1 Threshold Criteria

8.1.1 Overall Protection of Human Health and the Environment

This criterion measures how the alternative, as a whole, achieves and maintains protection of human health and the environment within the scope of this action. Alternative 1 is not protective of human health and the

environment. It neither reduces the threat of exposure to drinking water supplies nor prevents further degradation of the groundwater. Alternatives 2, 3, and 4 are protective of human health and the environment. Each alternative reduces the risk to potentially exposed populations and prevents further degradation of the groundwater.

8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

This evaluation criterion is used to determine whether each alternative will meet all of the Federal and State ARARs that have been identified for this interim action. Compliance with an ARAR as an evaluation criteriais not applied to Alternative 1, the baseline alternative. Alternatives 2, 3, and 4 achieve compliance with the ARARs. This analysis is summarized in the Statutory Determinations section.

8.2 Primary Balancing Criteria

8.2.1 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion, the results of a remedial action in terms of the risk remaining at the site after response objectives have been met and the extent and effectiveness of the controls that may be required to manage treatment residuals are addressed. Because the spent carbon produced by Alternative 2 would be regenerated off-site, Alternative 2 would provide a higher degree of long-term effectiveness and permanence than Alternatives 3 or 4. Alternative 3 is less reliable because of the necessity of long-term management controls for providing continued protection from potential mixed-waste residuals. Alternative 4 is less reliable because of the uncertainties associated with long-term operation and maintenance functions.

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This evaluation criteria addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Alternatives 2, 3, and 4 reduce the mobility and volume of contaminants in the groundwater

due to extraction. Alternative 2, through the regeneration of spent carbon by incineration, and Alternative 4, through chemical destruction, result in the greatest amount of organic contaminants destroyed. Alternative 3 poses a greater risk than Alternatives 2 and 4 because the treatment residues would have to be handled as a mixed waste.

8.2.3 Short-Term Effectiveness

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial response objectives are met. Alternatives 2, 3, and 4 could not begin operation until 1993, to allow sufficient time for design and construction of the treatment facilities. Alternatives 2 and 3 would require less time to achieve protection because they are proven technologies with documented performance data, and would use readily available systems. Alternative 4 would require more time to design and achieve full-scale operation.

Alternatives 2, 3, and 4 are not expected to pose significant risks to workers during construction. Short-term risks to workers, such as exposure to contaminants during installation of groundwater monitoring wells, could be mitigated by engineering controls and standard health and safety practices. Alternatives 2, 3, and 4 are not expected to pose significant

risks of exposure to workers during the handling and transportation of wastes. Short-term risks could be mitigated by engineering controls and standard health and safety practices. Alternative 2 is not expected to pose a significant risk of exposure to the community during transportation of spent carbon to a recycling facility or during regeneration of the carbon by incineration. Organic contaminants would be bound to the carbon during transport and not subject to rapid release in the event of an accident. Incineration would occur at an EPAapproved facility designed to safely handle the contaminated carbon. Shortterm risks could similarly be mitigated by engineering controls and standard health and safety practices. Alternative 4 has the disadvantage of requiring more extensive bench-or pilot-scale studies than the other alternatives before a larger scale treatment system could be designed. In addition, this alternative would require more complex technology, which would increase the risk to the workers and the environment if a failure occurred.

8.2.4 Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative as well as various services and materials required during its implementation. Alternatives 2 and 3 employ well-established technologies that are widely used in the treatment of hazardous waste streams. Air stripping, carbon adsorption, and ion exchange are easily integrated into complex treatment systems. Alternative 4 includes chemical oxidation to destroy organic contaminants. Treatability studies are necessary to demonstrate the applicability and performance of this technology for a specific site; and therefore, the technical uncertainties associated with design and construction may hinder implementation. The necessary equipment and specialists as well as services and materials are expected to be readily available for each alternative. From the perspective of waste treatment and disposal, Alternative 3 would be more difficult to implement than Alternative 2 which would be more difficult than Alternative 4. Alternative 3 would be difficult to implement because it is possible that a mixed waste would be generated and treatment and disposal options for mixed waste are very limited. Alternative 2 would be more difficult to implement than Alternative 4 because spent carbon would need to be transported off-site for regeneration. Alternative 4 would be the most implementable from a waste treatment and disposal perspective because no mixed or hazardous waste would be generated.

8.2.5 Cost

The evaluation of alternatives under this criteria includes capital costs and annual operation and maintenance costs. Alternative 3, estimated at $7,440,000, is the least expensive of the treatment alternatives. Alternative4 is estimated at $7,360,000, followed by Alternative 2 at $7,715,000. A summary breakdown of these costs for each alternative is shown in Table 82.

8.3 Modifying Criteria

8.3.1 State Acceptance

This assessment criterion evaluates the technical and administrative issues and concerns the IDHW may have regarding each of the alternatives. The IDHW concurs with the preferred remedial alternative. The IDHW has been involved with the development and review of the Proposed Plan, Record of Decision, and other project activities such as public meetings.

8.3.2 Community Acceptance

This assessment evaluates the issues and concerns the public may have regarding each of the proposed alternatives. On the basis of verbal comments received during the public meeting held February 4, 5, and 6, 1992 and written comments received during the comment period ending March 13, 1992, the community appears to accept the

preferred remedial alternative. Specific responses and comments to the remedial alternatives may be found in the attached Responsiveness Summary (Appendices A and B).

9. SELECTED REMEDY

On the basis of consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments, DOE, EPA, and IDHW have determined that Alternative 2 (Groundwater Extraction and Treatment by Air Stripping, Carbon Adsorption, and Ion Exchange) is the most appropriate remedy for OU 1-07A.

The objectives of the interim action are twofold:

- Reduce the contaminants near the TSF-05 injection well and in the surrounding groundwater.

- Measure aquifer parameters based on data from the groundwater extraction and monitoring wells.

Removing contaminants will help prevent further degradation of groundwater while the OU 1-07B RI/FS is being completed. Performance information will facilitate the OU 1-07B RI/FS by providing site-specific data to be used to evaluate the potential performance and engineering requirements of final remedial actions.

On the basis of existing information and an analysis of all remedial alternatives, DOE, EPA, and IDHW believe that the selected remedy will achieve these objectives. The interim action will end if it is determined that it is no longer effective or when the ROD for OU 1-07B is signed. The OU 107B ROD will address future use of the components of the interim action remedy.

9.1 Major Components of the Selected Remedy

The major components of the selected remedy include:

- Extract contaminated groundwater from the TSF-05 injection well and perhaps nearby groundwater monitoring wells that are capable of capturing contaminated groundwater.

- Install two groundwater monitoring wells within the contaminant plume to monitor the effectiveness of the interim action. These wells may also be used as extraction wells to expedite the removal of contaminated groundwater.
to monitor the effectiveness of the interim action. These wells may
- Install on-site groundwater treatment facilities to reduce contaminants of concern in the extracted groundwater to prescribed performance standards. The selected treatment system is air stripping, carbon adsorption, and ion exchange.

- Monitor the groundwater contaminant plume and theextraction/treatment system during groundwater extraction activities to track the effectiveness of the system and to ensure that performance standards are achieved.

system during groundwater extraction activities to track the n. effectiveness of the system and to ensure that performance standards groundwater and ensure that discharge water quality does not further degrade the underlying Snake River Plain Aquifer above maximum contaminant levels.

- Implement administrative and institutional controls that supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.

During operation of the interim action, the system's performance will be monitored on a regular basis and modified as warranted by the performance data. Modification may include any or all of the following:

- Alternate pumping of wells to eliminate stagnation points.

- Pulse pumping to allow aquifer equilibration and to allow adsorbed contaminants to dissolve into the groundwater.

- Discontinue pumping at individual wells where remediation objectives have been attained.

It may also become apparent during design, implementation, or operation of the effluent discharge system that the TAN disposal pond is not an appropriate discharge point. In such a case, the interim action will cease operation until other alternatives for effluent discharge can be considered.

The residual spent carbon will be transported off-site for regeneration at a facility operating in compliance with EPA's Revised Procedures for Planning and Implementing Off-Site Response Actions. Other waste residuals from the treatment process will be addressed on-site at existing facilities as described in Section 9.2.5 and Table 9-1.

9.2 Remedial Action Objectives

The OU 1-07B RI/FS report will evaluate the effectiveness of the interim action in meeting the objectives. This evaluation will be incorporated into the ROD for the OU 1-07B RI/FS.

9.2.1 Pumping Rates

An average pumping rate of approximately 50 gpm is expected with occasional pumping rates of 10 to 100 gpm. Actual pumping rates will be determined to ensure efficient contaminant removal based on engineering and hydrogeologic considerations.

9.2.2 Treated Effluent

Alternative 2 will achieve the interim performance standards listed in Table 9-2 for the contaminants of concern in the treated effluent. These standards are protective to levels appropriate to the use of the Snake River Plain Aquifer as a drinking water source, and are technically practicable from an engineering perspective.

The effluent discharge standards for TCE, PCE, and lead are based on not creating a condition that would cause MCLs to be exceeded in the aquifer as a result of treated water discharge to the disposal pond. These standards are relevant and appropriate as in situ groundwater performance standards.

The standards for protection against radiation (10 Code of Federal Regulations [CFR] 20) specify limits for radionuclides in effluents that may

be released to unrestricted areas. Environmental fate and transport modelling demonstrates that effluent concentrations of strontium-90 will not exceed the MCL when that effluent reaches the aquifer. The modelling considered 2 years of effluent discharge (the anticipated duration of the interim action), contaminant transport through the unsaturated zones, and radionuclide halflives.

9.2.3 Air Emissions

Interim performance standards listed in Table 9-2 are technically practicable from an engineering perspective and are protective to levels appropriate for controlling emissions into the air.

The emission standard for lead will not exceed 1.5 micrograms per cubic meter, as prescribed by 40 CFR 50.12 (National primary and secondary ambient air quality standards for lead). The emission standard for strontium90 will not exceed an effective dose equivalent of 10 millirem per year (mrem/yr), as prescribed by 40 CFR 61.92 (National emission standards for emissions of radionuclides other than radon from Department of Energy facilities).

Emission standards for trichloroethylene and tetrachloroethylene were derived using the Idaho Air Quality Bureau's New Source Policy for Toxic Air Pollutants in accordance with Idaho Administration Procedures Act (IDAPA) 16.01.01952,02. Although not legally enforceable, these guidelines will be addressed in implementing the interim action.

9.2.4 Obtain Data on Aquifer Performance

To the extent practicable, data collected under the remedial alternative on contaminant removal effectiveness from the aquifer (sustained contaminant levels), on aquifer characteristics (transmissivity and well response), and on

contaminant levels in the groundwater (types and concentrations of contaminants) will also be used in the OU 1-07B RI/FS. These data will be used in the evaluation of the alternatives considered for the final action under the OU 1-07B RI/FS.

9.2.5 RCRA Waste Characteristic Determination

On the basis of an evaluation of existing documentation, DOE has determined that the groundwater contaminants are not listed RCRA hazardous wastes. As appropriate, investigation-derived wastes and treatment residuals will be sampled and analyzed in accordance with IDAPA 16.01.05005. If these wastes exhibit RCRA characteristics, the wastes would be handled in accordance with RCRA requirements. Treatment, storage, and disposal options for all identified interim action wastes are given in Table 9-1.

The residual spent carbon, which would not be radioactive, will be transported off-site for regeneration at a facility operating in compliance with EPA's Revised Procedures for Planning and Implementing Off-Site Response Actions. The spent resins are not expected to accumulate high concentrations of metals since the levels of the metals in the water are relatively low (Table 51). Therefore, the waste resin would not be a mixed waste, but would only be a low-level radioactive waste. Drill cuttings from wells installed near the TSF-05 injection well have not been hazardous in the past, and the cuttings from the interim action wells are also expected to be nonhazardous. Other waste residuals from the treatment process will be addressed on-site at existing facilities (Table 9-1).

9.2.6 Estimated Waste Generation and Disposal Options

The wastes will be disposed in accordance with Table 9-1. Lowlevel radioactive wastes (an estimated 160 drums of ion exchange resins and sediments) will be disposed of on the INEL at the RWMC in the Subsurface Disposal Area. An estimated 45 drums of hazardous carbon will be regenerated. Minimal quantities (which cannot be estimated at this time) of other hazardous wastes, such as the laboratory wastes identified in Table 9-1, may be disposed of offsite in accordance with EPA's Revised Procedures for Planning and Implementing Off-Site Response Actions. Solid waste (an estimated 275 cubic yards of personnel protective gear and facility paper waste) will be disposed at both offsite and on-site facilities, depending on availability.

If these existing treatment, storage, and disposal facilities are inadequate or unavailable, either:

- The wastes would be stored in a TAN storage area until additional disposal facilities are available, or

- The interim action would be stopped until additional waste storage capacity is available.

The selected remedy is not expected to generate mixed wastes. However, minimal amounts of contaminated sludge that may exhibit mixed waste characteristics could be extracted from the TSF-05 injection well. This material will be dealt with as described in Table 9-1.

10. STATUTORY DETERMINATION

The selected remedy meets the statutory requirements of Section 121 of CERCLA, as amended by SARA, and to the extent practicable, the NCP. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health

The selected remedy protects human health by reducing contaminants near the TSF-05 injection well and in the surrounding groundwater. Removing contaminants will also help prevent further degradation of groundwater while the OU 1-07B RI/FS is being completed. Contaminants of concern in the waters discharged to the TAN disposal pond will be treated to achieve the performance standards given in Table 9-2. Any short-term threats associated with the selected remedy could be addressed by engineering controls and standard health and safety practices. In addition, no cross-media impacts are expected. 10.2 Protection of the Environment

Although a quantitative ecological assessment was not completed, a qualitative appraisal of the contaminants of concern suggests that these contaminants will not result in short-term adverse impacts to the aquatic and terrestrial biota at TAN.

The maximum measured concentration of trichloroethylene (1,300 ug/L) in groundwater monitoring wells at the TAN does not exceed the acute (45,000 ug/L) or chronic (21,900 ug/L) freshwater quality criteria concentrations for trichloroethylene. Similarly, the maximum measured concentration of tetrachloroethylene (71 ug/L) does not exceed the acute (5,280 ug/L) or chronic (840 ug/L) freshwater quality criteria concentrations for tetrachloroethylene.

Although the maximum measured concentration of lead (515 ug/L) in groundwater monitoring wells at the TAN exceeds both the acute (83 ug/L) and

chronic (3.2 ug/L) freshwater quality criteria concentrations for lead, treatment of the groundwater to the prescribed performance standards should minimize potential ecological effects from the treated effluent. For example, the number of liters of treated effluent that a deer or a duck would have to ingest on a daily basis in order to pose an unacceptable risk was derived from toxicity data. The magnitude of ingestion for a deer was calculated to be approximately 2,040 liters/day and for a duck approximately 160 liters/day. These magnitudes are not possible.

Similar toxicity data for wildlife are not readily available for strontium-90. Because some wildlife might be affected by chronic exposure to strontium -90, the discharge area will be observed on a regular basis for potential impacts to the environment.

10.3 Compliance with ARARs

The selected remedy will comply with all Federal ARARs, andpromulgated State ARARs that are more stringent than Federal ARARs.

10.3.1 Chemical-Specific ARARs

. National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities (40 CFR 61.92). This applicable requirement specifies 10 mrem/yr for radiation exposures for the general public from ambient air concentrations of Radon from Department of Energy Facilities (40 CFR 61.92). This

. National Ambient Air Quality Standards (40 CFR 50.12). This applicable requirement specifies 1.5 g/m[3] for ambient air concentrations of lead.

. Safe Drinking Water Act (40 CFR 141). This relevant and appropriate requirement establishes MCLs for TCE, PCE, lead, and strontium-90 in groundwater that may be used for drinking water.

10.3.2 Action-Specific ARARs

. Hazardous Waste Management Act IDAPA 16.01.05005, 01.05009, 01.05011. Where RCRA 40 CFR 268 is more strident than IDAPA 16.01.05011 the federal law will be applicable.

Where RCRA 40 CFR 268 is more strident than IDAPA 16.01.05011 the for New Stationary Sources (IDAPA 16.01.01952, 02) which specifies that new sources of air emissions shall achieve the greatest degree of emission reduction that has been adequately demonstrated.
for New Stationary Sources (IDAPA 16.01.01952, 02) which specifies

. Applicable requirements of the rules for the Control of Fugitive Dust, IDAPA 16.01.01251 and -01252 which specify that all reasonable precautions be taken to prevent the generation of fugitive dusts.

IDAPA 16.01.01251 and -01252 which specify that all reasonable Wastewater Land Application regulations (IDAPA 16.01.17600) and Water Quality and Wastewater Treatment regulations (IDAPA16.01.2600). These requirements establish standards for discharges of suspended solids.

10.3.3 Location-Specific ARARs

There are no location-specific ARARs identified for this interim action.

10.3.4 Other Criteria, Advisories, or Guidance To-Be-Considered

IDHW guidelines on emission standards for TCE and PCE (Idaho Department of Environmental Quality Air Toxics Program) will be used as to-beconsidered guidelines in facility design. These standards were derived as part of the Idaho Air Quality Bureau's New Source Policy for Toxic Air Pollutants, and are considered consistent with IDAPA 16.01.01952, 02.

To-be-considered, chemical-specific material is contained in DOE order Radiation Protection of the Public and Environment (5400.5), Radiation Protection of Occupational Workers (5480.11), and Radioactive Waste Management (5820.2A) which contain concentration limits on radiation exposures to workers and the public and on releases of material containing radioactive substances. The to-be-considered, action-specific material is contained in DOE orders 5400.5, Environment, Safety and Health Program for DOE Operations (5480.1B), Hazardous and Radioactive Mixed Hazardous Waste Management (5480.3), Environmental Protection, Safety and Health Protection Standards (5480.4), 5480.11, and 5820.2A. These orders contain requirements for monitoring waste storage facilities, packaging and shipping wastes, and on implementing environmental regulations at DOE facilities.

10.4 Cost Effectiveness

The selected remedy is cost-effective and provides overall effectiveness proportional to its costs and duration for protection of human health and the environment.

10.5 Use of Permanent Solutions and Alternative Treatment orResource Recovery Technologies to the Maximum Extent Possible

DOE, EPA, and IDHW have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for this interim action. Of those alternatives that are protective of human health and the environment and comply with ARARs, DOE, EPA, and IDHW have determined that this selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

The selected remedy for OU 1-07A is intended to help prevent further degradation of the groundwater by reducing contaminants near the TSF-05 injection well and in the surrounding groundwater. Although this interim action is not the final action, it will not be inconsistent with nor preclude the final response action scheduled to be selected in 1994.

10.6 Preference for Treatment as a Principal Element

By treating the contaminated groundwater using a combination of air stripping, carbon adsorption, and ion exchange, the selected remedy partially satisfies the statutory preference in which treatment, as a principal element, permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances. The preference will be fully addressed by the final response action.

11. EXPLANATION OF SIGNIFICANT CHANGES

The DOE, EPA, and IDHW have reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it wasoriginally identified in the Proposed Plan, were necessary.

However, as a result of further review of the Proposed Plan incidental to the public review period, the following clarifications need to be made to the Proposed Plan.

(1) The 90% reduction in treated effluent contaminant levels proposed for the interim action treatment facility have been changed to the interim performance standards as described in Section 9.2.2 and given in Table 9-2. The new performance standards are technically practicable, and are expected to be protective of human health and the environment.

(2) The Proposed Plan stated that strontium-90 levels of up to 230 pCi/L were found in the groundwater samples collected during late 1989 and 1990. After further review of the 1989 and 1990 groundwater data during preparation of the RI/FS work plan, an analytical result of 680 pCi/L of strontium-90 was found for well TSF-05. This increase in strontium-90 levels will not cause a change to the Proposed Plan or the final remedy because strontium-90 was already listed as a contaminant of concern and was already listed as being above MCLs. This increase will cause a change in the design of the treatment facility by increasing the requirements for the ion exchange system.

(3) The Proposed Plan stated that only TCE was found above MCLs further than 1/4 mile from the TSF-05 injection well. Further review of the 1990 groundwater data also showed a well 1 mile from the TSF-05 injection well that had PCE concentrations of 8 to 9 ug/L just above the MCL of 5 ug/L. This change in the size of the PCE plume will not cause a change to the Proposed Plan or the final remedy because PCE was already listed as a contaminant of concern. This change also fits within the original concept of using other wells in the contaminant plume farther from the TSF-05 injection well to decrease contaminant levels.

(4) Interviews conducted with TAN personnel have indicated that concentrated sludges were disposed of in the TSF-05 injection well in addition to the liquid wastes mentioned in the Proposed Plan. These sludges would have come from an evaporator that processed the same types of liquid wastes that were discharged to the well. Also, the condensate from the evaporator was discharged to the well. This sludge was removed in January 1990 as described in the Proposed Plan. The sludge has been analyzed and the data were placed into the Administrative Record for the interim action on or about January 3, 1992. The types of contaminants found in the groundwater are similar to the types found in the sludge, thus information on sludge being disposed of in the TSF-05 injection well will not affect the final decision under the Proposed Plan.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/30/1992
Operable Unit: 22
ROD ID: EPA/ROD/R10-92/046

Media: Sediment, Sludge, Debris

Contaminant: Metals, Radioactive Materials

Abstract: SITE HISTORY/DESCRIPTION: The 890-square-mile U.S. DOE Idaho National Engineering Laboratory (INEL), located 32 miles west of Idaho Falls, Idaho, is operated by the U.S. Department of Energy. Land use in the area is predominantly industrial and mixed use. The site overlies a sole source Class I aquifer, known as the Snake River Plain Aquifer. Within INEL, an area known as the Power Burst Facility (PBF) operated from 1972 to 1985 and supported the testing of pressurized-water fuel rods under hypothetical reactor accidents. This area contained several site features, including a corrosive waste sump, an evaporation pond, and discharge pipe. From 1978 to 1984, water containing a chromium-based algal and corrosion inhibitor from the PBF reactor's secondary coolant system was discharged from the corrosive waste sump (CWS) via a discharge pipe to an evaporation pond. To prevent discharge of toxic hexavalent chromium to the sump, cooling water was treated in the discharge pipe by bubbling sulfur dioxide through it to reduce the hexavalent chromium to less toxic trivalent chromium, and the treated water was discharged to the sump and neutralized using sodium hydroxide or sulfuric acid. As a result of these activities, approximately 363 cubic yards of sediment in the evaporation pond have been contaminated by metals and radioactive materials. In 1987, the pond and sump were listed as RCRA land disposal units; however, wastewater exhibiting the toxicity characteristic (TC) for chromium is believed to have been discharged

after the effective date of the TC rule. The INEL site is currently divided into 10 Waste Area Groups (WAGs). Three previous RODs signed in 1991 and 1992 addressed interim remedies for the warm waste pond sediment in WAG 2, unexploded ordnance and contaminated soil in WAG 10, and ground water contamination from the TS-05 injection well in WAG 1, respectively. This ROD provides an interim remedy for the contaminated sediment and sludge in the evaporation pond, discharge pipe, and waste sump as OU22 in WAG 5. A future ROD will address the underlying aquifer and unsaturated zone. The primary contaminants of concern affecting the sediment, debris, and sludge are metals, including chromium; and radioactive materials. PERFORMANCE STANDARDS OR GOALS: Sediment and sludge excavation goals are based on a site-specific residential use scenario for a populationthat begins residence at the site within 100 years in the future. Chemical- specific goals include chromium 800 mg/kg and cesium-137 30 Pci/g. INSTITUTIONAL CONTROLS: Not applicable.

Remedy: SELECTED REMEDIAL ACTION: The selected interim remedial action for this site includes removing and solidifying/stabilizing the 100 cubic yards of contaminated sediment from the evaporation pond by grouting, followed by onsite disposal in the Radioactive Waste Management Complex (RWMC) at INEL along with existing lowlevel waste containers; removing sludge and sediment from the waste sump; treating the sludge by grouting, if feasible, based on the results of treatability studies, and disposing of the treated sludge onsite in RWMC; decontaminatingthe discharge pipe; and sampling the remaining sediment to verify residual contaminant concentrations. The estimated total cost for this remedial action is $480,000. No O&M costs were provided for this remedial action.

Text: Full-text ROD document follows on next page.

Text:
Power Burst Facility Corrosive Waste Sump and Evaporation Pond

Operable Unit 5-13
Waste Area Group 5
Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Power Burst Facility Corrosive Waste Sump and Evaporation Pond
Operable Unit 5-13
Waste Area Group 5
Idaho National Engineering Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Power Burst Facility (PBF) Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory (INEL), Operable Unit (OU) 5-13. This alternative was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on information in the Administrative Record for the site, which is located in the INEL Technical Library, 1776 Science Center Drive, Idaho Falls, Idaho.

The lead agency in this decision is the U.S. Department of Energy. The U.S. Environmental Protection Agency approves of this decision and, along with the Idaho Department of Health and Welfare (IDHW), has participated in the evaluation of the interim action alternatives. The IDHW concurswith the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to human health and welfare or the environment due to the presence of chromium in the Evaporation Pond sediments.

Description of the Selected Remedy

This ROD for OU 5-13 addresses the contamination of the sediments of the Evaporation Pond and the sludge and sediment contained within the Corrosive Waste Sump and discharge pipe at the PBF. This interim remedial action involves:

. The removal of the identified areas of high contaminant concentration in the Evaporation Pond

. Stabilization of contaminated material from the pond by grouting and in the Evaporation Pond
INEL.

. Removal of the sludge and sediment present within the Corrosive Waste

Sump

- Treatment of materials and sediments removed from the sump by grouting, if feasible based on treatability studies, and disposal at the RWMC.

Removing the areas of high contaminant concentration reduces the potential risk to human health by reducing the potential for exposure to chromium by inhalation and cesium-137 by direct ionizing radiation. Cleanup levels which have been determined to be protective of human health for this remedial action are 800 mg/kg for total chromium and 30 pCi/g for cesium-137. Cesium-137does not present an unacceptable risk, but will be used as an indicator for chromium during the interim action. All contaminant concentrations above these levels will be removed from the pond.

Declaration

This interim action is protective of human health and the environment. It complies with federal and state applicable or relevant and appropriate requirements directly associated with this interim action and is cost-effective. This interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable. It does, however, use treatment, and is in furtherance of that mandate by utilizing permanent solutions and alternative treatment technology to the maximum extent practicable given the limited scope of this action. As mandated by CERCLA, a review will be conducted within 5 yrs to assess the risk remaining at the site.

Because this action may not constitute the final remedy for the Evaporation Pond, Corrosive Waste Sump, and discharge pipe, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as the principal element will be addressed at the time of the final response action. Subsequent actions may be necessary to fully address the principal threats posed by the site. Because the interim remedy will result in some contaminants remaining onsite, the effectiveness of the interim action as a final action will be evaluated in the Waste Area Group 5 Comprehensive Remedial Investigation/Feasibility Study (OU 5-12), scheduled to begin in 1996.

Signature sheet for the foregoing Record of Decision for Operable Unit 5-13 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the PowerBurst Facility Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

Signature sheet for the foregoing Record of Decision for Operable Unit 5-13 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the Power Burst Facility Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

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pipe at the Idaho National Engineering Laboratory.

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ACRONYMS

ARARs applicable or relevant and appropriate requirements

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act CFR Code of Federal Regulations COCA Consent Order and Compliance Agreement

DOE U.S. Department of Energy

EPA U.S. Environmental Protection Agency

FFA/CO Federal Facility Agreement and Consent Order
FR Federal Register

HWMA Hazardous Waste Management Act - State of Idaho

IDHW Idaho Department of Health and Welfare
INEL Idaho National Engineering Laboratory

NCP National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP National Emission Standards for Hazardous Air Pollutants
NPL National Priorities List

OU Operable Unit

PBF Power Burst Facility
pCi/g picocuries per gram

RCRA Resource Conservation and Recovery Act
RI/FS Remedial Investigation/Feasibility Study
ROD Record of Decision
RWMC Radioactive Waste Management Complex

SARA Superfund Amendments and Reauthorization Act

TRA Test Reactor Area

WAG Waste Area Group

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is located in southeastern Idaho on the northeast portion of the Eastern Snake River Plain and encompasses approximately 890 square miles of desert. The closest major community is Idaho Falls (population 46,000), located 42 miles southeast of the INEL. The Power Burst Facility (PBF) is located in the south-central portion of the INEL (Figure 1). This Record of Decision (ROD) documents the interim action decision for the PBF Evaporation Pond, Corrosive Waste Sump, and discharge pipe [Operable Unit (OU) 5-13], which are located within the PBF area, east of the Reactor Building (PBF-620) (Figure 2).

The PBF Corrosive Waste Sump is an unlined concrete structure that was used during the neutralization of spent reactor secondary coolant water prior to discharge to the Evaporation Pond. The Corrosive Waste Sump dimensions are 11 x 11 x 21 ft deep. The sump walls are 12 in. thick, and the floor is 15 in. thick. The discharge pipe (approximately 6 in. in diameter) that leads from the Corrosive Waste Sump to the Evaporation Pond may also be contaminated.

The PBF Evaporation Pond is a 140- x 140-ft lined surface impoundment enclosed by a 6-ft high cyclone fence. The pond is used to receive reactor secondary cooling water from the PBF reactor following neutralization in theCorrosive Waste Sump. The Evaporation Pond was constructed in 1978 by borrowing native soil from a source located east of the pond. This material was used to form a 4.5-ft high berm containing a Hypalon liner, which was covered by 6 in. of sediments for protection.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The PBF reactor, which operated from 1972 to 1985, was built to support the Thermal Fuel Behavior Program's testing of pressurized-water reactor fuel rods under hypothetical reactor accidents. The discharge from the regeneration of the demineralizes and secondary coolant system waste was released to the Corrosive Waste Injection Well (OU 5-08) from 1972 to 1978. From 1978 to 1984, water containing a chromium-based algal and corrosion inhibitor from the PBF reactor's secondary coolant system was discharged into the Evaporation Pond via the Corrosive Waste Sump, along with

discharges associated with the regeneration of demineralizers. In 1984, a phosphate-based corrosion inhibitor replaced the chromium-based inhibitor, thereby eliminating further discharge of chromium.

The Corrosive Waste Sump and discharge piping from the Waste Sump to the Evaporation Pond are part of a system whose prime function was to transfer secondary coolant water from the PBF secondary coolant system to the Evaporation Pond. The secondary coolant system was drained 2 to 4 times per yr when the reactor was operational. To prevent discharge of toxic hexavalent chromium to the Corrosive Waste Sump, the secondary coolant water was treated by bubbling sulfur dioxide through it to reduce the hexavalent chromium to less toxic trivalent chromium. The coolant was discharged to the Corrosive Waste Sump, where the liquid was neutralized using sodium hydroxide or sulfuric acid. The Ph of the sump effluent was monitored for only a short period in late 1984 and was normally between 6.5 and 7.0. Because the process did not change, these results are assumed to be representative of all effluent discharged through the sump.

The Corrosive Waste Sump also received water from the demineralizer system. The demineralizer system contains ion exchange resin columns that were used for purifying primary and

secondary reactor cooling water and for treatment of wastewater. After the majority of the exchange capacity is used, the resin, which is in the form of beads, is regenerated.

During regeneration of the resin columns, backflushing operations allowed some resin beads to flow to the Corrosive Waste Sump and then to the Evaporation Pond. Because ion exchange resin beads selectively bind to metal ions such as chromium and cesium-137, the highest concentrations of chromium and cesium-137 would most likely occur in areas of the pond where the resin beads accumulate. Results from sampling done in 1989 support the concept that chromium and cesium-137 are associated as mentioned above.

As a result of the evaporation of secondary coolant water discharged to the pond, chromium and cesium-137 contamination is found in the 9,800 cubic feet (363 cubic yards) of sediments located on top of the Hypalon liner. The INEL's waste management records indicate, on the average, a total of 33 lb/yr trivalent chromium was discharged to the Evaporation Pond. There is no leak detection system under the liner, and no samples have been collected from beneath the liner to determine if leakage and subsequent contamination of the sediments beneath the liner have occurred. However, the pond does retain water, which has been introduced to control the emission of particulate material.

The PBF Evaporation Pond sediments have been sampled several times. In 1988, six random grab samples were collected from the Evaporation Pond. Chemical analyses were performed to quantify the types and concentrations of metals, volatile organics, semi-volatiles, pesticides, and polychlorinated biphenyls present. In September 1989, six biased grab samples were collected from the Evaporation Pond and analyzed for the presence of gamma-emitting radionuclides. A combination of biased and systematic random samples (a total of 20 samples) were collected to characterize the pond and sump contents in November of 1989. The laboratory data from these sampling efforts and the preliminary risk evaluation based on those data, provide the basis for this interim action.

The release of radioactive or hazardous contaminants to the Evaporation Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action Requirements of the July 1987 Consent Order and Compliance Agreement (COCA)

signed by the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), and U.S. Geological Survey. The sump and pond were listed as COCA units PBF-08 and PBF-10, respectively, in that agreement.

Under the COCA, the pond and sump were listed as RCRA Land Disposal Units because there was information indicating wastewater exhibiting the toxicity characteristics for chromium was discharged to the pond after the effective date of the relevant RCRA regulations. These units have since been incorporated into the Federal Facility Agreement and Consent Order (FFA/CO) and are being addressed under the CERCLA process. The 1989 EP Toxicity tests show Evaporation Pond sediments do not exhibit the toxicity characteristic for chromium, and therefore are not RCRA hazardous. The material in the Corrosive Waste Sump has not been subjected to toxicity characteristic leach test. However, much lower concentrations of contaminants were detected in the waste sump. These low concentrations in a medium consisting mostly of resin beads, whichaggressively binds chromium and other metal ions, indicates that the sump materials are not RCRA hazardous waste. Consistent with the FFA/CO Action Plan, Section 1.3.1, the final action for this OU will meet the applicable substantive requirements of RCRA/Hazardous Waste Management Act - State of Idaho (HWMA) in the event an unacceptable risk to human health and the environment is demonstrated.

The INEL was proposed for listing on the National Priorities List (NPL) in the Federal Register (FR) on July 14, 1989 (54 FR 29820). The listing was proposed by the EPA under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The final rule, which listed the INEL on the NPL, was published on November 21, 1989, in 54 FR 44184.

In December 1991, the EPA, DOE, and Idaho Department of Health and Welfare (IDHW) signed the FFA/CO that superseded the COCA. This agreement provides the process and schedule to facilitate cleanup of the areas identified in the FFA/CO Action Plan, in accordance with CERCLA, RCRA, and HWMA.

The FFA/CO lists OU 5-13 as an interim action requiring investigation and/or remediation. This ROD documents the decision to perform an interim action on OU 5-13 and the remedy selected. The OU 5-13 interim action will be evaluated for adequacy as a final remedial action in the Waste Area Group (WAG) 5 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), which is scheduled to begin in 1996.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA, sections 113(k)(2)(B)(i-v) and 117, the public was given the opportunity to participate in the remedy selection process. In accordance with CERCLA, section 113(k)(1), an Administrative Record was established to provide the basis for the selection of the remedialaction. The Notice of Availability for the Proposed Plan was published in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), and Times News (Twin Falls) on April 3, 1992; in the Idaho Statesman (Boise) and Daily News (Moscow) on March 21; and in the South Idaho Press (Burley) on March 27 and April 3.

Public involvement opportunities for the PBF OU 5-13 Interim Action were announced via the INEL News newsletter, which is distributed to approximately 14,000 members of the general public. Newspaper and radio advertisements and an INEL press release were utilized to inform the public of this proposed action. Personal phone calls were made to key individuals, environmental groups, and organizations by the INEL outreach offices in Pocatello, Twin Falls, and Boise and by the Community Relations office in

Idaho Falls. The Proposed Plan for the interim action for the PBF Evaporation Pond and the PBF Corrosive Waste Sump was mailed to the public on March 19, 1992. The Proposed Plan was mailed to approximately 6,500 individuals on the INEL mailing list with a cover letter from the Director of the Environmental Restoration Division of the DOE, Field Office Idaho, urging citizens to comment on the Proposed Plan and to attend public meetings. Copies of the Proposed Plan and the Administrative Record are available to the public in six regional INEL information repositories: the INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, and Boise; and the University of Idaho Library in Moscow. The city library in Moscow originally received the material, but the material has since been moved to the University of Idaho Library. Copies of the Administrative Record file for the PBF Evaporation Pond and Corrosive Waste Sump Interim Action were placed in the information repositories sections or at the reference desk in each of the libraries on March 19, 1992.

The public comment period was initially scheduled from March 25 to April 24, 1992. Two public meetings were held on April 8 and 9, 1992, inIdaho Falls and Burley, respectively. Representatives from the DOE, IDHW, and EG&G Idaho, were present to discuss the Proposed Plan, answer questions, and receive public comment. The EPA was available via teleconference to assist in answering questions and receiving comments. Verbatim transcripts were prepared by a court reporter at each public meeting. Written comment forms were also available at each meeting. A telephone technical briefing was held for the League of Women Voters and other citizens of Moscow on May 7, 1992, at the University of Idaho Education Building.

During the initial comment period a written request was received for an extension, and the public comment period was extended an additional 30 days, to May 24. The reason for the requested extension was the delay in some of the public receiving the Proposed Plan due to mailing problems. The extension announcement was made in the Post Register on April 24, the Idaho State Journal on April 26, the Times News on April 26, the Idaho Statesman on April 27, the Daily News on April 24, the South Idaho Press on April 24, and the Morning Tribune (Lewiston) on April 26.

All verbal comments given at the public meetings and all submitted written comments are recorded verbatim in the Administrative Record for the ROD. Responses to the public comments received during the public comment period are included in the Responsiveness Summary (Appendix A) and were considered during the development of this ROD. Public comments on the Proposed Plan are annotated to indicate which response in the Responsiveness Summary addresses each comment. The information used as the basis of the decision for this interim action is included in the Administrative Record.

Predominant public opinions on the preferred alternative, as described in the Proposed Plan, are that any potentially contaminated sediments beneath the pond should be removed, in addition to removal of all the sedimentswithin the pond and the liner itself. Others who believe the risk to human health and the environment is minimal, suggested the "No Action" alternative should be implemented.

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

To better manage the investigations needed to determine appropriate remedial actions, the INEL has been divided into 10 WAGs. Within each WAG, known or suspected areas of contamination are assigned to an OU as a means of managing and controlling investigation and cleanup activity. This strategy allows the EPA, IDHW, and DOE to focus available cleanup resources on those areas that could potentially pose a risk to human health and the

environment. WAG 5 consists of the PBF and the Auxiliary Reactor Area. The PBF Evaporation Pond sediments, Corrosive Waste Sump, and connecting discharge pipe are identified as OU 5-13. The underlying aquifer and unsaturated zone are not included in this OU but will be addressed in a subsequent investigation.

Existing characterization data were available to identify OU 5-13 as a risk to human health and the environment due to the presence of chromium and to support selection of a remedial technology. This interim action is intended to reduce immediate unacceptable risks associated with the Evaporation Pond sediments and to remove and dispose of the contaminants contained in the Corrosive Waste Sump to expedite overall INEL cleanup. On the basis of the characterization data available in the Administrative Record for the sediments of the PBF Evaporation Pond, an immediate unacceptable risk to human health has been identified due to potential receptor inhalation of chromium. No exposure pathway exists that poses an unacceptable risk to human health and the environment from contaminants contained within the Corrosive Waste Sump and discharge pipe. However, the pipe and sump are being cleaned up under this action to eliminate a potential future source of contamination to the pond sediments. The interim actionwill not be inconsistent with any known future CERCLA actions.

As mandated by CERCLA, a review will be conducted within 5 yrs to reassess potential risk from this OU. This review will only consider the effectiveness of the protective measures employed, by an evaluation of actions and verification data to date. The interim action will be evaluated for adequacy as a final remedial action as part of the WAG 5 Comprehensive RI/FS (OU 5-12), scheduled to begin in 1996.

5. SUMMARY OF SITE CHARACTERISTICS

To more definitively characterize materials contained within the PBF Evaporation Pond and Corrosive Waste Sump, biased and random sediment samples were collected in 1989 and documented in the Closure Plan for the Power Burst Facility Corrosive Waste Sump and the Power Burst Facility Evaporation Pond (COCA units PBF-08 and PBF-10), EGG-WM-8996, May 1990. The regulatory status was changed from RCRA to CERCLA in 1991 by the signing of the FFA/CO. Data from samples collected in 1989 were used to support CERCLA site characterization. Analyses for the presence of gamma-emitting radionuclides and metals were performed on the samples collected from the Evaporation Pond sediments (Table 1). Chromium (total) and cesium-137 were the contaminants of concern identified in the toxicity screen performed on the Evaporation Pond sediments. Average total chromium concentration of the random samples in the PBF Pond is 500 mg/kg, with the maximum concentration (3,439 mg/kg) of total chromium occurring in a biased sample located near the pond inlet. Because hexavalent chromium was chemically reduced prior to discharge, all the chromium in the sump and pond is assumed to be trivalent chromium. The highest concentration of cesium-137 (325 pCi/g) was from a biased sample near the pond inlet, with an average of 20.3 pCi/g from all random samples collected throughout the pond. Figure 3 is a diagram of the PBF Evaporation Pond, indicating sample locations and contaminantconcentrations.

In addition to sampling the waste disposal areas, undisturbed areas upwind of the Corrosive Waste Sump and the Evaporation Pond were sampled to characterize background metal levels. The purpose of the background samples was to have a point of comparison for the samples collected in the pond. Background samples indicated the surrounding soils have a mean total chromium concentration of 21 mg/kg, which is attributable to natural occurring chromium. These background samples were well within the range of background chromium concentrations reported at other locations on the INEL.

The results of the PBF Corrosive Waste Sump sampling indicated the presence of low-level radioactivity (6.97 to 7.86 pCi/g of cesium-137). In addition, compounds found only in the sump were the volatile organic compounds 4-methyl-2-pentanone (150.0 to 170.0 ug/kg), ethylbenzene (5.0 to 16.0 ug/kg), and xylene (32.0 to 100.0 ug/kg).

6. SUMMARY OF SITE RISKS

6.1 Human Health Risk

A preliminary risk evaluation was performed in accordance with EPA guidance to determine the risks to human health posed by contaminants identified in the Evaporation Pond sediments, and is available in the Administrative Record. The contaminants identified in the sump (a closed concrete vault) were not considered for this preliminary evaluation because it is unlikely these contaminants have a pathway to receptors (since the contaminants are contained) and because of the small volume of waste material in the sump. However, the sump and discharge pipe materials are to be removed to eliminate future contamination of the pond sediments.

In the preliminary risk evaluation, the potential for carcinogenic and noncarcinogenic toxic effects was computed using EPA default parameters and methods found in the Risk Assessment Guidance for Superfund, Volume I, "Human Health Evaluation Manual." The default model parameters may be more conservative than site-specific parameters but are routinely applied.

Occupational and future residential scenarios were examined to assess the risks to humans from exposure to the contaminants in the Evaporation Pond sediments. The pathways by which workers or future residents could be potentially exposed to the contaminants within the pond were identified as inhalation, ingestion, direct contact, and direct radiation. The risks from the groundwater pathway were not included in this risk evaluation because OU 5-13 is confined to the sediments overlying the Hypalon liner. The aquifer and unsaturated zone in this area will be evaluated in another investigation within WAG 5.

Of the four exposure pathways identified, inhalation of fugitive dust and direct exposure to ionizing radiation were the greatest contributions to risk. The inhalation pathway of chromium presented an excessive hazard quotient, and direct exposure to ionizing radiation contributed to an excess in the incidence of cancer. For both of these pathways, future residential risk was the highest. The future residential use scenario is based on an individual beginning future residence at the pond site 100 yrs in the future. One hundreds yrs was agreed to by the three agencies involved for use in evaluating future residential scenarios.

For present day workers (occupational) and future residents, the risk due to the inhalation of existing levels of chromium-contaminated dust were both calculated and found to exceed the EPA hazard quotient of 1 (Table 2). This result implies sensitive sub-populations may exhibit adverse health effects due to their exposure to fugitive dust emissions from the pond.

Additionally, exposure to direct ionizing radiation, due to the presence of cesium-137, was found to be within the acceptable risk rangedefined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as 10[-4] to 10[-6] for occupational and residential populations. The calculated value for present day workers is 8 additional cancer incidences in 100,000 exposed workers, and for future residents the calculated value for excess cancer incidences is 4 additional incidences of cancer per 10,000 exposed individuals residing near the pond 100 yrs in the future. The NCP,

40 CFR 300.430, establishes the point of departure for determining remedial goals as 1 in 1,000,000 (10[-6]) for carcinogens. For cesium-137, a 10[-6] risk corresponds to a concentration of 0.66 pCi/g.

Cleanup goals for the PBF Evaporation Pond sediments are based on a site-specific residential use scenario for a population that begins residence at the site 100 yrs in the future. This scenario results in the calculation of a conservative cleanup level protective of current occupational and future residential populations at the PBF. The cleanup goal for chromium is 800 mg/kg. This level was established using equations from the Risk Assessment Guidance for Superfund, Part A (EPA 1989), and site -specific exposure parameters for the residential use scenario. An inhalation rate of 20 cubic meters/d, exposure time of 350 d/yr, and a PM-10 fraction (particles of less than 10 microns) of 12.5% of the total suspended particulates were used in these calculations (Rapid Assessment of the Exposure to Particulate Emissions from Surface Contamination Sites, EPA/600/8-85/002, February 1985). The chromium cleanup level of 800 mg/kg results in a hazard quotient below the EPA's threshold hazard quotient and protects sensitive individuals and sub-populations from adverse health effects.

The cesium-137 cleanup goal of 30 pCi/g will ensure the high concentrations of chromium are also removed. Radioactive decay of the cesium-137, will result in a concentration of 3 pCi/g at the site 100 yrs in the future. This corresponds to an excess cancer risk of 5 x 10[-5] at the site 100 yrs in the future. These cleanup levels were calculated using EPA-approved methods (Part B of the Risk Assessment Guidance).

The presence of high concentrations of chromium is the primary risk driver for this interim action. Although the risk of exposure to cesium-137 is within the acceptable risk range, these risks

will also be reduced by removal of the contaminated sediments. The presence of cesium-137 will be used as an indicator for the presence of chromium.

Based on 1989 sampling results, cesium-137 and total chromium concentrations display a strong spatial correlation. Figure 4 shows the spatial relationship of the two contaminants. Removing areas of high concentrations of contaminants is predicated on the observed spatial correlation between the cesium-137 and the chromium. Cleanup of higher radioactive areas, as detected by field instrumentation, will indicate a reduction in the concentration of both contaminants of concern. When the cleanup goal of 30 pCi/g for cesium-137 is attained, the cleanup goal of 800 mg/kg for total chromium is assumed to be attained also. To confirm the effectiveness of the cleanup, sampling of the remaining sediments will be performed to verify residual concentrations of cesium-137 and total chromium are at or below established cleanup levels.

6.2 Ecological Concerns

An ecological risk assessment was not performed for this interim action. Because the interim risk evaluation methodology is conservative and the major ecological exposure routes are expected to be the same as for human exposures, the risk reduction realized due to this interim action should also achieve a significant reduction in adverse ecological effects. An ecological assessment will be performed as part of the INEL-wide Comprehensive RI/FS scheduled to begin in 1998.

6.3 Basis for Response

Actual or threatened releases of hazardous substances from this site, if not

addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to human health or the environment due to the presence of chromium in the Evaporation Pond sediments.

7. DESCRIPTION OF ALTERNATIVES

Consistent with NCP and EPA guidance, a limited number of alternatives were evaluated for this interim action. A summary of the alternatives and controls for each alternative is provided below.

7.1 Alternative 1: No Action

If the No Action alternative is implemented, the OU would remain in its current state. This alternative does not further restrict access to the site or restrict the pathways through which the contaminants may be transported. The No Action alternative was evaluated to determine if it is a viable alternative as required by the NCP (40 CFR 300.430). No additional costs or implementation time is involved with this alternative.

7.2 Alternative 2: Removal of Areas of High Contaminant Concentration

There is a strong correlation between areas of higher radioactivity (relative to the pond) and elevated levels of chromium in the pond sediments as demonstrated by the 1989 sampling results (Figure 4). Removing the areas of high contaminant concentration reduces potential risk to human health. Removal options include but are not limited to, pneumatic lifting, manual extraction, or light mechanical extraction. Removal of extracted material will be handled prior to treatment such that exposure to direct ionizing radiation andemission of fugitive dust are minimized.

Two treatment and disposal options were proposed for the removed sediments. Option A involves treatment (separation/extraction) and disposal using the sediment washing process proposed for the Test Reactor Area (TRA) Warm Waste Pond Interim Action. Presently, treatability studies are being conducted at TRA. The major applicable or relevant and appropriate requirements (ARARs) pursuant to this option are discussed in the TRA ROD located in the Administrative Record.

Option B involves treatment (stabilization/solidification) followed by disposal at the Radioactive Waste Management Complex (RWMC). The stabilized sediments would be used to fill void spaces in existing certified low-level waste containers. Treatability studies will be conducted to determine the optimum sediment/grout/additive mixture. Major ARARs pursuant to this option are listed and discussed in Section 10.2.

During the sediment removal process, the materials located in the sump and discharge pipe will also be removed, treated, and disposed. The sump and associated discharge pipe will be decontaminated to ensure they will not be a continuing source of contamination.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires each remedial alternative be evaluated according to specific criteria. The purpose of the evaluation is to determine the advantages and disadvantages of each alternative, thereby guiding selection of the remedial alternative offering the most effective and feasible means of achieving the stated cleanup objectives. While all nine CERCLA criteria are important, they are weighted differently in the decision making process depending on whether they describe a required level of performance (threshold criteria), technical advantages and disadvantages (balancing

criteria), or review and evaluation by other entities (modifying criteria). The two remedial alternatives described in Section 7 were evaluated according to the following CERCLA criteria:

- Threshold criteria

  - Overall protection of human health and the environment
  - Compliance with ARARs

- Balancing criteria

  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment

  - Short-term effectiveness
  - Implementability
  - Cost

- Modifying criteria

  - State acceptance
  - Community acceptance.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the ROD. The threshold criteria must be met for a final remedial action, and this interim action is intended to meet those criteria to the maximum extent practicable. The effectiveness of this remedial action as a final remedy will be evaluated in the WAG 5 Comprehensive RI/FS.

8.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment requires evaluation of how well the remedial alternatives eliminate, reduce, or control the identified risks. This overall assessment of protection of human health andthe environment draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. For this interim action to be successful, present unacceptable risks will be reduced and further remedial action may be unnecessary.

The No Action alternative provides no reduction in contaminant concentrations and, therefore, does not meet the protection of human health and the environment criterion. The alternative of removing areas of high contaminant concentration from within the sediments provides protection of human health and the environment by reducing the potential for exposure by inhalation of chromium to below the threshold hazard quotient of 1. As described in Section 7.2, Option A involves treatment and disposal using the sediment washing process proposed for the TRA Warm Waste Pond. Option B involves treatment (stabilization/solidification) followed by disposal at the RWMC. Both of these options, with the necessary facilities designed and constructed, would meet protective criteria.

8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

CERCLA, as amended by SARA, requires remedial actions for Superfund sites comply with federal and state substantive requirements that are applicable

to the action being taken. Remedial actions must also comply with the substantive requirements of laws and regulations that are not directly applicable, but are relevant and appropriate unless waivers are granted. These are requirements that pertain to situations sufficiently similar to those encountered at a Superfund site, so their use is well suited. Combined, these are referred to as ARARs. State ARARs are limited to those requirements that are more stringent than federal counterpart requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance withchemical-, location-, and action-specific ARARs or justification for a waiver. Compliance also requires consideration of whether the remedial alternative considers other criteria, advisories, and guidelines.

8.2 Primary Balancing Criteria

After the proposed alternatives are evaluated using the two threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Each alternative is evaluated using each of the balancing criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Each criterion is further explained in the following sections. The No Action alternative did not meet the threshold criterion (protection of human health and the environment) and was not considered further.

8.2.1 Long-Term Effectiveness and Permanence

In evaluating long-term effectiveness and permanence, the magnitude of residual risks as well as the adequacy and reliability of controls must be examined. The magnitude of the remaining risks is evaluated by assessing the residual risk associated with untreated waste and the treated residual. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate. Adequacy and reliability of controls is evaluated by assessing the containment and/or institutional controls to determine if they are sufficient to ensure any exposure to residual risks is within protective levels.

Alternative 2, Option A (separation/extraction), reduces the risks associated with the chromium and cesium-137 in the Evaporation Pond sediments by extracting the contaminants of concern from the sediments and placing the treated residuals in a controlled environment, thereby reducing the risks associated with the Evaporation Pond sediments. The contaminated sediment could present a risk due to its radioactive content, but the material would be treated, containerized, and stored in such a way as to be directly or indirectly monitored. Final disposal would be addressed in the WAG 2 Comprehensive RI/FS.

Alternative 2, Option B (stabilization/solidification), meets the criterion for long-term effectiveness because the contaminants in the sediment are physically bound in a grout mixture, thereby reducing the residual risks associated with the Evaporation Pond sediments. The permanence of stabilization technology is unproven for the length of time needed for the highest expected concentration of cesium-137 to decay to acceptable levels consistent with the NCP. However, regardless of the performance of the grout over time, the contaminated sediments will be placed in certified low-level waste containers and disposed of in the RWMC, which is a low-level waste repository. Institutional and administrative controls are presently in place at the RWMC in accordance with the DOE Orders applicable to low-level

waste storage.

8.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions employing treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Evaluating alternatives based on the reduction of toxicity, mobility, or volume through treatment requires analysis of the following factors: treatment process used, toxicity and nature of the material treated, amount of hazardous material destroyed or treated, irreversibility of the treatment, type and quantity of treatment byproducts, and statutory preference for treatment as a principal element.

The separation/extraction process (Option A) would reduce the toxicity of the sediment removed from the pond by removing the majority of the contaminants. Because the process is still in development, the total reduction in toxicity and volume is not known at the present time. The concentrated sediment portions extracted should be more toxic than initial pond sediments because of the concentrating of contaminants. However, the small volume of highly-contaminated material left after extraction would be containerized, thereby reducing mobility of the contaminants while awaiting final disposition.

Option B, stabilization/solidification, reduces the toxicity and mobility of the contaminants of concern by dispersing the contaminants in an inert (grout/sediment) matrix. Stabilization increases the volume of contaminated material due to the addition of grout, but this interim action utilizes existing container void space to allow disposal with no net increase in the volume used in the RWMC. Therefore, waste minimization principals have been considered.

8.2.3 Short-Term Effectiveness

The evaluation of alternatives based on the short-term effectiveness requires an evaluation of the effectiveness of protection for the community and workers during remedial actions, environmental impacts during implementation, and the amount of time required for remedial action objectives to be achieved. Either option would achieve the remedial action objectives in about the same amount of time. The time required to execute the action after design is completed is not anticipated to exceed one field season. During implementation of either option of Alternative 2, protection of workers from radiation exposure would be an important element of the remedial design. Because the Evaporation Pond is currently a radioactively-controlled area, all personnel entering the area must have training for working with hazardous substances, radioactive substances, and respirators. Health physics personnel will be on site at all times when work is ongoing to monitor and control radiation exposure to personnel. Every person entering the working area at the pond will wear appropriate personal protective equipment, including a dosimeter to record the radiation received. DOE has as low as reasonably achievable radiation dose goals for personnel; these goals will be met.

By using administrative and institutional controls, either option for Alternative 2 proposed for the Evaporation Pond minimizes any short-term risk to the community from this interim action. The large distances from population centers and the strict security at the PBF prevent risks to communities during implementation of this interim action. Access by visitors and site personnel not working on the project will be restricted to those meeting INEL requirements.

8.2.4 Implementability

The implementability criterion has three factors requiring evaluation: technical feasibility, administrative feasibility, and the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations.

Removal of contaminated sediments as proposed by Alternative 2, is a common approach to risk reduction. Because a small volume of material is to be removed (approximately 100 cubic yards), this approach is easily implemented. The ability to coordinate actions with other agencies is a factor for evaluating administrative feasibility and is not anticipated to be a major issue for this project. The availability of services and materials requires evaluation of treatment, storage capacity, disposal services, necessary equipment and specialists, and prospective technologies.

Implementation of the treatment and disposal options at the TRATreatment Facility (Option A) and the RWMC (Option B) varies considerably. Implementation of treatment and disposal at TRA is dependent on developing a new application of an existing technology. If the timing of the projects does not correspond, implementing the proposed TRA treatment and disposal option will be problematic. The RWMC is an existing facility, and the equipment for grouting can be acquired and assembled in a timely manner. The disposal of the stabilized waste will be in an existing facility. For these reasons, grouting (Option B) followed by disposal of the waste at the RWMC is the option most implementable.

8.2.5 Cost

In evaluating project costs, an estimation of capital costs, operation and maintenance costs, and present worth costs are required. Capital costs include design, construction, equipment, buildings, startup, and contingency costs. Operating and maintenance costs include labor, power, disposal of residuals, administrative, and periodic review. Actual costs are expected to be no more than 50 percent over, or 30 percent under, the cost estimate. Costs for each alternative are summarized in Table 3. Alternative 1, No Action, has no cost. The total cost for Alternative 2, Option A including sediment removal and treatment would be $557,000, while Option B total cost would be $480,000 (see Table 3).

8.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state acceptance and community acceptance. For both of these criteria, the factors considered include the elements of the alternatives supported, the elements of the alternatives not supported, and the elements of the alternatives having strong opposition.

8.3.1 State Acceptance

This assessment evaluates the technical and administrative issuesand concerns the state may have regarding each of the alternatives. The IDHW concurs with the interim action because it takes the contaminants of concern from an uncontrolled environment to a controlled situation. The IDHW participated in the development of this project, including preparation of the Proposed Plan and this decision document. Comments received from the state were incorporated into these documents, which have been issued with concurrence from the IDHW.

8.3.2 Community Acceptance

The public comment period, which was held from March 25 to May 24, 1992, provided the opportunity for the public to express their opinions regarding each of the remedial alternatives. Many citizens commented on the efficacy of the preferred alternative. Some suggested the agencies should remove all the pond sediments, liner, and any potential contamination present beneath the pond liner. Other members of the public believed the risk to human health and the environment to be minimal and supported the No Action alternative. Public comments on the plan were considered during the preparation of this ROD and are responded to in the attached Responsiveness Summary.

9. SELECTED REMEDY

The DOE, EPA, and IDHW selected Alternative 2, Option B (removal of areas of high contaminant concentration and grouting of the sediments for disposal at the RWMC), as the interim action for the PBF Evaporation Pond, Corrosive Waste Sump, and discharge pipe. This alternative is preferred because it is a standard, available technology that can be readily implemented at reasonable cost. The contaminated sediments will be characterized, treated by stabilization/solidification, and disposed of at the RWMC. A treatability study will be performed to determine the optimum sediment grout additive mixture. Voids in certified low-level waste containers, which are to be disposed of in the RWMC, will be filled with the grout mixture containing thecontaminated sediments. The

estimated amount of contaminated sediments to be removed is approximately 100 cubic yards. The interim action of OU 5-13 will cost an estimated $480,000.

Removing the areas of high contaminant concentration will reduce the risk to human health by reducing the potential for exposure to chromium from inhalation and cesium-137 from direct ionizing radiation. The effectiveness of the interim action as a final action will be evaluated in the WAG 5 Comprehensive RI/FS, OU 5-12, scheduled to begin in 1996.

9.1 Sump Decontamination

Sludge and sediments will be removed from the sump to eliminate future contamination to the pond sediments during future discharge events. The sump will be pumped and the sludge and sediments will be collected and sampled. The interior of the sump will be decontaminated. The interior of the sump will be analyzed for radioactivity to ensure decontamination is complete. The discharge pipe will also be decontaminated and analyzed for residual radioactivity. Treatment of materials and sediments removed from the sump will be by grouting, if feasible based on treatability studies, and disposal at the RWMC.

9.2 Contaminated Sediment Removal

Approximately 100 cubic yards of the sediments in the PBF Evaporation Pond will be removed, incorporated into a grout mixture, and injected in void spaces of existing certified low-level waste containers for disposal at the RWMC. Field screening using portable radiation detectors will be used to identify sediments to be removed. The chromium and cesium-137 concentrations correlate well in the pond sediments as demonstrated by previous sampling efforts. By using field screening, elevated concentrations of cesium-137 and correspondingareas of elevated concentrations of chromium can be identified. Verification samples will be collected to ensure the concentration of remaining chromium does not pose an

unacceptable risk. Sediment samples will be taken under the liner, and any sediments contaminated above cleanup levels will be removed and disposed of as part of this action. However, since no contamination has been identified beneath the liner, none of that material was included in the estimated volume of sediments to be removed. The cleanup levels for this interim action are 800 mg/kg for chromium and 30 pCi/g for cesium-137.

A doubled lined evaporation tank will be placed on the site to receive discharges that may occur during the interim action due to an emergency situation. This tank may be used for future discharges in lieu of relining the pond.

9.3 Estimated Waste Generation and Disposal Option

Any wastes generated by removing areas of high contaminant concentration will be disposed of in accordance with laws regulating their characteristics (hazardous, radioactive). Low-level radioactive wastes will be disposed of at the RWMC on the INEL. Minimal quantities of other hazardous wastes, such as laboratory wastes, may be disposed of offsite in accordance with EPA's Revised Procedures for Planning and Implementing Off-Site Response Actions. Solid waste will be disposed at offsite and onsite facilities, depending on availability.

If these existing treatment, storage, and disposal facilities are inadequate or unavailable, the following option will be implemented:

- The waste would be stored on the INEL until additional disposal facilities are available

If this conditions occurs, it would be resolved as soon as possible, but no later than the WAG 5 ROD (OU 5-12).

10. STATUTORY DETERMINATIONS

Under CERCLA, the DOE and EPA have primary responsibility to ensure interim actions taken at the site reduce the immediate, identified risks to human health and the environment. Additionally, CERCLA, section 121, as amended by SARA, establishes several other statutory requirements and preferences. These specify that, when complete, the final selected remedy at each OU must implement applicable or relevant and appropriate environmental standards established under federal and state environmental laws unless a statutory waiver is justified.

The selected remedy must also be cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The remedy should represent the best balance of tradeoffs among alternatives with respect to pertinent criteria. Finally, the statute includes a preference for remedies employing treatments that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The selected remedy (removal of areas of high contaminant concentration and grouting of the sediments for disposal at the RWMC) for the interim remedial action for OU 5 -13 at the INEL meets these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 9, the selected remedy will alleviate the potential risk to human health by reducing the potential for exposure to chromium by inhalation and cesium-137 by direct ionizing radiation. This action may not constitute the final remedy for the PBF Evaporation Pond, Corrosive Waste Sump, and the discharge pipe. However, the statutory preference for

remedies employing treatment that reduces toxicity, mobility, or volume as the principal element, although partially addressed in this remedy, will be fully addressed at the time of the final response action. 10.2 Compliance with ARARS

The selected remedy will comply with the substantive requirements of all ARARs. A summary of the ARARs for this interim action is given in the following sections.

10.2.1 Chemical-Specific ARARS

The Clean Air Act establishes national standards and goals for air pollution control. The chemical-specific ARAR applicable to this interim action is 40 CFR 61.92, "National Emission Standards for Hazardous Air Pollutants [NESHAP], National Emission Standards for Radionuclide Emission from DOE facilities." This applicable requirement specifies a limit of 10 mrem/yr for radiation exposures for the general public from ambient air concentrations of radionuclides.

Air emissions from the interim action facility will meet these standards. Based on current knowledge, there are no other chemical- or radionuclidespecific ARARs governing cleanup levels for the Evaporation Pond sediments, Corrosive Waste Sump, or discharge pipe.

10.2.2 Action Specific ARARs

. Applicable requirements of the rules for the "Control of Fugitive Dust," IDAPA 16.01.01251 and .01252 which specify that all reasonable precautions be taken to prevent the generation of fugitive dusts.

. Applicable requirements of 40 CFR 61.93, NESHAP, "Emission Monitoring and Testing Procedures," which contains monitoring requirements.

10.2.3 Location-Specific ARARs
and Testing Procedures," which contains monitoring requirements.
There are no location-specific ARARs identified for this interim action.

10.2.4 Other Criteria, Advisories, or Guidance To-Be-Considered

Requirements under the Atomic Energy Act are applicable to the procurement, use, and disposal of all source, byproduct, and special nuclear material at the INEL. Although DOE Orders are not ARARs, since they are not promulgated requirements, all of the requirements of DOE Orders are to be considered. DOE Orders that may apply to this CERCLA activity include:

. DOE 5480.11, "Radiation Protection for Occupational Workers," establishes radionuclide-specific criteria to protect workers from hazard of exposure to ionizing radiation and radioactive materials.

. DOE 5820.2A, "Radioactive Waste Management," establishes standards for radiation exposure as follows:

... external exposure to the waste and concentration of radioactive material
radiation exposure as follows:
animals which results in an effective dose equivalent that does not exceed 25 mrem/yr to any member of the public ... and assures that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 yrs) will not exceed 100 mrem/yr for a continuous exposure or 500 mrem/yr for a single acute exposure.

Removal of pond sediments and stabilization/solidification, as described, meets this standard for both the removed contaminants and the residual pond sediments.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OU 5-13, interim action of the PBF Evaporation Pond and Corrosive Waste Sump was released for public comment in March 1992. The PBF Proposed Plan identified Alternative 2, removal of areas of high contaminant concentration, as the preferred alternative. Upon review of the cost estimates presented for the two disposal options in the Proposed Plan, the cost estimates were found to be low. The revised total cost for this interim action, Alternative 2, Option B, is $480,000. This change reflects the addition of the costs for: technical support, decontamination of the sump and discharge pipe, and assembling a tank to receive any emergency discharge that may be necessary during the interim action. The increase in the cost estimates, which have changed from Table 2 of the Proposed Plan to the update in Table 3 of this ROD (Section 8.2.5), resulted from a review and revision of the assumptions used in developing the estimates. The adjustment is the same for both options presented for Alternative 2, and therefore, has no effect on the selected remedy.

The DOE, EPA, and IDHW have reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined no further significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/10/1992
Operable Unit: 04
ROD ID: EPA/ROD/R10-93/056

Media: None

Contaminant: None

Abstract: The 1,700 by 1,900 feet USDOE Idaho National Engineering Laboratory (Operable Unit 4) is part of the 890-square mile U.S. Department of Energy (USDOE) facility located in Idaho Falls, Idaho. The primary mission of the Idaho National Engineering Lab (INEL) is nuclear reactor technology development and waste management. Land use in the area is predominantly industrial with mixed uses (restricted agricultural and recreational uses). The site, also known as the Test Reactor Area (TRA), contains more than 73 buildings and 56 structures such as tanks, cooling towers, laboratories, offices, and three high neutron flux nuclear test reactors, of which only one is currently operational. Approximately 7,700 people are employed at the INEL, with an estimated 600 employed at the TRA. Drinking water for the employees is obtained from production wells located within the facility. The site is contained within the northeastern portion of the Eastern Snake River Plain (ESRP), borders a floodplain to the west and north, and overlies the Snake River Plain Aquifer, which is a sole-source aquifer. The TRA was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Prior to 1964, most of the chemical and radioactive wastewater generated during site operations was discharged directly to six wastewater ponds at the TRA. Use of these ponds has contributed to the formation and contamination of the Perched Water System. From 1964 until 1982, wastewater was injected directly into the Snake River Plain Aquifer, which did not

contribute to the perched water contamination. Currently, there are four active disposal units that receive waste effluent generatedat the TRA. These are the warm waste pond, which receives radiologically-contaminated wastewater; the cold waste pond, which receives primarily reactor cooling water with no radiological activity; the chemical waste pond, which is used for disposal of wastewater from ion exchange units and water softeners; and the sanitary waste ponds. Studies of the perched ground water and the Snake River Plain Aquifer, conducted by DOE, identified low-level contamination by VOCs, other organics, metals, other inorganics, and radionuclides. Previous 1992 RODS addressed sediment at the Warm Waste Pond, ordnance and contaminated soil, contaminated ground water at the Technical Support Facility, and contaminated sediment and sludge in the evaporation pond, discharge pipe, and waste sump as OUs 5, 23, 2, and 22, respectively. This ROD addresses the contaminated Perched Water System within the TRA, as OU4. Other 1993 RODs addresses the Perched Water System, the CFA Motor Pool Pond and Pit 9 of the Subsurface Disposal Area, as OUs 4, 9, and 18 respectively. Because public access to the TRA is restricted and the Perched Water System is approximately 50 to 150 feet below the ground surface, current public exposure to the perched water is unlikely. Furthermore, results of human health and ecological risk assessments demonstrate no unacceptable risk to human health and the environment. As a result, no remedial action is necessary for the Perched WaterSystem at the TRA; therefore, there are no contaminants of concern affecting this site. SELECTED REMEDIAL ACTION: The selected remedial action for this site is no further action, with ground water monitoring. To support the no remedial action decision, DOE will begin a minimum 10-year decontamination and decommission period in the year 2007, when operations at the TRA have ceased; maintain existing institutional controls, including land use restrictions and property access restrictions; and replacing the existing warm wastewater pond, which is the major source of contamination in the perched ground water, with a new lined pond in 1993. Future contact with the Perched Water System also is unlikely because it is predicted to dissipate within about 7 years of ceasing disposal of wastewater to the ponds at the TRA according to modeling results. Results of human health and ecological risk assessments demonstrate no unacceptable risk due to potential future use. There are no costs provided for this no action remedy. PERFORMANCE STANDARDS OR GOALS: Not applicable. INSTITUTIONAL CONTROLS: Institutional controls, including land use restrictions, will be maintained to prevent site access during the 10-year period.

Remedy: It has been determined that no remedial action is necessary for the Perched Water System at the Test Reactor Area to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected current or future use of the Snake River Plain Aquifer beneath the Perched Water System at the Test Reactor Area.

Components and assumptions for the No Remedial Action decision are:

* Groundwater monitoring will be conducted to verify that contaminant concentration trends follow those predicted by a groundwater computer model. Within forty-five days of signature of this Record of Decision,
a monitoring plan will be developed by the U.S. Department of Energy and submitted to the U.S. Environmental Protection Agency and the Idaho Department of Health and Welfare as a primary document pursuant to the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order.
* Operations at the Test Reactor Area will continue at least through the year 2007, followed by a minimum estimated 10-year decontamination and decomissioning period. Existing institutional controls, which include
land use and property access restrictions, will continue to be maintained during this period.
* The existing warm waste pond, which is the major source of contamination in the perched groundwater, will be replaced by a new lined pond in 1993. The Remedial Investigation incorporated the assumption that the existing warm waste pond would be replaced by the new lined pond.

Text: Full-text ROD document follows on next page.

Text:
Record of Decision

Auxiliary Reactor Area-I Chemical Evaporation Pond

Operable Unit 5-10

Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Auxiliary Reactor Area-I Chemical Evaporation Pond
Operable Unit 5-10
Waste Area Group 5
Idaho National Engineering Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

This decision document presents the remedial action selected for the Auxiliary Reactor Area-I (ARA-I) Chemical Evaporation Pond, Idaho National Engineering Laboratory Operable Unit 5-10. This alternative was selected in accordance with the Comprehensive Environmental Response, Compensation, andLiability Act, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision was based on the information in the site Administrative Record, which is located in the INEL Technical Library in Idaho Falls, Idaho.

The lead agency in this decision was the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare (IDHW) participated in scoping the site investigations and evaluating the remedial investigation data. The IDHW concurs with the selected remedy.

Description of the Selected Remedy

The DOE has determined that no further remedial action is necessary at the ARA-I Chemical Evaporation Pond to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which indicate that conditions at the ARA-I Chemical Evaporation Pond pose no unacceptable risk to human health or the environment. The EPA approves of the DOE decision, and the IDHW concurs.

Declaration

No remedial action is necessary at Operable Unit 5-10 to ensure protection of human health and the environment. A statutory 5-year review will not be required because hazardous substances do not remain onsite above health-based levels. Subsurface conditions and the groundwater pathway need further evaluation; consequently, additional investigations will be conducted in another Operable Unit within Waste Area Group 5.

Signature sheet for the foregoing Record of Decision for Operable Unit 5-10 at the Idaho National Engineering Laboratory by the United States Department of Energy and approved by the United States Environmental ProtectionAgency, with concurrence by the Idaho Department of Health and Welfare. The

operable unit consists of the Auxiliary Reactor Area-I Chemical Evaporation Pond at the Idaho National Engineering Laboratory.

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ACRONYMS AND ABBREVIATIONS

ARA Auxiliary Reactor Area

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
COCA Consent Order and Compliance Agreement

DOE U.S. Department of Energy
DOE-ID U.S. Department of Energy Idaho Field Office

EPA U.S. Environmental Protection Agency

FFA/CO Federal Facility Agreement and Consent Order
FR Federal Register

IDHW Idaho Department of Health and Welfare
INEL Idaho National Engineering Laboratory

ug/kg micrograms per kilogram
mg/kg milligrams per kilogram

NCP National Oil and Hazardous Substances Pollution Contingency Plan
NPL National Priorities List

OU Operable Unit

pCi/g picocuries per gram

UCL upper confidence limit

VOC volatile organic compound

WAG Waste Area Group

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a U.S. Department of Energy (DOE) facility that encompasses approximately 2,305 sq km (890 sq mi) in southeastern Idaho. The nearest permanent residents are located in Atomic City (population 34) about 11 km (7 mi) south of the Auxiliary Reactor Area (ARA) facilities. The nearest large population center is Idaho Falls (population 46,000), located approximately 48 km (32 mi) to the east. INEL land is currently classified for industrial and mixed use (restricted agricultural and recreational) by the U.S. Bureau of Land Management. It has been designated as a National Environmental Research Park. The ARA is located in Butte County on the southern portion of the INEL site (Figure 1).

The INEL is part of the Eastern Snake River Plain, a volcanic plateau consisting of a series of basaltic lava flows with sedimentary interbeds. The topography of the INEL is generally flat to gently rolling, with an elevation range of 1,732 m (4,750 ft) to 1,896 m (5,200 ft). The topography at the ARA is relatively flat with a gradual slope to the south. Soils in the vicinity of the ARA are shallow and poorly developed and are composed of windblown (eolian) sediments exhibiting a sandy loam or loamy composition. The majority of the soils are Aridisols with calcic horizons (accumulations of calcium carbonate).

The Snake River Plain Aquifer underlies the INEL and has been designated as a sole source aquifer pursuant to the Safe Drinking Water Act. The depth to the aquifer varies from 61 m (200 ft) in the northern portion of the INEL to 270 m (900 ft) in the southern portion; the depth to the aquifer at the ARA is approximately 183 m (600 ft). Regional groundwater flow is generally to the southwest.

The ARA consists of four separate facilities; ARA-I is the southernmost and oldest facility. The ARA facilities have been used for research reactor operations and support activities. All ARA reactors have been removed, and each facility has undergone partial decontamination and decommissioning. ARA -I was a support facility and has not been used for operations since 1988.

The ARA-I Chemical Evaporation Pond is listed as Operable Unit (OU) 5-10 in Waste Area Group (WAG) 5 under the Federal Facility Agreement and Consent Order (FFA/CO) for the INEL. OU 5-10 is an unlined surface impoundment that was previously used to dispose of laboratory wastewater from building ARA-627 (Figure 2). The pond is now typically dry except after precipitation events. The pond was constructed in 1970 by excavating native soil tocreate a topographic depression. Basalt outcrops are present within the pond and immediately adjacent to the pond. Field sampling conducted on the pond in 1990 found a maximum pond soil depth of 1.1 m (3.5 ft) and an average soil

depth of approximately 0.5 m (1.5 ft). The ARA-I facility is approximately 3 m (10 ft) higher in elevation than the pond. The dimensions of the area sampled were approximately 40 x 140 m (130 x 460 ft), but the ponded area was approximately 20 m (66 ft) in diameter (Figure 3).

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Enforcement Activities

Under the INEL Consent Order and Compliance Agreement (COCA) signed by the U.S. Environmental Protection Agency (EPA), DOE, and U.S. Geological Survey in July 1987, the ARA-I Chemical Evaporation Pond was classified as a Land Disposal Unit and was listed as COCA Unit ARA-01. Releases of radioactive or hazardous contaminants to the ARA-I Chemical Evaporation Pond were first identified and evaluated during investigations conducted in accordance with the COCA.

In July 1989, the INEL was proposed for inclusion on the National Priorities List (NPL) in 54 Federal Register (FR) 29820. The listing was proposed by the EPA under the authority granted by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986. The final rule placing the INEL on the NPL was published in November 1989 in 54 FR 44184.

In December 1991 the EPA, DOE, and Idaho Department of Health and Welfare (IDHW) signed the FFA/CO. The FFA/CO and Action Plan supersede the COCA and provide schedules and strategies for implementing the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at the INEL. Under the FFA/CO the ARA-I Chemical Evaporation Pond is listed as OU 5-10.

2.2 Site History and Investigations

ARA-I is a surplus facility that was used as a nuclear research area, as research laboratories, and for various operations related to the examination or storage of radioactively contaminated materials. The ARA-I facility is comprised of two main buildings, ARA-626 and ARA-627. ARA-626 was a hot cell used to support materials research, and it contained a small laboratory area for sample preparation and inspection. ARA-626 was not connected to the pond.

ARA-627 served many purposes following its construction in 1955. Between 1955 and 1971, ARA-627 was a print shop. Beginning in 1970, the building was expanded and modified to serve as a research laboratory for materials development and testing. During this expansion, the ARA-I Chemical Evaporation Pond and the waste line from ARA-627 were constructed. From 1970 to 1984, small amounts of volatile organic compounds (VOCs) and mineral acids were used for material testing operations at ARA-627. On rare occasions when large amounts of acids or VOCs were used on a specific project, they were retained and sent to the Idaho Chemical Processing Plant for processing. Small amounts of acids and VOCs were used on a more routine basis and were disposed of in the following manner:

- Radioactively contaminated acids were placed into the radioactive waste sewer and retained in the radioactive waste tank (ARA-729) before disposal.

- Nonradioactively contaminated acids and VOCs were discharged through the waste line to the ARA-I Chemical Evaporation Pond (ARA-745).

In 1980, ARA-627 was further modified to incorporate a radiochemistry laboratory that operated until 1988. The laboratory performed extractions

to determine potential leaching characteristics and concentrations of radionuclides in various waste forms and environmental media. The laboratory testing performed resulted in approximately 95 to 99% of the low-level radioactive material leached from the analytical samples to be retained on filter paper. The contaminated filter papers were periodically sent to the Radioactive Waste Management Complex for disposal. The small amounts of radioactive material not captured on the filter paper and the VOCs used in the extraction process (xylene, heptane, 2-ethyl hexanol, and methanol) were discharged with other laboratory wastewater to the ARA-I Chemical Evaporation Pond. In 1988, the radiochemistry laboratory was moved to the Test Reactor Area; except for janitorial rinsewater from ARA-627 discharges to the pond ceased.

A sampling effort was conducted in 1990 to better characterize the ARA-I Chemical Evaporation Pond in support of Resource Conservation and Recovery Act closure activities under the COCA. Previous characterization activities did not define the extent of contamination; therefore, additional sampling was necessary to better characterize the pond and discharge pipe. The 1990 sampling results are documented in the Remedial Investigation Report for the ARA Chemical Evaporation Pond (Operable Unit 5-10), which is available in the Administrative Record. Upon the signing of the FFA/CO in 1991, the EPA, DOE, and IDHW agreed that these data would be used for CERCLA site characterization and risk assessment.

The sampling strategy developed to detect chemical and radioactive contaminants in the pond sediments was based on process knowledge and a previous investigation that determined limited quantities of materials were discharged over the 17 years of pond use. A total of 25 biased and 23 random sediment samples (including quality assurance samples) were collected at the surface and basalt interface from within the pond and discharge pipe area. Ten biased soil samples were collected approximately 30 m (100 ft) to the south ofthe pond in an area unaffected by ARA activities. These 10 samples were used to determine background metal concentrations (Figure 3).

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

On June 26, 1992, a document containing proposed plans for three INEL sites, including the ARA-I Chemical Evaporation Pond, was released to the public. The plan was mailed to approximately 6,500 individuals on the INEL mailing list, with a cover letter from the Director of the Environmental Restoration Division, U.S. Department of Energy Idaho Field Office (DOE-ID). The public comment period for the proposed plan was from July 6 to August 5, 1992. Community participation activities have been conducted as required by CERCLA sections 113(k)(2)(B) (i-v) and 117 and part XXIV of the FFA/CO.

The ARA-I Chemical Evaporation Pond proposed plan summarized the results of the human health risk assessment, which was based on modeled exposures to the pond contaminants. The modeling indicated that the contaminants at the site pose no unacceptable risk to human health and the environment. Therefore, the DOE, EPA, and IDHW recommended No Action for the Chemical Evaporation Pond in the proposed plan.

The Notice of Availability for the proposed plan was published in the following newspapers:

- The Post Register (Idaho Falls) - July 1, 1992
- The Idaho State Journal (Pocatello) - July 2, 1992
- Times News (Twin Falls) - July 1, 1992
- Idaho Statesman (Boise) - July 2, 1992
- Daily News (Moscow-Pullman) - July 11 and 12, 1992
- South Idaho Press (Burley) - July 1, 1992

- The Lewiston Morning Tribune (Lewiston) - July 1, 1992.

Copies of the plan are available in the Administrative Record file in the INEL Technical Library, 1776 Science Center Drive, Idaho Falls. Copies of the file also are available in the INEL Information Repository sections of the public libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and theUniversity of Idaho Library in Moscow.

Technical briefings on the proposed plan were held July 13 in Twin Falls, July 14 in Moscow, and July 15 in Pocatello. The Twin Falls briefing was presented to the Twin Falls City Council and was open to the public; the Moscow and Pocatello briefings were presented to the public.

Articles explaining the proposed plan for the ARA-I Chemical Evaporation Pond were printed in the May and July 1992 issues of the INEL Reporter newsletter, which is widely distributed within Idaho. Additionally, during the public comment period (from July 6 to August 5), public meetings on the proposed plan were held in Idaho Falls on July 20, Burley on July 21, Boise on July 22, and Moscow on July 23. An INEL press release informing the public of the upcoming meeting in their area was distributed to state-wide media. Personal phone calls were made by INEL Outreach Offices in Pocatello, Twin Falls, and Boise to inform key representatives from community groups of the opportunity for public comment.

The notices of the times and dates of public meetings were published in the following newspapers:

- The Post Register (Idaho Falls) - July 17, 1992
- The Idaho State Journal (Pocatello) - July 17, 1992
- Times News (Twin Falls) - July 20, 1992
- Idaho Statesman (Boise) - July 20, 1992
- Daily News (Moscow-Pullman) - July 21, 1992
- South Idaho Press (Burley) - July 20, 1992
- The Lewiston Morning Tribune (Lewiston) - July 21, 1992.

At the meetings, representatives from the DOE-ID, EPA, and IDHW discussed the proposed plan, answered questions, and received public comment. Verbatim transcripts of each public meeting were prepared by a court reporter and are available, along with the written comments, in the Administrative Record. Comments received from the public were considered in the final decision and have been summarized and addressed in the Responsiveness Summary attached to this Record of Decision (Appendix A).

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL is divided into 10 WAGs; each WAG consists of several OUs. This strategy allows the DOE-ID, EPA, and IDHW to investigate OUs and focus available cleanup resources on those areas that pose an unacceptable risk to human health and the environment. WAG 5 consists of 13 OUs located at the Power Burst Facility and the ARA. As previously stated, the ARA-I Chemical Evaporation Pond is designated as OU 5-10.

OU 5-10 includes the pond sediments and the sediments under the discharge pipe. The data collected to characterize the pond's sediments were used in the remedial investigation baseline risk assessment. This risk assessment indicates the sediments within the Chemical Evaporation Pond and under the discharge pipe pose no unacceptable risk to human health and the environment. Based on these results and risk management considerations, the three agencies agree that the ARA-I Chemical Evaporation Pond requires no remedial action to protect human health and the environment. Any impacts from past releases to the pond that may affect the subsurface (vadose zone)

or groundwater will be evaluated in a future investigation that will be completed before the INEL site-wide Record of Decision is finalized.

5. SITE CHARACTERISTICS

The ARA-I Chemical Evaporation Pond sediments were investigated by DOE for the presence of contamination between 1982 and 1990. Investigations before 1990 indicated that metals, VOCs, and radionuclides existed in the sediments. Samples collected in 1990 were analyzed for metals, VOCs, and gamma- and alpha-emitting radionuclides. Analyses for metals and VOCs were performed as specified in the laboratory manual Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (EPA, SW-846, 1986). Gamma-emitting radionuclides were analyzed by gamma-spectroscopy methods specified in the EG&G Radiation Measurements Laboratory Standard Operating Procedures (Procedure DM-1), and alpha emitting radionuclides were analyzed using the "Total Spectrometric Alpha Determination" procedure used by the Radiation Measurement Laboratory at the INEL. Analytical results for random, biased, and background samples are summarized in Table 1.

Because some of the constituents identified at the site also occur naturally in the soil, it was necessary to determine background concentrations specific to ARA-I. Background samples were taken approximately 30 m (100 ft) to the southeast of the pond. Analysis of these soil samples indicated metal concentrations similar to generally accepted background values for the western United States (EPA, Office of Solid Waste and Emergency Response, Hazardous Waste Land Treatment, SW-874, April 1983).

The pond sediment samples were analyzed for 16 naturally occurring metals. All metals were detected; however, as shown in Table 1, most metal concentrations were at or below the background concentration. The samples with the highest metal concentrations were collected within a 9 sq m (approximately 100 sq ft) area adjacent to the pond inlet (see Figure 2).

A full gamma spectroscopy analysis was performed, only three gammaemitting radionuclides were detected in the pond sediments: cesium-137 (25 of 40 samples), cesium-134 (4 of 40 samples), and cobalt-60 (3 of 40 samples). However, only two samples containing gamma-emitting radionuclides (biased sample and replicate) had detections statistically greater than background radioactivity as determined from samples collected within the WAG 5 area and reported in Environmental Monitoring for EG&G Idaho Falls Facilities at the Idaho National Engineering Laboratory, EG&G-2612(90), August 1991. The maximum concentration of radionuclides in these samples was 297 pCi/gcesium-137, 11.4 pCi/g cesium-134, 8.14 pCi/g cobalt-60, 2.6 pCi/g plutonium-239, and 1.6 pCi/g uranium-234. As with the metals, the samples with the highest radionuclide concentrations were collected adjacent to the pond inlet.

Only one sample was analyzed for alpha-emitting radionuclides. That sample was collected from the area adjacent to the pond inlet, which was the area expected to exhibit the greatest contamination. The alpha-emitting radionuclides, plutonium-239 and uranium-234, were detected at low concentrations in that sample. Although only one sample was targeted for alpha-emitting radionuclides, other data exist that indicate their absence. Specifically, the alpha-emitting radionuclides plutonium-239 and plutonium-241 are co-produced from the decay of a parent compound. Plutonium-241 quickly undergoes radioactive decay (14-year half-life) to produce americium -241, which is a x-ray emitting radionuclide and is detectable by gamma spectroscopy. Gamma spectroscopy analysis was performed on the sediment samples collected throughout the rest of the pond, and americium-241 was not detected. The absence of americium-241 indicates that the parent plutonium-241 and the associated plutonium-239 are also absent, and it supports the assumption that the alpha contamination has limited distribution in the pond

sediments.

Three VOCs (methylene chloride, acetone, and toluene) were detected in the pond sediments. Out of 32 total random and biased samples targeted for VOC analysis, methylene chloride was detected in four samples at concentrations ranging from 8 to 26 ug/kg, acetone was detected in two samples (2 and 7 ug/kg), and toluene was detected in three samples (3 to 4 ug/kg).

The fate and transport of the detected contaminants are affected by a variety of physical and chemical processes. Radionuclides decay and VOCs dissipate; therefore, their concentrations will continue to decrease overtime. Metal contamination (including radionuclides) found in the sediments isrelatively immobile; the primary mode of transport is windblown dust. Metals of potential concern in the sediments are:

- Arsenic, chromium-VI, cesium-137, cesium-134, cobalt-60, plutonium-239, and uranium-234, which are classified as Group A human carcinogens

- Cadmium, a Group B1 probable human carcinogen

- Beryllium, a Group B2 probable human carcinogen

- Chromium-III, a noncarcinogen that may have other adverse human health effects.

At the ARA-I Chemical Evaporation Pond, potential pathways for contaminant migration and exposure to humans include (a) direct atmospheric transport, (b) indirect transport via game animals, (c) direct transport via groundwater, and (d) direct ingestion by workers or future residents. Direct exposure to ionizing radiation emitted by pond contaminants constitutes another exposure route, but it is not a migration pathway. Exposure pathways selected for the risk assessment include soil ingestion, inhalation, direct contact with contaminants, and exposure to direct ionizing radiation.

Potential exposure scenarios based on the above pathways at the ARA-I Chemical Evaporation Pond were limited to present occupational and future residential users. For the occupational scenario, the site worker was assumed to be exposed to direct radiation and to inhale or ingest contaminants from the pond sediments. Currently, exposure to the public is unlikely because of the strict security policy at the INEL. However, a future residential scenario was evaluated because it is possible a home could be built on the site if existing land use policy changes. Residential exposures may occur by inhalation, ingestion, dermal contact, or direct radiation exposure. For the risk assessment, it was assumed residential development will not occur for at least 30 years. A 100-year residential scenario was also evaluated consistent with previously published FFA/CO investigations.

6. SUMMARY OF SITE RISKS

6.1 Human Health Risk

The contaminants found in the ARA-I Chemical Evaporation Pond were evaluated to identify those that contribute the greatest potential risk. A concentration-toxicity screen was used, which involved ranking each contaminant by its highest detected concentration multiplied by a chemicalspecific risk factor developed by the EPA. Consistent with EPA guidance (Risk Assessment Guidance for Superfund, Part A), contaminants contributing more than 1% of the total calculated risk were retained in the

baseline risk assessment. The concentration-toxicity screen identified chromium-III as the main contributor of noncarcinogenic risk, while the most significant carcinogenic risk drivers were chromium-VI, cadmium, beryllium, arsenic, and radionuclides (Table 2).

Table 2 gives the concentrations of the contaminants in the ARA-I Chemical Evaporation Pond that were used in the baseline risk assessment for each scenario. Initial concentrations of contaminants measured in the pond sediments were used to calculated the 95% upper confidence limit (UCL) for each identified risk driver. Calculation of the 95% UCL is based on an apparent lognormal distribution on analytic results, using a one sided t-test. For assessment of risk, the mean background concentration was then subtracted from the associated UCL, and the resulting value was used for risk modeling. For nonradioactive analytes and long-lived radionuclides, concentrations are considered to remain constant with time. The nonradioactive material may deteriorate over time, but the decay is neither constant nor predictable. Radioactive material decays at a predictable rate, but the activity reduction experienced by a longlived radionuclide during a 30- or 100-year period would be insignificant.

The human-health effects of the contaminants were evaluated for current occupational and future residential scenarios (30 and 100 year). Two risk assessments for each scenario were developed: the first using EPA default parameters and the second using site-specific parameters. ARA-I is a surplus facility that is not normally occupied. Therefore, occupational direct radiation and ingestion exposures were modeled for an individual who would spend 2 hours at the site every 90 days. Occupational inhalation exposure was modeled for an individual who spends 1 day/week at ARA-I[100 m (328 ft) from the pond].

Residential carcinogenic risks were calculated for both the 30- and 100-year future-use scenarios for site-specific and default parameters. The timing of the residential scenario is not important to the chemical risk assessment, but it is considered in the radiological risk assessment because radionuclide decay reduces risk over time. Residential exposure at the site may occur by inhalation, ingestion, dermal contact, or direct radiation exposure.

Each scenario was assessed using EPA default exposure parameters to establish a baseline risk value. Site-specific risk assessment reflects site conditions as they exist today and as they are likely to exist in the future. The major difference between the default and site-specific conditions is the exposure frequency; a lower frequency is more realistic for this site. The baseline risk assessment is included in the Remedial Investigation Report for the ARA Chemical Evaporation Pond (Operable Unit 5-10).

Contaminant intake rates for metals and radionuclides were calculated for inhalation, ingestion, and dermal absorption in accordance with EPA methods found in the Risk Assessment Guidance for Superfund, Volume I, "Human Health Evaluation Manual." For noncarcinogens, the calculated contaminantintake rates and absorbed doses for each contaminant and exposure route were compared to EPA reference doses. The hazard quotients (the ratio of the calculated intake to the reference dose for each contaminant) were summed by exposure route and scenario to obtain the hazard indices. A hazard index value greater than 1 indicates possible adverse human-health effects for sensitive subpopulations. For the modeled scenarios, no hazard indices greater than 1 were identified. This indicates the noncarcinogenic contaminants at the ARA-I Chemical Evaporation Pond pose no unacceptable risk to human health (Table 3).

Carcinogenic health effects for each scenario were evaluated in accordance with EPA methodology using calculated intake rates and absorption and slope factors for each carcinogen. The results were the calculated excess cancer risks for each carcinogen. These risks were then summed to determine the total excess cancer risk for that scenario. For the occupational scenario, the current total carcinogenic risk to workers near the ARA-I Chemical Evaporation Pond was 2 in 100,000 (2 x 10[-5]) using the default parameters and 2 in 10,000,000 (2 x 10[-7]) using site-specific parameters. For the default 30-year future residential scenario, the total carcinogenic risk from radionuclides and inorganic metals was 1 in 100,000 (1 x 10[-5]) and 2 in 1,000,000 (2 x 10[-6]) for the site-specific scenario. For the 100-year future residential scenario, the total carcinogenic risk for the default scenario was 4 in 1,000,000 (4 x 10[-6]) and 1 in 1,000,000 (1 x 10[-6]) for the site-specific scenario (Table 3).

In summary, noncarcinogenic contaminants resulted in a hazard quotient of less than 1 for the occupational and residential scenarios. The calculated excess risk of carcinogenic effects from exposure to the chemical and radioactive contaminants in the pond sediments from all routes of exposure was within or below the EPA's target risk range of 1 in 10,000 (1 x 10[-4]) to 1 in 1,000,000 (1 x 10[-6]). The greatest potential for carcinogenic effects to both workers and future residents was from exposure to direct ionizing radiation. These calculated probabilities are within or below the acceptable risk range (10[-4] to 10[-6]) for increased cancer incidence as specified in the NCP.

Several sources of uncertainty, such as those associated with sampling and analysis or the use of EPA established toxicity values, are common to risk assessments and generally have a low potential for adding uncertainty to the results. Other assumptions specific to the ARA-I Chemical Evaporation Pond are more important to analysis of uncertainty. These assumptions include the use of all contaminants detected in the pond in the risk assessment, which may increase the risk. However, using EPA-approved methodologies, such as toxicity-concentration screening, removes many metals and VOCs from consideration in the risk assessment. The toxicity screen has a small probability of underestimating the risk. Another source of uncertainty is which samples were used in the risk assessment. For the ARA-I Chemical Evaporation Pond, all samples (both random and biased) were used. The use of biased samples should overestimate total contaminant concentrations in the pond, thus, making the risk assessment more conservative. Perhaps the most important assumption affecting the risks associated with the pond is that a residence would be located at the pond site in the future. Because of conditions at the pond the probability of a residence being located in close proximity to the pond is quite small. The limited areal extent of contamination and the improbability of future residents spending significant time in the area indicates that the potential risks have probably been overestimated.

Because the potential effects of the assumptions used in the risk assessment are not quantified, it is difficult to measure the effect on total risk. However, the potential for over-and underestimation can be qualitatively compared. On balance, it appears there is a greater potential for overestimation of exposures and risks. Therefore, the estimates of total risk for this site can be considered conservative.

6.2 Environmental Risk

The remedial investigation also addressed the effects the contaminants in the ARA-I Chemical Evaporation Pond sediments would have on the environment. The main contaminants of concern are metals and radionuclides, which typically are immobile in the soils and unlikely to be transferred through

the food chain. The contamination in the pond has a limited distribution; therefore, any effect that could be identified would be on an individual and not on a population or community. These factors, combined with the discontinued use of the pond, semi-arid climate, sparse vegetation, and limited habitat for wildlife, minimize risks to the ecosystem. However, environmental risk will be further evaluated in the WAG 10 Comprehensive Remedial Investigation/Feasibility Study scheduled to begin in 1998.

7. DECISION

The DOE has determined no further remedial action is necessary at the ARA-I Chemical Evaporation Pond to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments that determined conditions at the site pose no unacceptable risk to human health or the environment. The EPA approves of the decision and the IDHW concurs.

8. EXPLANATION OF SIGNIFICANT CHANGES

The proposed plan for the ARA-I Chemical Evaporation Pond sediments was released for public comment on June 26, 1992. The proposed plan identified No Action as the alternative preferred by the DOE, EPA, and IDHW. The three agencies have reviewed and considered all written and verbal comments concerning the proposed action that were submitted during the public comment period. The agencies determined that no significant changes to the preferred alternative, as presented in the proposed plan, were necessary.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/10/1992
Operable Unit: 04
ROD ID: EPA/ROD/R10-93/057

Abstract: The 1,700 by 1,900 feet USDOE Idaho National Engineering Laboratory (Operable Unit 4) is part of the 890-square mile U.S. Department of Energy (USDOE) facility located in Idaho Falls, Idaho. The primary mission of the Idaho National Engineering Lab (INEL) is nuclear reactor technology development and waste management. Land use in the area is predominantly industrial with mixed uses (restricted agricultural and recreational uses). The site, also known as the Test Reactor Area (TRA), contains more than 73 buildings and 56 structures such as tanks, cooling towers, laboratories, offices, and three high neutron flux nuclear test reactors, of which only one is currently operational. Approximately 7,700 people are employed at the INEL, with an estimated 600 employed at the TRA. Drinking water for the employees is obtained from production wells located within the facility. The site is contained within the northeastern portion of the Eastern Snake River Plain (ESRP), borders a floodplain to the west and north, and overlies the Snake River Plain Aquifer, which is a sole-source aquifer. The TRA was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Prior to 1964, most of the chemical and radioactive wastewater generated during site operations was discharged directly to six wastewater ponds at the TRA. Use of these ponds has contributed to the formation and contamination of the Perched Water System. From 1964 until 1982, wastewater was injected directly into the Snake River Plain Aquifer, which did not contribute to the perched water contamination. Currently, there are four active disposal units that receive waste effluent generated at the TRA. These are the warm waste pond, which receives radiologically-contaminated wastewater; the cold waste pond, which

receives primarily reactor cooling water with no radiological activity; the chemical waste pond, which is used for disposal of wastewater from ion exchange units and water softeners; and the sanitary waste ponds. Studies of the perched ground water and the Snake River Plain Aquifer, conducted by DOE, identified low-level contamination by VOCs, other organics, metals, other inorganics, and radionuclides. Previous 1992 RODS addressed sediment at the Warm Waste Pond, ordnance and contaminated soil, contaminated ground water at the Technical Support Facility, and contaminated sediment and sludge in the evaporation pond, discharge pipe, and waste sump as OUs 5, 23, 2, and 22, respectively. This ROD addresses the contaminated Perched Water System within the TRA, as OU4. Other 1993 RODs addresses the Perched Water System, the CFA Motor Pool Pond and Pit 9 of the Subsurface Disposal Area, as OUs 4, 9, and 18 respectively. Because public access to the TRA is restricted and the Perched Water System is approximately 50 to 150 feet below the ground surface, current public exposure to the perched water is unlikely. Furthermore, results of human health and ecological risk assessments demonstrate no unacceptable risk to human health and the environment. As a result, no remedial action is necessary for the Perched WaterSystem at the TRA; therefore, there are no contaminants of concern affecting this site.

Remedy: SELECTED REMEDIAL ACTION: The selected remedial action for this site is no further action, with ground water monitoring. To support the no remedial action decision, DOE will begin a minimum 10-year decontamination and decommission period in the year 2007, when operations at the TRA have ceased; maintain existing institutional controls, including land use restrictions and property access restrictions; and replacing the existing warm wastewater pond, which is the major source of contamination in the perched ground water, with a new lined pond in 1993. Future contact with the Perched Water System also is unlikely because it is predicted to dissipate within about 7 years of ceasing disposal of wastewater to the ponds at the TRA according to modeling results. Results of human health and ecological risk assessments demonstrate no unacceptable risk due to potential future use. There are no costs provided for this no action remedy.

INSTITUTIONAL CONTROLS: Institutional controls, including land use restrictions, will be maintained to prevent site access during the 10-year period.

Text: Full-text ROD document follows on next page.

Text:
RECORD OF DECISION

FOR THE TEST REACTOR AREA PERCHED WATER SYSTEM

OPERABLE UNIT 2-12

AT THE

IDAHO NATIONAL ENGINEERING LABORATORY

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DECLARATION OF THE RECORD OF DECISION
FOR THE TEST REACTOR AREA PERCHED WATER SYSTEM
AT THE
IDAHO NATIONAL ENGINEERING LABORATORY

SITE NAME AND LOCATION

Perched Water System
Test Reactor Area
Idaho National Engineering Laboratory

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected final remedy (no remedial action with monitoring) for the Test Reactor Area Perched Water System, Operable Unit 2-12 at the Idaho National Engineering Laboratory. The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record for the site.

The lead agency for this decision is the U.S. Department of Energy. The Environmental Protection Agency approves of this decision and, along with the State of Idaho Department of Health and Welfare, has participated in the scoping of the site investigations and in the evaluation of remedial investigation data. The State of Idaho concurs with the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

It has been determined that no remedial action is necessary for the Perched Water System at the Test Reactor Area to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected current or future use of the Snake River Plain Aquifer beneath the Perched Water System at the Test Reactor Area.

Components and assumptions for the No Remedial Action decision are:

- Groundwater monitoring will be conducted to verify that contaminant concentration trends follow those predicted by a groundwater computer model. Within forty-five days of signature of this Record of Decision, a monitoring plan will be developed by the U.S. Department of Energy and submitted to the U.S. Environmental Protection Agency and the Idaho Department of Health and Welfare as a primary document pursuant to the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order.

- Operations at the Test Reactor Area will continue at least through the year 2007, followed by a minimum estimated 10-year decontamination and decommissioning period. Existing institutional controls, which include land use and property access restrictions, will continue to be maintained during this period.

- The existing warm waste pond, which is the major source of contamination in the perched groundwater, will be replaced by a new lined pond in 1993. The Remedial Investigation incorporated the assumption that the existing warm waste pond would be replaced by the new lined pond.

DECLARATION

It has been determined that no remedial action is necessary to ensure protection of human health and the environment. Because this decision will result in hazardous substances remaining on the site above health-based levels, a statutory review of this decision will be conducted by the Department of Energy, the Environmental Protection Agency, and the Idaho Department of Health and Welfare if any of the assumptions used to arrive at the No Remedial Action decision change, but no later than three years to ensure that adequate protection of human health and the environment continues to be provided. This review will evaluate the assumptions used to arrive at the No Remedial Action decision.

Signature sheet for the foregoing Operable Unit 2-12 Perched Water System at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Signature sheet for the foregoing Operable Unit 2-12 Perched Water System at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United

States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Signature sheet for the foregoing Operable Unit 2-12 Perched Water System at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

RECORD OF DECISION FOR THE PERCHED WATER SYSTEM AT THE TEST REACTOR AREA, OPERABLE UNIT 2-12, AT THE IDAHO NATIONAL ENGINEERING LABORATORY

DECISION SUMMARY

Introduction

The Idaho National Engineering Laboratory (INEL) was proposed for listing on the National Priority List (NPL) July 14, 1989 [54 Federal Register (FR) 29820]. The listing was proposed by the Environmental Protection Agency (EPA) under the authorities granted EPA by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986. The final rule that listed the INEL on the NPL was published November 21, 1989, in 54 FR 44184.

In accordance with the CERCLA, Executive Order 12580 (Superfund Implementation) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (EPA 1990), the U.S. Department of Energy (DOE) performed a Remedial Investigation for the Perched Water System. The Remedial Investigation characterized the nature and extent of contamination in the Perched Water System. A Human Health Risk Assessment and an Ecological Risk Assessment were conducted to evaluate potential effects of the Perched Water System on human health and the environment.

1. SITE NAME, LOCATION, AND DESCRIPTION

The INEL is an 890-square mile federal facility operated by the DOE (Figure 1). The primary mission of the INEL is nuclear reactor technology development and waste management.

Current land use at the INEL is industrial. Approximately 7,700 people are employed at the INEL, with an estimated 600 employed at the Test Reactor Area. The nearest off-site populations are in the cities of: Atomic City (13 miles southeast of the Test Reactor Area), Arco (17 miles west), Howe (14 miles north), Mud Lake (32 miles northeast), and Terreton (34 miles northeast).

The INEL has semi-desert characteristics with hot summers and cold winters. Normal annual precipitation is 8.7 inches. Twenty distinctive vegetation cover types have been identified at the INEL. Big sagebrush, the dominant species, covers approximately 80 percent of the area. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Underlying the INEL are a series of silicic and basalt lava flows and relatively minor amounts of sedimentary interbeds. The basalts immediately beneath the site are relatively flat-lying and covered with 20 to 30 feet of alluvium. The Snake River Plain Aquifer underlies the INEL and was designated a sole source aquifer in 1992 pursuant to the Safe Drinking Water Act.

The Test Reactor Area is located in the southwestern portion of the INEL approximately 47 miles west of Idaho Falls (Figure 1). The Test Reactor

Area covers an area of approximately 1,700 by 1,900 feet and is surrounded by a double security fence (Figure 2). Located inside the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, laboratories and offices. The facility contains three high neutron flux nuclear test reactors: the Materials Test Reactor, the Engineering Test Reactor, and theAdvanced Test Reactor. Only the Advanced Test Reactor is currently operational.

The area around the Test Reactor Area is relatively flat with the exception of several construction rubble piles resulting from Test Reactor Area activities. Generally, the land surface slopes gently from the west-southwest corner to the east-northeast corner of the facility. The only surface water bodies at the Test Reactor Area are the four wastewater disposal ponds located outside the security fence (Figure 2). The Big Lost River channel is located 4,480 feet south of the Test Reactor Area. Drinking water for employees at the TRA is obtained from production wells in the northeast part of the facility (see Figure 7).

Chemical and radioactive wastewater have been and continue to be generated from scientific and engineering research at the Test Reactor Area. Wastewater discharged to unlined surface ponds at the Test Reactor Area percolates downward through the surficial alluvium and the underlying basalt bedrock. A shallow perched water zone has formed at the interface between the surficial sediments and the less permeable underlying basalt approximately 50 feet below land surface. Further downward movement of groundwater is again impeded by a low permeability layer of silt, clay, and sand encountered at a depth of about 150 feet. The deep perched water zone occurs on top of this low permeability interbed. Figures 3 and 4 illustrate the vertical and areal extent, respectively, of the perched groundwater at the Test Reactor Area.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Site History

The Test Reactor Area was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Wastewater generated during operations is disposed of in the wastewater ponds at the Test Reactor Area. Six disposal units have been used that have contributed to the formation andcontamination of the Perched Water System; the retention basin, chemical waste pond, sanitary waste (sewage) pond, warm waste pond, cold waste pond, and former disposal Well U.S. Geological Survey (USGS)-53.

The chemical composition of water discharged to the ponds has varied over the years. Prior to 1962, all wastewater generated at the Test Reactor Area, except sanitary sewage, was discharged directly to the warm waste pond. From 1952 to 1962, radionuclides, water softener and ion exchange column regeneration fluids, reactor cooling water containing hexavalent chromium, and other miscellaneous wastes were all disposed to the warm waste pond. In 1962, the regeneration fluids were diverted to the chemical waste pond for disposal. Water used in the secondary reactor cooling system that contained hexavalent chromium was disposed to the warm waste pond from 1952 until November 1964.

Two different wells were used for disposal of waste water at the Test Reactor Area. From 1964 until 1972, the Test Reactor Area disposal well was used to dispose of the secondary reactor cooling water. This disposal well injected directly into the Snake River Plain Aquifer and did not contribute contaminants to the Perched Water System. After 1972, hexavalent chromium was no longer used as a rust inhibitor in the cooling systems and was no longer discharged to the disposal well or to the ponds. Use of the disposal

well ceased in 1982. From 1960 to 1964, during peak wastewater generation, a second well, USGS-53, was used intermittently to inject wastewater to the Perched Water System as the warm waste pond had insufficient capacity.

The volume of discharged wastewater has been estimated for each pond system over the operating period from 1952 to present, and is summarized in Table 1. For the period of record from 1962 to 1990, a total of 6,770 million gallons of water were discharged from the waste streams to the Perched Water System. Discharge volumes have remained near 200 to 300 million gallons peryear, except for a 3-year period from 1979 to 1981 when discharge volumes were only 70 to 100 million gallons per year.

Water level elevations and areal extent of the deep perched groundwater fluctuate in response to the volume of water being discharged to the surface ponds. Water movement in the deep perched groundwater zone is both lateral and vertical. The size of the deep perched groundwater zone has remained fairly uniform over the years except between 1979 to 1981 when the size of the deep perched groundwater zone greatly decreased due to decreased discharge to the surface ponds. With increased discharge to the surface ponds since 1982, the deep perched groundwater zone has returned to its previous size.

2.2 Currently Facility Operations

Four disposal units are currently active and receive waste effluent currently generated at the Test Reactor Area. These are the warm waste pond which receives radiologically contaminated wastewater, the cold waste pond which receives primarily reactor cooling water with no radiological activity, the chemical waste pond which is used for disposal of wastewater from ion exchange units and water softeners, and the sanitary waste ponds for sanitary (sewage) wastes. These discharge ponds are identified on Figure 2.

Discharge rates to each pond are summarized in Table 1. The greatest volume of wastewater is discharged to the cold waste pond at approximately 500 gallons per minute. Water discharged to the cold waste pond is nonradioactive wastewater. The water is uncontaminated secondary reactor cooling water and is discharged in significant volumes to the Perched Water System.

2.3 Previous Groundwater Investigations

A number of groundwater investigations have been conducted since 1949 in the vicinity of the Test Reactor Area to characterize the quality of the Snake River Plain Aquifer. The USGS began installing monitor wells andevaluating waste migration from the deep perched groundwater to the Snake River Plain Aquifer in 1960. USGS monitoring parameters have included nitrate, chloride, pH, specific conductivity, sodium, hexavalent chromium, total and dissolved chromium, chromium-51, tritium, cobalt-60, cesium-137, and strontium-90.

2.4 Enforcement

A Consent Order/Compliance Agreement (COCA) (EPA 1987) was entered into between DOE and EPA in August, 1987, pursuant to the Resource Conservation and Recovery Act (RCRA). The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL. The release of radioactive and/or hazardous contaminants to the disposal ponds and the deep injection well were identified and evaluated during investigations conducted in accordance with RCRA corrective action requirements.

As a result of the INEL's listing on the NPL in November 1989, DOE, EPA, and the State of Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent Order (FFA/CO) (EPA 1991a) in December 1991 pursuant to CERCLA and the Idaho Hazardous Waste Management Act. The FFA/CO superseded the COCA and established a procedural framework for agency coordination and a schedule for all FFA/CO remedial action activities conducted at the INEL as a result of the NPL listing. The Perched Water System Remedial Investigation (EG&G 1992) was conducted in accordance with the FFA/CO.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community participation activities have been conducted in compliance with CERCLA Sections 113(K)(2)(b)(i-v) and 117, and Section 24 of the FFA/CO.

To announce the beginning of the Perched Water System investigation project, public informational meetings were held in late July 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. The meetings were to explain the CERCLA process and to introduce the Perched Water System investigation project to the public. These informational meetings were announced via the INEL Reporter newsletter, which is distributed to INEL employees as well as the general public, through newspaper and radio advertisements, and in an INEL press release. Personal phone calls were made to key individuals, environmental groups, and organizations by the INEL field offices in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator also made calls to community leaders in Idaho Falls and Moscow.

When the investigation was completed, a Notice of Availability for the Proposed Plan (USDOE 1992) for no remedial action of the Perched Water System was published June 26, 1992, in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Idaho Statesman (Boise), and Daily News (Moscow/Pullman). A similar newspaper advertisement appeared in the same newspapers the following week repeating the announcement of the public meeting locations and times. Personal phone calls, as noted above, were also made to inform interested individuals and groups about the opportunity to comment.

The Proposed Plan for the remedial action of the Perched Water System was mailed June 26, 1992, to 6,500 individuals on the INEL mailing list. It included a cover letter from the Director of the Environmental Restoration Division of the DOE Idaho Field Office urging citizens to comment on the Proposed Plan and to attend public meetings. Copies of the Proposed Plan and the Administrative Record were available to the public in six regional INEL information repositories: the INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. The original documents comprising the Administrative Record are located at the INEL Technical Library; copies are present in the five other libraries. These copies were placed in the information repository sections or at the reference desk in each ofthese libraries.

The public comment period on the Proposed Plan for the Perched Water System was held from July 6 to August 5, 1992. No requests for extensions were made. Technical briefings were conducted via speaker phone to interested members of the public in Twin Falls, Moscow, and Pocatello on July 13, 14, and 15, 1992, respectively. Public meetings were held July 20, 21, 22, and 23, 1992, in Idaho Falls, Burley, Boise, and Moscow, respectively. At these meetings, representatives from DOE, EPA, and IDHW discussed the project, answered questions, and received public comments. Verbatim transcripts of each public meeting were prepared by a court reporter. In addition to accepting oral comment during the meetings, written comment sheets and an

audio tape recorder were made available at the meeting to accept public comments. Written comments were accepted throughout the 30-day comment period.

A Responsiveness Summary has been prepared as part of this Record of Decision. All verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the Record of Decision. Comments are annotated to indicate which response in the Responsiveness Summary addresses each comment. It should be noted that the Responsiveness Summary groups similar comments together, summarizes them and provides a single response for each comment group.

Persons on the mailing list will receive a notice of availability stating that the signed Record of Decision is available. Copies of the signed Record of Decision and the Responsiveness Summary will be placed in the Administrative Record and in the information repositories, and will be provided to the public upon request.

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL is divided into ten waste area groups (WAGs) which generally correspond to facility areas. The WAGs are further subdivided into operable units (OUs). The Test Reactor Area has been designated WAG 2, and the Perched Water System has been designated OU 2-12, one of the thirteen OUs identified at the Test Reactor Area. OU 2-12, the subject of this Record of Decision, addresses the risk due to infiltration of the contaminated perched water into the Snake River Plain Aquifer. The following three separate OUs will address sediment/soil contamination resulting from the wastewater discharge:

OU 2-09

OU 2-09 will evaluate contaminated sediments in the cold waste pond and the sewage lagoons. Preliminary investigations are currently underway to determine if the sediments in the sewage lagoons or the cold waste pond present an unacceptable risk.

OU 2-10

Risk calculations have already demonstrated that the warm waste pond sediments currently pose an unacceptable risk. An Interim Action Record of Decision for OU 2-10 was signed December 5, 1991, which addresses the pond sediments. A new lined replacement pond for the warm wastewater is currently under construction. The existing warm waste pond will be closed in 1993 when the new pond is completed, at which time wastewater will no longer be discharged to the pond.

OU 2-11

OU 2-11 consists of the retention basin and the Test Reactor Area disposal well. The disposal well was used to inject wastewater directly to the Snake River Plain Aquifer and was an additional source of aquifer contamination; however, it was not a source to the Perched Water System.

The retention basin is part of the warm wastewater system. Wastewater passes through the basin to allow short-lived radionuclides time to decay before reaching the pond. Evidence of a leak was discovered in the retention basin and was studied in 1971 (Langford, 1971). The preliminary investigation for OU 2-11 will determine if the contaminated sediments resulting from the leakage present an unacceptable risk.

In addition to these three investigations, a final WAG 2 investigation (OU 2-13) will be conducted to evaluate remaining sources within the Test Reactor Area and consider the potential risk from the perspective of the entire WAG. This investigation is scheduled to begin in 1996.

OU 10-4 is the Comprehensive/Snake River Aquifer RI/FS investigation at the INEL. After information concerning each source is evaluated in the individual WAGs, risks will be investigated for the INEL in its entirety as OU 10-4 with particular attention given to the Snake River Plain Aquifer. An evaluation of the impact to the Snake River Plain Aquifer from the Test Reactor Area will be included in the INEL-wide investigation.

5. SUMMARY OF SITE CHARACTERISTICS

5.1 Geology and Hydrology

The INEL is located along the northern edge of the Eastern Snake River Plain, a 50- to 70-mile wide northeastern trending geologic basin extending from the vicinity of Twin Falls on the southwest to the Yellowstone Plateau on the northeast. The Eastern Snake River Plain is underlain by a substantial volume of volcanic rocks with relatively minor amounts of sediment, except along its margins where drainages emerge from the nearby mountain ranges. The Test Reactor Area is underlain by 30 to 50 feet of surficial alluvium and a thick sequence of fractured basalt flows with thin sedimentary interbeds. These alluvial sediments are primarily composed of sandy gravel with minor amounts of silt and clay. Quartz is the major mineral component of the alluvium, followed by plagioclase and alkali feldspar and minor amounts of clays.

Fractured basalt flows underlie the surficial alluvium and are separated by sedimentary interbeds that vary in thickness and lateral extent. The most extensive interbed occurs approximately 150 feet below the surface. Similar to the surficial alluvium, quartz is the major mineral component of the sedimentary interbeds, followed by plagioclase and alkali feldspars. The Snake River Plain Aquifer occurs in this sequence of basalt with sedimentary interbeds at a depth of approximately 480 feet beneath the Test Reactor Area (see Figure 3).

5.1.1 Surface Water

Most of the INEL is located in a topographically closed drainage basin, referred to as the Pioneer Basin, where the Big Lost River, Little Lost River, and Birch Creek once drained from the mountain ranges to the west and north. Today, most of the water flowing in these streams is diverted upstream of the INEL for irrigation purposes.

The Big Lost River is the principal natural surface-water feature on the INEL and is the closest major drainage to the Test Reactor Area. The Big Lost River has not flowed on the INEL since 1984. Neither the Test Reactor Area facilities nor ponds are located within the 100-or 500-year flood plain of the Big Lost River.

5.1.2 Perched Water

The presence of perched water at the Test Reactor Area is directly related to infiltration from wastewater disposal ponds. Perched groundwater occurs when downward flow of the wastewater to the aquifer is impeded by finegrained sediments and/or dense basalt flows having relatively low permeability. Two distinct perched water zones, shallow and deep, have been recognized at the Test Reactor Area (see Figure 3). The shallow perched groundwater occurs in the immediate vicinity of the ponds and retention

basin, and forms on the interface between the surficial alluvium and the underlying basalts at about50 feet below land surface.

The deep perched groundwater is caused by low-permeability sediments and/or sediment infilling of fractures within the interbedded basaltsediment sequence. The top of this interbedded basalt-sediment sequence begins at depths of approximately 140 feet below land surface and ends at depths of about 200 feet below land surface. This perching zone includes silt, clay, sand, cinders, and gravel, and appears to be laterally continuous in the vicinity of the Test Reactor Area.

Water levels in the deep perched monitoring wells and the areal extent of the deep perched groundwater have fluctuated in response to the volume of water discharged to the surface ponds. During March 1991, the areal extent of the deep perched groundwater was about 6,000 by 3,000 feet (see Figure 4). The volume of deep perched groundwater was calculated to be approximately 1.4 billion gallons at these dimensions.

5.1.3 Snake River Plain Aquifer

The eastern portion of the Snake River Plain Aquifer extends from Ashton, Idaho, on the northeast to Hagerman, Idaho, on the southwest. The aquifer occurs within a series of basalt flows with interbedded sedimentary deposits. Recharge to the aquifer is primarily due to valley underflow from the mountains to the north and northeast of the plain, and from infiltration of irrigation water. Recharge to the aquifer within the INEL boundaries is primarily due to underflow from the northeastern portion of the plain and from the Big Lost River.

Site-wide water-level data show that the general direction of groundwater flow across the INEL is toward the south-southwest at an average gradient of about 4 ft/mi. The depth to the water table varies from about 200 feet below the surface in the northern portion of the INEL to about 900 feet below the surface in the southern portion. At the Test Reactor Area, the depth to groundwater is at approximately 480 feet and the gradient is about 2 ft/mi.

Aquifer permeability is controlled primarily by fractures, fissures, and voids along the upper and lower contacts of basalt flows, large interstitial voids, and intergranular pore spaces. Based on site-specific data, the average groundwater flow velocity at the Test Reactor Area was estimated to be 4.3 feet per day.

5.2 Nature and Extent of Contamination

All available data were used to evaluate the nature and extent of groundwater contamination for the Perched Water System Remedial Investigation. In addition to the data collected by the USGS from 1949 to 1990, groundwater was sampled between January and March, 1991 for a comprehensive water quality evaluation specifically for this investigation. The purpose of this sampling effort was to analyze for additional parameters not routinely monitored by USGS. USGS monitoring parameters have included nitrate, chloride, pH, specific conductivity, sodium, hexavalent chromium, total and dissolved chromium, chromium-51, tritium, cobalt-60, cesium-137, and strontium-90. Groundwater samples were collected from the existing monitoring wells and production wells including six shallow perched wells, 22 deep perched wells, and 11 Snake River Plain Aquifer wells. The location of the shallow perched, deep perched, and Snake River Plain Aquifer wells sampled for this investigation are identified on Figures 5 through 7.

Samples were analyzed in 1991 for volatile organics, acrylonitrile,

semivolatile organics, pesticides, metals, hexavalent chromium, and radionuclides. In addition, samples were analyzed for field parameters of specific conductivity, pH, and temperature. Laboratory analyses were performed for the water quality parameters: alkalinity, fluoride, total dissolved solids, nitrate, nitrite, phosphate, chloride, silica, and sulfate. Results of the 1991groundwater sample analysis are discussed below and summarized in Tables 2 and 3. As a point of comparison, concentrations observed in the Perched Water System were compared to primary or secondary maximum contaminant levels (MCL) and site-specific background. A primary MCL is the concentration of a constituent allowed in a public drinking water system determined under the Safe Drinking Water Act. A secondary MCL pertains to control of contaminants in drinking water that primarily affect aesthetic qualities. Table 4 summarizes the drinking water standards and background concentrations for inorganics, organics and radionuclides.

5.2.1 Shallow Perched Zone

Organics

Volatile organic compounds detected above the quantitation limit in shallow wells near the cold waste pond include low concentrations of toluene, xylene, and various derivatives of benzene, which are common constituents of hydrocarbon fuels. Trace volatile organics were also detected in wells beneath the chemical waste pond. Of the semivolatile organic compounds analyzed, low concentrations of bis(2-ethylhexyl)phthalate appear to be the most prevalent and were detected in shallow wells beneath the retention basin and the cold waste pond.

Inorganics

Mercury, manganese, and iron were the only metals detected which exceeded MCLs in the filtered samples of shallow perched groundwater. Results of metals analyses on unfiltered samples collected from shallow perched zone wells indicated that several metals exceeded their MCLs. These metals included cadmium, chromium, lead, manganese, and mercury.

Radionuclides

Several radionuclides were detected in Wells SB-01, SB-02, and SB04 located near the retention basin. The radionuclides detected above MCLs include cobalt-60, cesium-137, americium-241, tritium, and strontium-90.

5.2.2 Deep Perched Groundwater Zone

Organics

Volatile organic compounds detected above the quantitation limit in the deep perched water included chloroform, methylene chloride, toluene, benzene, and 1,1,1-trichloroethane. Of the semivolatile organic compounds detected, low concentrations of bis(2-ethylhexyl)phthalate were the most widespread. No pesticides were detected in the deep perched groundwater.

Inorganics

Concentrations of cadmium, chromium, and manganese in the filtered samples collected in the deep perched wells were above MCLs. Cadmium concentrations exceeded the MCL of 10 ug/L in the filtered water sample from one well. Filtered groundwater samples from four wells near the chemical waste disposal pond exceeded the MCL for manganese. Fluoride, sulfate, and phosphate were detected at elevated concentrations in the deep Perched Water System.

Chromium is the most frequently detected metal in the deep perched zone. Chromium concentrations were detected up to 1125 ug/L which is well above the MCL of 50 ug/L. The highest concentrations of chromium occur in the north central portion of the deep perched groundwater zone, north of the warm waste pond.

Radionuclides

Of the radionuclides analyzed, tritium and strontium-90 were detected above the MCL of 20,000 pCi/L (picocuries per liter) and 8 pCi/L, respectively. These radionuclides appear to be the most widespread of all contaminants in the deep perched groundwater. This is likely caused by the continuing discharge of the warm waste stream to the warm waste pond. The concentration of tritium in the deep perched groundwater ranged from below detection limits to752,000 pCi/L (1990 USGS monitoring data); strontium-90 concentrations ranged from below detection limits to 124 pCi/L. These concentrations are approximately one order of magnitude less than those in the shallow perched groundwater near the retention basin, indicating dilution from the cold waste pond discharge and attenuation in the soil column.

5.2.3 Snake River Plain Aquifer

Organics

Groundwater samples were collected from 11 Snake River Plain Aquifer wells during the 1991 sampling activities. Trace levels of volatile organic compounds were detected in groundwater samples from the aquifer wells at estimated concentrations less than 1 ug/l. Phthalates were the only semivolatile organic compounds detected. The presence of phthalates is not likely to be the result of site activities because phthalates typically occur in plastics and are also common laboratory contaminants. No pesticides were detected. Of the volatile and semivolatile organics detected, none were detected above MCLs.

Inorganics

Chromium was the only metal detected in groundwater samples from the Snake River Plain Aquifer which exceeded MCLs. Since 1968, the concentration of total chromium in samples from down-gradient Well USGS-65 has generally declined from about 750 ug/l to current levels of about 179 ug/l. This decline is anticipated to continue because chromium has not been disposed at the Test Reactor Area since 1972.

Radionuclides

Tritium was the only radionuclide detected above natural background levels or MCLs. Since 1970, the concentration of tritium in samples from Well USGS -65 has generally declined from about 220,000 pCi/L to current levels of about 61,000 pCi/L. This decline will likely continue once the new linedevaporation ponds for warm waste disposal are operational, and the tritium source is eliminated. The tritium concentrations in down-gradient Well USGS-76 have remained less than the MCL since 1965.

5.2 Groundwater Model

A computer model was developed using both historic and recent information concerning groundwater flow and contamination in the Perched Water System and in the underlying Snake River Plain Aquifer in the vicinity of the Test Reactor Area. The computer model predicted concentrations from the present

through a point in time 125 years in the future. These predicted concentrations were then used in the risk assessment calculations. Development of the model began with identification of the assumptions on which the model is based. The assumptions are based on existing knowledge of groundwater flow in the vicinity of the Test Reactor Area. A comparison of modeling results was made with historical data to ensure that it represented groundwater flow in the Perched Water System in order to provide confidence in the useability of the model for predictions.

Among the assumptions on which the model is based are: 1) the Warm Waste Pond, as the major source of contamination, will be removed from service within one year. This assumption is based on the fact that construction of a new lined replacement pond has already begun, and; 2) The Cold Waste Pond will remain in service at least through the year 2007. This is based on the expected operational lifetime of the Test Reactor Area which would then be followed by a 10-year decommissioning period through the year 2017.

6. SUMMARY OF SITE RISKS

Trends simulated by the model are shown in Figures 8 through 10 for several key contaminants in the Snake River Plain Aquifer. In addition to chromium and tritium, which currently exceed MCLs, the only other contaminant predicted by the model to exceed its MCL in the Snake River Plain Aquifer is cadmium.

The risk assessment for the Perched Water System considered both human health and ecological risks. The human health risk assessment included calculations of risk for future (in year 2115) and near-term receptors. The risk assessments were conducted in accordance with the EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (EPA 1989b) and Volume II: Environmental Assessment Manual (EPA 1989f) and other EPA national guidance. The risk assessment methods and results are summarized in the following sections.

6.1 Human Health Risk Assessment

The risk assessment consisted of contaminant identification, exposure assessment, toxicity assessment, and human health risk characterization. The objective of the contaminant screening was to identify chemicals based on concentration and toxicity, that are most likely to contribute significantly to risks. The exposure assessment detailed the exposure pathways that exist at the site for various receptors. The toxicity assessment documented the adverse effects that may be caused in a receptor as a result of exposure to a site contaminant.

The human health risk assessment evaluated potential risks associated with exposure to chemical contaminants present in the Snake River Plain Aquifer due to infiltration of contaminants from the Perched Water System. Both carcinogenic and non-carcinogenic risks were evaluated. The health risk evaluation used both the exposure concentrations and the toxicity data to determine a hazard index for potential noncarcinogenic effects and a cancer risk level for potential carcinogenic contaminants. In general, a hazard index of less than 1 indicates that even the most sensitive population is not likely to experience adverse health effects. The excess cancer risk level isthe increase in the probability of contracting cancer. The NCP acceptable risk range is 1 in 10,000 to 1 in 1,000,000. An excess lifetime cancer risk of 1 in 10,000 (10[-4]) indicates that an individual has up to a one chance in ten thousand of developing cancer over a lifetime of exposure to a site-related contaminant.

Key steps taken in the risk assessment process are summarized in Sections

6.1.1 through 6.1.5.

6.1.1 Identification of Contaminants of Concern

Potential contaminants of concern are those that are released to the environment at a site that may pose a health risk to humans who come into contact with them. A contaminant screening process was completed for the Perched Water System to reduce the number of chemicals carried through the computer model and quantitative risk assessment, and focus on those contaminants that contribute significantly to the overall risk. The first step in contaminant identification was to compare analytical results for each chemical from the Perched Water System investigation to the background concentration for that chemical. Background concentrations were derived by calculating the arithmetic mean concentration for each chemical from the analytical data from production wells TRA-03 and TRA-04 and the Site 19 well. These wells are upgradient from the shallow and deep perched zone and are unaffected by contamination from the Perched Water System. The next screening step was to consider the half-life and concentration of detected radionuclides. Radionuclides with a half-life of less than 5-years were eliminated at this step because they decay rapidly. Next, an evaluation of the concentration, toxicity and mobility of each contaminant was completed to determine the contribution of each contaminant to the total risk. Contaminants that represented a small percentage of the risk were eliminated (less than 1 percent). Although chromium, tritium, and strontium90 represent less than 1 percent of the site risk, these contaminants were retained because of the historical association with the facility. Table 5 lists the contaminants of concern that were included in the risk assessment.

6.1.2 Exposure Assessment

Exposed Populations

Only exposure pathways deemed to be complete (i.e., where a plausible route of exposure can be demonstrated from the site to a receptor) were quantitatively evaluated in the risk assessment. The populations at risk due to exposure to the perched water were identified by considering both current and future use scenarios.

Currently, public access to the Test Reactor Area is restricted so public exposure to the perched water is not likely. Exposure to contaminants in the Perched Water System by site employees is also unlikely, as the Perched Water System is approximately 50 to 150 feet below the ground surface and is not used. The potential exposure to contaminants in the perched water during environmental sampling is addressed separately by health and safety documentation for each individual activity. The potential for current exposure to contaminants in the Perched Water System was judged to be low and risks associated with current exposure scenarios were not evaluated. Production wells at the TRA from which workers obtain drinking water from the Snake River Plain Aquifer are upgradient of the contamination and are monitored regularly to ensure that they produce clean water.

Future contact with the Perched Water System is unlikely because the Perched Water System is predicted to dissipate within about 7 years of ceasing disposal of wastewater to the ponds at the Test Reactor Area according to the modeling results. Future exposure resulting from the migration of contaminants from the Perched Water System to the Snake River Plain Aquifer was evaluated for a hypothetical resident living on the site.

An agricultural scenario was determined to be the most probable scenario for future use at the Test Reactor Area. The exposed population would consist of site resident farmers, including both adults and children. For the

purpose of the risk assessment, onsite residence with agricultural land use was assumed to occur 125 years in the future based on planned operations at the Test Reactor Area. This period was selected based on an expected 25 years of operation and decommissioning followed by 100 years of institutional controls.

Exposure Pathways

The exposure pathways identified for the future resident farmer scenario consist of:

- Ingestion of groundwater from domestic wells in the Snake River Plain Aquifer
- Ingestion of garden grown fruits and vegetables irrigated with Snake River Plain Aquifer water
- Ingestion of domestically grown livestock.

Exposure Point Concentrations

Chemical concentrations at points where the potential for human exposure is expected to occur are necessary to evaluate the chemical intake of potentially exposed individuals. Exposure pathways from the source to receptors were evaluated using a groundwater transport computer model. The results of the computer modeling are expressed as predicted concentrations in drinking water from the Snake River Plain Aquifer. The concentrations predicted by the model which were used in the risk assessment are shown on Table 6. Groundwater transport modeling was used to estimate future concentrations of the chemicals of concern in the Snake River Plain Aquifer. These concentrations are considered reasonable maximum concentrations because the highest model-predicted concentrations in the Snake River Plain Aquifer were selected for the risk assessment exposure concentrations. This is generally directly below the perched zone in the upper part of the Snake River Plain Aquifer before any dilution in the aquifer would occur.

Exposure to contaminants of concern from the Perched Water System could result from ingestion of crops irrigated with contaminated water pumped from the Snake River Plain Aquifer. The potential exists for contaminants to accumulate in surface soils as a result of irrigation and may be available for plant uptake. The concentration of contaminants in onsite soils as a result of irrigation with contaminated water was calculated in the Risk Assessment by applying recommended methods in Risk Assessment Guidance for Superfund. Human Health Evaluation Manual Part A. Interim Final (EPA, 1989a).

Contaminant concentrations in crops were assessed by estimating uptake and accumulation through roots from the soil. Separate calculations were performed for vegetative (leaf and root) and reproductive (fruit and seed) portions of crops.

Chemical Intake by Exposure Pathway

Chemical intakes for each exposure pathway were based on the exposure point concentrations calculated from the modeled concentrations in the Snake River Plain Aquifer directly below the Test Reactor Area and other exposure parameters, such as water ingestion rates, crop and livestock ingestion rates, body weights, and exposure frequency and durations recommended in the risk assessment guidance.

There are multiple conservative or upper bound assumptions in the health

risk characterization for the Perched Water System:

- An individual consumes all drinking water from an onsite well
- An individual derives a reasonable maximum amount of hisdiet from onsite sources
- An individual lives for 30 years at or near the site (90 percent of time spent in one house)
- An individual has continuous, daily exposure to constituents detected at the site
- Cancer risks are linearly related to exposure (i.e., carcinogenic effects have no thresholds)
- Contaminant concentrations remain constant over the exposure period
- Exposure remains constant over time
- Risks are additive
- All intake of contaminants is from the exposure medium being evaluated.

6.1.3 Toxicity Assessment

The toxicity assessment addresses the potential for a chemical to cause adverse effects in exposed populations and estimates the relationship between extent of exposure and extent of toxic injury (i.e., dose-response relationship). Qualitative and quantitative toxicity information for the contaminants was acquired through evaluation of relevant scientific literature (e.g., Health Effects Assessment Summary Tables, EPA 1991). The most directly relevant data came from human studies. Most of the useable information on the toxic effects of chemicals came from controlled animal experiments.

6.1.4 Risk Characterization

Risk characterization is the process of combining the results of the exposure and toxicity assessments. This process provides numerical quantification relative to the existence and magnitude of potential public health concerns related to contamination detected at the site. A summary of the calculated future carcinogenic and non-carcinogenic risk estimates is presented in Tables 7 through 10.

Risk calculations are divided into carcinogenic and noncarcinogenic categories. The calculation of health risks from potential exposure to carcinogenic compounds involves the multiplication of cancer slope factors for each carcinogen and the estimated intake values for that chemical.

Noncarcinogenic risk is assessed by comparison of the estimated daily intake of a contaminant to its applicable Reference Dose. A Reference Dose is a provisional estimate of the daily exposure to the human population that is likely to be without an appreciable risk of deleterious effects during a portion of the lifetime. The estimated daily intake of each chemical by an individual route of exposure is divided by its Reference Dose and the resulting quotients are calculated to provide a hazard index.

Future Risk

Lifetime cancer risks from potential exposure to each carcinogenic contaminant were added across all of the exposure pathways. Cancer risks from the different routes of exposure were assumed to be additive, as recommended by EPA guidance. It should be noted that adding cancer risks from different exposure routes provides health-protective risk estimates. The excess cancer risk to the future (year 2115) onsite residential farmer is shown in Tables 7 and 8. This risk (5.6 x 10[-9]) is dominated by the ingestion of cobalt-60 through the drinking water pathway, but is well below the acceptable 10[-4] to 10[-6] risk range.

The potential future exposure to non-carcinogenic contaminants falls below the individual Reference Doses for each contaminant of concern. Noncarcinogenic hazard indices are presented in Tables 9 and 10 for child and adult exposures, respectively. The non-carcinogenic constituent at the site that poses the greatest potential for adverse health effects at year 2115 iscadmium (HI=0.17). These results suggest that chronic exposure to modeled concentrations of contaminants in the Snake River Plain Aquifer are unlikely to represent significant non-carcinogenic health effects to humans.

Near-Term Risk

In addition to the risk calculations, contaminant concentrations were compared to MCLs for both the Perched Water System and the Snake River Plain Aquifer. Concentrations for several contaminants currently exceed these levels in the Perched Water System. However, there is no risk associated with these contaminants because there is no current use of the Perched Water System itself. Although tritium and chromium exceed MCLs in the aquifer, there is also no current use of the contaminated water in the Snake River Plain Aquifer beneath the Test Reactor Area. The closing of the warm waste pond, scheduled for 1993, will eliminate future discharge of tritium to the Perched Water System, and therefore the concentrations of tritium (with a half-life of 12.5 years) in the Snake River Plain Aquifer will decrease due to radioactive decay. The computer model predicts the concentration of tritium will meet its MCL during the year 2004 (See Figure 9). Concentrations of chromium in the Snake River Plain Aquifer have declined since 1972 when discharge of chromium to the warm waste pond ceased. Chromium is predicted to meet its MCL by the year 2016. The model also predicted that cadmium would exceed its MCL in the late 1970s and would again drop below the MCL by 2027 (See Figure 10). Cadmium levels have never been observed above the MCL in water samples collected from Snake River Plain Aquifer wells at the TRA. Therefore, the model is considered to be conservative for cadmium and it is not certain that the cadmium MCL will be exceeded. For several contaminants of concern, including cadmium, the model used the average concentration in the shallow perched water for contaminant input to the system because there was limited data on the amount of the contaminantsthat had been released through time. This input concentration was then assumed to remain constant throughout the life of the TRA facility which is unlikely since the Warm Waste pond will be eliminated as a source of contamination in the next year.

Near-Term Human Health Risk Assessment

Due to the uncertainty of future land use at the INEL and the fact that MCLs are currently exceeded in the Snake River Plain Aquifer, the computer groundwater modeling results were used to evaluate near-term risks. This evaluation was completed to provide an estimate of the risk posed by the contaminants that currently exceed, or are predicted to exceed, MCLs in the Snake River Plain Aquifer (chromium, tritium, and cadmium). This assessment evaluated ingestion of contaminated groundwater for chromium, tritium, and cadmium and vapor inhalation for a residential adult receptor for several periods in the future.

Groundwater model results were used to calculate exposure concentrations for five 30-year periods. The scenarios include years 1990 to 2020, 1995 to 2025, 2000 to 2030, 2005 to 2035, and 2010 to 2040. Average concentrations for each thirty-year period are shown on Table 11.

The lifetime excess cancer risk due to tritium under the 1990 to 2020 scenario is estimated to be 3 x 10[-4]. This calculated risk then decreases with time and falls well below one chance in 10,000 which is within the acceptable target risk range for later years. Table 12 summarizes the results from the near-term risk assessment for tritium.

The hazard quotients for chromium and cadmium were calculated for the five 30-year exposure scenarios. For the 1990 to 2020 time period, the hazard quotient for chromium and cadmium were estimated to be 0.6 and 1.3, respectively. The hazard quotient for cadmium is one or below thereafter. These results are summarized in Table 13.

6.1.5 Uncertainty

Risk assessments are subject to uncertainty from sampling and analysis, fate and transport estimation, exposure estimation, and toxicological data. Uncertainty was addressed by using health-protective assumptions that systematically overstate the magnitude of health risks. This process bounds the plausible upper limits of risk and facilitates an informed risk management decision. The following is a summary of risk assessment uncertainties:

- Uncertainty associated with sampling and analysis includes the inherent variability (standard error) in the analysis, representativeness of the samples, sampling errors, and heterogeneity of the sample matrix. While the quality assurance/quality control used in the investigation serves to reduce such errors, it cannot eliminate all errors associated with sampling and analysis. The samples were analyzed using EPA-approved analytical methods. These data were evaluated by the agencies to ensure they were representative of the area of investigation.

- Sources of uncertainty arising from the fate and transport modeling include the contaminant concentration in the effluent waste stream, the impact of mixing in the shallow perched water zone, and uncertainty of assumed adsorption coefficient values for each contaminant. Additional parameters that were most sensitive include the infiltration rate of wastewater and the saturated hydraulic conductivity of the lower interbed at about 150 ft. The model was most sensitive to the values for contaminant attenuation and the concentration used for infiltrating wastewater. The hydraulic conductivity of some model layers was also found to be a sensitive parameter.

  An example of the sensitivity of the infiltrationparameter is illustrated by the concentrations for cadmium. The modeled concentration for cadmium, as well as other contaminants of concern, is probably higher than what will actually occur in the Snake River Plain Aquifer. This is attributed to the higher than normal infiltration (recharge) rate used in the model. The infiltration rate used in the model was 15 cm/yr. A more realistic value is 1.5 to 5 cm/yr. Thus, the modeled cadmium concentration of 15 ug/L at approximately 2010 is probably an overestimate and adds to the conservatism of the risk assessment. The projected concentration for cadmium may not exceed the Federal Drinking Water Standard of 5 ug/L.

- Because concentrations of contaminants vary over time and the calculated risks are representative of modeled concentrations at only one point in time, this temporal variation is another source of uncertainty.

- The toxicological database is also a source of uncertainty. The EPA outlined some of the sources of uncertainty in its Guidelines for Carcinogen Risk Assessment, (EPA 1986). They include extrapolation from high to low doses and from animals to humans; species differences in uptake, metabolism, and organ distribution; species differences in target site susceptibility; and human population variability with respect to diet, environment, activity patterns, and cultural factors.

6.2 Ecological Risk Assessment

The ecological risk assessment qualitatively evaluated the potential ecological effects associated with the presence of the Perched Water System. This ecological evaluation follows the Risk Assessment Guidance for Superfund Volume II (EPA 1989b). The evaluation focused on the same contaminantsand receptor locations as those evaluated in the human health assessment. Objectives of the ecological risk assessment are to qualitatively evaluate the potential risk to ecological receptors from the contaminants in the Perched Water System. The assessment identified sensitive nonhuman species and characterizes potential exposure pathways including ingestion of contaminated groundwater or vegetation, and contaminant uptake by plants. Similar to the human health risk assessment, no credible current use exposure scenario exists. The future use exposure scenario included using contaminated groundwater for irrigation, with contaminants entering the food chain which could result in potentially complete exposure pathways throughout the ecological system.

The approach used in the ecological risk assessment is consistent with EPA guidance for evaluating ecological risk. The steps included identification of contaminants, assessment of potential exposure pathways, and characterization of threats to exposed biota.

6.2.1 Exposure Assessment

Table 5 lists the contaminants of concern identified in the Perched Water System. The ecological scenarios assume that wildlife would inhabit the site. This assessment was limited to exposure due to contamination of the Perched Water System. Consequently, migration of the contaminated perched groundwater to a potential exposure point via some pathway was considered to be a prerequisite to exposure.

For an ecological risk to exist, there must be a complete pathway for the contaminant to reach an ecological receptor. Either a receptor would need to reach the Perched Water System or the contaminated water would need to get to the surface. The Perched Water System does not recharge any local surface water, and no evidence of any resurfacing exists at the site.

Although some of the animals at the site are burrowing mammals,burrowing activity is usually limited to a few feet below the surface. Therefore, contact with the Perched Water System is not likely. While sagebrush has a deep root system (up to 99 in.), it is not likely to reach the perched water. Some of the trees could have a root system deep enough to penetrate to the shallow Perched Water System; however, the nearest trees are 1 mile from the site and not in the plume area. Therefore, no complete exposure pathway exists between the contaminants and ecological receptors under the current land use scenario.

Similar to the human risk assessment, the ecological risk assessment considered a future land use scenario that includes pumping contaminated water from the Snake River Plain Aquifer onto the surface for agricultural irrigation purposes. Contaminants then enter the food chain resulting in potentially complete exposure pathways throughout the ecological system.

6.2.2 Risk Characterization

Although ecological receptors are currently present on the site, contact with contaminants of concern is not possible under current site conditions. The depth to the Perched Water System and the absence of any resurfacing phenomena prevents contact with the contaminants of concern. Because no complete exposure pathways are identified in the present scenario, the contaminants of concern do not appear to pose a potential ecological risk.

Under a future scenario, it is plausible that ecological receptors could come into contact with contaminants currently in the Perched Water System as these contaminants migrate to the Snake River Plain Aquifer. This water then is pumped to the surface for agricultural use. The water used for agricultural purposes may provide a source of contact to ecological receptors for ingestion. Dermal contact with water and soil is also possible as chemicals are deposited onto soil as a result of irrigation. In addition, plants can cache some of the chemicals of concern, and transfers between trophic levels are possible for some of the chemicals with longer biological half-lives. However, given the concentration of the contaminants of concern, unacceptable risk to ecological receptors is not judged to be likely.

7. DESCRIPTION OF NO ACTION DECISION

Based on results of the human health and ecological risks assessments, the contaminants of concern do not pose unacceptable risks to human health or the environment for the future use scenarios evaluated for the Snake River Plain Aquifer beneath the Test Reactor Area. Therefore, no remedial action is necessary for the Perched Water System OU at the Test Reactor Area. Because this conclusion is based on predictive computer modeling, water quality monitoring activities will be conducted to: (1) evaluate the contaminant concentration trends in the Snake River Plain Aquifer, and (2) evaluate the effect of discontinued discharge to the warm waste pond and fate of contaminants in the Perched Water System.

A groundwater monitoring plan will be developed with the approval of EPA and IDHW. The plan will be a primary document as defined in the FFA/CO and will be submitted for agency review 45 days after signature of this Record of Decision. The plan will define the wells that will be monitored, parameters that will be monitored, frequency of monitoring, reporting requirements and criteria for future decisions. Monitoring data will be made available in the information repositories.

As stated previously in the Declaration Statement, a 3-year statutory review of the No Action decision will be conducted to ensure that human health and the environment are being protected and that the assumptions upon which the No Action decision was based are still valid. Should the three-year review or post-ROD monitoring or a change in any assumptions used to arrive at the decision indicate that other actions or modifications of the No Action response are required, these will be initiated by the agencies, as appropriate, and in accordance with the FFA/CO.

In addition, it should be noted, as discussed in Section 4, that the WAG 2 Comprehensive RI/FS will evaluate risk from the perspective of the entire

TRA facility.

8. EXPLANATION OF SIGNIFICANT CHANGES

There are no significant changes between the recommendations presented in the Proposed Plan and this Record of Decision.

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Orr, B.R., L.D. Cecil, and L.L. Knobel, 1991, Background Concentrations of Selected Radionuclides, Organic Compounds, and Chemical Constituents in the Ground Water in the Vicinity of the Idaho National Engineering Laboratory, USGS Water-Resources Investigations Report 91-4015.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/31/1992
Operable Unit: 09
ROD ID: EPA/ROD/R10-93/058

Media: None

Contaminant: None

Abstract: The USDOE Idaho National Engineering Laboratory (Operable Unit 9), is part of the 890-square mile U.S. Department of Energy (USDOE) facility, located in Idaho Falls, Idaho. The primary mission of the Idaho National Engineering Laboratory (INEL) is nuclear reactor technology development and waste management. Land use in the area is predominantly industrial, with some restricted agricultural and recreational uses. The site is contained within the northeastern portion of the Eastern Snake River Plain (ESRP) and borders a floodplain to the west and north, and overlies the Snake River Plain Aquifer, which is a sole-source aquifer. The site, also known as the Central Facilities Area (CFA) Motor Pool Pond, is an administrative and support area that includes security facilities, environmental chemistry laboratories, a motor pool and maintenance shop, a general warehouse, and other support facilities. From 1951 until 1985, the site's CFA Motor Pool Pond received wastes from two sumps that collected wastewater from the washing of fleet vehicles and from roof downspouts. During the 35year service life of the Motor Pool Pond, an estimated 15,900 liters of wastewater, containing metals and organic compounds associated with road dust, oil, grease, and some residual radioactive contamination, per day were discharged into the pond. In late 1985, the waste was diverted through an oil/water separator to a sanitary sewer line connected to the Sewage Treatment Plant, and onsite discharge to the CFA Motor Pool Pond ceased. Studies conducted in 1982, 1988, and 1989 by USDOE

indicated that the CFA Motor Pool Pond sediment and soil were contaminated with VOCs, other organics, metals, and radionuclides. Radiological surveys conducted in 1991 indicated only background levels of radiation. Previous 1992 RODs addressed sediment at the Warm Waste Pond, ordnance and contaminated soil, contaminated ground water at the Technical Support Facility, and contaminated sediment and sludge in the evaporation pond, discharge pipe, and waste sump as OUs 5, 23, 2, and 22, respectively. This ROD addresses the CFA Motor Pool Pond, including the excavated soil and sediment along the ditch, in the ditch, at the discharge pipe outlet, and in the pond, as OU9. Other 1993 RODs addresses the Perched Water System, the CFA Motor Pool Pond and Pit 9 of the Subsurface Disposal Area, as OUs 4, 9, and 18 respectively. Future RODs will address any impacts from past releases to the pond that may affect the subsurface or ground water. Based upon the results of the RI and risk management considerations, therefore, there are no contaminants of concern affecting this site. SELECTED REMEDIAL ACTION: The selected remedial action for this site is no further action because risk data obtained during the RI indicate that the contaminated sediment within the CFA Motor Pool Pond poses no unacceptable risk to human health and the environment. There are no present worth or O&M costs associated with this no action remedy. PERFORMANCE STANDARDS OR GOALS: Not applicable. INSTITUTIONAL CONTROLS: Not applicable.

Remedy: The DOE has determined that no further remedial action is necessary at the CFA Motor Pool Pond to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which indicate that conditions at the site pose no unacceptable risk to human health or the environment. The EPA has approved the DOE decision; the IDHW concurs.

Text: Full-text ROD document follows on next page.

Text:
Record of Decision

Central Facilities Area Motor Pool Pond

Operable Unit 4-11
Waste Area Group 4

Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Central Facilities Area Motor Pool Pond
Operable Unit 4-11
Waste Area Group 4
Idaho National Engineering Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

This decision document presents the remedial action selected for the Central Facilities Area Motor Pool Pond at the Idaho National Engineering Laboratory (INEL), Operable Unit 4-11. This alternative was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision is based on the information in the site Administrative Record, which is located in the INEL Technical Library, Idaho Falls, Idaho.

The lead agency in this decision is the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare (IDHW) have participated in the scoping of the site investigations and the evaluation of remedial investigation data. The IDHW concurs with the selected remedy.

Description of the Selected Remedy

The DOE has determined that no further remedial action is necessary at the CFA Motor Pool Pond to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which indicate that conditions at the site pose no unacceptable risk to human health or the environment. The EPA has approved the DOE decision; the IDHW concurs.

Declaration

It has been determined that no remedial action is necessary at this operable unit to ensure protection of human health and the environment. This determination is based on the results of the site-specific risk assessment/however, a risk assessment using default exposure factors indicates that hazardous substances may remain on the site above health-based levels. Therefore, five-year reviews will be conducted to confirm the assumptions used to arrive at the no remedial action decision.

Signature sheet for the foregoing Record of Decision for Operable Unit 4-11 at the Idaho National Engineering Laboratory by the United States Department

of Energy and approved by the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit consists of the Central Facilities Area Motor Pool Pond at the Idaho National Engineering Laboratory.

Signature sheet for the foregoing Record of Decision for Operable Unit 4-11 at the Idaho National Engineering Laboratory by the United States Department of Energy and approved by the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit consists of the Central Facilities Area Motor Pool Pond at the Idaho National Engineering Laboratory.

Signature sheet for the foregoing Record of Decision for Operable Unit 4-11 at the Idaho National Engineering Laboratory by the United States Department of Energy and approved by the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit consists of the Central Facilities Area Motor Pool Pond at the Idaho National Engineering Laboratory.

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ARAR Applicable or Relevant and Appropriate Requirement

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CFA Central Facilities Area

COCA	Consent Order and Compliance Agreement
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
mg/kg	Milligrams per kilogram
ug/kg	Micrograms per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan)
NPL	National Priorities List
OU	Operable Unit
PCB	Polychlorinated biphenyl
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RfD	Reference dose
ROD	Record of Decision
UCL	Upper confidence limit
VOC	Volatile Organic Compound
WAG	Waste Area Group

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a U.S. Department of Energy facility that encompasses approximately 2,305 square kilometers (890 square miles) in southeastern Idaho (see Figure 1). The population centers closest to the INEL Central Facilities Area (CFA) include Atomic City (11 mi southeast), Arco (18 mi west), Howe (15 mi north), Mud Lake (32 mi northeast), and Terreton (34 mi northeast). The nearest large population center is Idaho Falls (population 46,000), located approximately 48 km (32 mi) to the east. The INEL is currently classified for industrial and mixed use by the Bureau of Land Management, and has been designated as a National Environmental Research Park.

The INEL is located in the northeastern portion of the Eastern Snake River Plain (ESRP) in southeastern Idaho. The ESRP is a volcanic plateau consisting of a series of basaltic lava flows with sedimentary interbeds. The topography of the INEL is generally flat to gently rolling, with elevations ranging from 1,585 m (5,200 ft) in the northeast to 1,450 m (4,750 ft) in the southwest. In the vicinity of CFA, the topography is flat, with the Big Lost River floodplain lying to the west and north and gently rolling basalt plains to thesouth and east. Elevations range from 1,500 m (4,920 ft) to 1,510 m (4,960 ft). Soils in the vicinity of CFA are thin and poorly developed, overlying alluvial deposits of sand, silt, and gravel.

The Snake River Plain Aquifer underlies the INEL and has been designated as a sole source aquifer pursuant to the Safe Drinking Water Act. The depth to the aquifer varies from 61 m (200 ft) in the northern portion of the INEL to 270 m (900 ft) in the southern portion; the depth to the aquifer in the CFA area is approximately 146 m (480 ft). Groundwater in this aquifer generally flows to the southwest.

The Central Facilities Area is located in the south central portion of the INEL near the intersection of U.S. Highways 20 and 26. The CFA is an administrative and support area that includes security facilities, environmental chemistry laboratories, a motor pool and maintenance shop, a general warehouse, and other support facilities.

The CFA Motor Pool Pond is located in an abandoned gravel pit approximately 366 m (1,200 ft) east of the CFA Equipment Yard (Figure 2). A small pond, approximately 36 by 18 m (120 by 60 ft), formed in the low spot when wastes were being discharged. Currently, the pond is typically dry; however, runoff may temporarily accumulate in the pond after storm events and during spring thaws. Waste water discharged to the pond originated at the CFA Service Station (Building CF-664). A 20-cm (8-in.) diameter concrete pipe extends southeast from the Service Station approximately 322 m (1,056 ft) and discharges to a ditch. The ditch extends approximately 68 m (225 ft) to an abandoned gravel pit and then continues for an additional 99 m (325 ft) to a low spot along the south side of the pit. The ditch ranges from 1 m (3 ft) deep at the pipe outlet to approximately 2 m (6 ft) deep near the pond inlet. The bottom ofthe ditch is 1 to 2 m (3 to 6 ft) wide. Sediments excavated from the ditch were placed along the north side of the ditch. This material was apparently removed to improve the flow of wastewater through the ditch. The remedial investigation (RI) focused on the characterization of soils and surficial sediments within this unlined pond and drainage ditch.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Enforcement Activities

Under the INEL Consent Order and Compliance Agreement (COCA) signed by the DOE, U.S. Environmental Protection Agency (EPA), and U.S. Geological Survey in July 1987, the Motor Pool Pond was classified as a Land Disposal Unit and was listed as COCA Unit CFA-05. The release of contaminants to the CFA Motor Pool Pond was first identified and evaluated during investigations conducted in accordance with the COCA.

On July 14, 1989, the INEL was proposed for inclusion on the National Priorities List (NPL) in 54 Federal Register (FR) 29820. The listing was proposed by the EPA under the authority granted by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986. The final rule that placed the INEL on the NPL was published in November 1989 in 54 FR 44184.

In December 1991, the DOE, EPA, and IDHW signed the Federal Facility Agreement and Consent Order (FFA/CO). The FFA/CO supersedes the COCA and provides enforceable schedules and strategies for implementation of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at the INEL.

2.2 Site History and Investigations

From 1951 until 1985, the CFA Motor Pool Pond received wastes from two sumps located at the CFA Service Station (CFA 664 - See Figure 2). Oneof the sumps is located in the Bus Wash Bay and collected wastes from bus washes and floor drains in the adjacent Service Bay. The Service Bay was used to perform routine servicing of fleet vehicles. The second sump is located outside the station and collected wastes from the Steam Cleaning Bay and water from roof downspouts. In late 1985, the wastes were diverted through an oil/water separator to a sanitary sewer line connected to the Sewage Treatment Plant, and discharge to the Motor Pool Pond ceased.

During the 35-year service life of the Motor Pool Pond, the waste stream mainly consisted of wastewater from washing vehicles. According to Service Station personnel, the waste volumes were highest between 1978 and 1985, when automatic washing systems were in place at the Service Station. The automatic systems enabled washing of up to 30 buses and 10 cars and trucks per day. These washes are estimated to have generated up to 15,900 L (4,200 gal) of wastewater per day that were discharged to the pond.

The wastes from vehicle washes can be assumed to have contained metals and organic compounds associated with road dust, oil, and grease. Although the Service Station was not used to decontaminate radioactively contaminated vehicles, some residual radioactive contamination may have been removed during routine washes. This may have occurred because this residual contamination was not detected by hand-held instruments that are used to check vehicles leaving radioactively contaminated areas.

The CFA Motor Pool Pond was sampled as part of an INEL-wide preliminary assessment of waste streams conducted in 1982 and 1983. One surface water sample and one surface soil/sediment sample were collected from the CFA Motor Pool Pond and analyzed for metals and organic compounds. The pond was sampled again in 1988 as part of a DOE Environmental Survey, designed to rank environmental risks at DOE facilities. Nine sediment samples werecollected in the Motor Pool Pond. Samples were analyzed for volatile organics using the methodology given in the Contract Laboratory Program Statement of Work dated July 1987 and Appendix D of the DOE Environmental Survey Manual.

Radiation surveys of the CFA Motor Pool Pond were conducted during periods when the pond contained water and when the pond was dry. The most recent survey at the CFA Motor Pool Pond, which was performed on September 4, 1991, indicated only background levels of radiation. No water was in the pond during the 1991 survey. The survey was conducted using portable Geiger-Muller detectors, capable of detecting gamma and high energy beta radiation.

In 1989, samples were collected from soils and sediments in and around the CFA Motor Pool Pond to support Resource Conservation and Recovery Act (RCRA) closure activities under the COCA. These samples were evaluated for the CERCLA site characterization. These samples were collected at the surface, at intermediate depths, and from sediments just above bedrock, which varies from 0.6 to 5.5 m (2 to 18 ft) below the surface. Sample locations included the discharge pipe outlet, the ditch, sediment excavated from the ditch, pond sediments, and the northern perimeter of the pond. In addition, ten

biased soil samples were collected in an area that was not affected by CFA activities to calculate background metal concentrations.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

On June 26, 1992, a document containing Proposed Plans for three INEL sites, including the CFA Motor Pool Pond, was released to the public. The plan was mailed to approximately 6,500 individuals on the INEL mailing list, with a cover letter from the Director of the Environmental Restoration Division, DOE Idaho Field Office. The public comment period for the Proposed Plan was initially scheduled from July 6 to August 5, 1992. An extension was requested due to errors identified in a table in the Proposed Plan. The publiccomment period was extended to September 8, 1992. A corrected table was provided to those on the mailing list who received the Proposed Plan. Community participation activities have been conducted as required by Sections 113(k)(2)(B)(i-v) and 117 of CERCLA and part XXIV of the FFA/CO.

The CFA Motor Pool Pond Proposed Plan summarized the results of the human health risk assessment, which was based on modeled exposures to contaminants identified in the pond sediments. The modeling indicated that the contaminants at the site pose no unacceptable risk to human health and the environment. Therefore, the DOE, EPA, and IDHW recommended No Action for the Motor Pool Pond in the Proposed Plan.

The Notice of Availability for the Proposed Plan was published in the following newspapers:

- The Post Register (Idaho Falls) - July 1, 1992
- The Idaho State Journal (Pocatello) - July 2, 1992
- Times News (Twin Falls) - July 1, 1992
- Idaho Statesman (Boise) - July 2, 1992
- Daily News (Moscow-Pullman) - July 11 and 12, 1992
- South Idaho Press (Burley) - July 1, 1992
- The Lewiston Morning Tribune (Lewiston) - July 1, 1992.

Copies of the plan are available in the Administrative Record file in the INEL Technical Library, 1776 Science Center Drive, Idaho Falls. Copies of the file are also available in the INEL Information Repository section of public libraries in Idaho Falls, Pocatello, Twin Falls, Boise, ShoshoneBannock Library at Fort Hall, Idaho State Library in Boise, and the University of Idaho Library in Moscow.

Technical briefings on the Proposed Plan were held on July 13 in Twin Falls, on July 14 in Moscow, and on July 15 in Pocatello. The Twin Fallsbriefing was presented to the Twin Falls City Council and was open to the public; the Moscow and Pocatello briefings were presented to the public.

Articles explaining the Proposed Plan for the CFA Motor Pool were printed in the May and July 1992 issues of the INEL Reporter newsletter, which is distributed to members of the public on the INEL mailing list. Additionally, during the public comment period (from July 6 to September 8), public meetings on the Proposed Plan were held in Idaho Falls on July 20, Burley on July 21, Boise on July 22, and Moscow on July 23. An INEL press release, informing members of the public of the upcoming meeting in their area, was distributed to statewide media. Personal telephone calls were

made by INEL Outreach Offices in Pocatello, Twin Falls, and Boise to inform key representatives from community groups of the opportunity for public comment.

The notices of the times and dates of public meetings were published in the following newspapers:

- The Post Register (Idaho Falls) - July 17, 1992
- The Idaho State Journal (Pocatello) - July 17, 1992
- Times News (Twin Falls) - July 20, 1992
- Idaho Statesman (Boise) - July 20, 1992
- Daily News (Moscow-Pullman) - July 21, 1992
- South Idaho Press (Burley) - July 20, 1992
- The Lewiston Morning Tribune (Lewiston) - July 21, 1992,

At the meetings, representatives from the DOE, EPA, and IDHW discussed the Proposed Plan, answered questions, and received public comment. Verbatim transcripts of each public meeting were prepared by a court reporter and are available, along with the written comments, in the Administrative Record. Comments received from the public were considered in the final decision and have been summarized and addressed in the Responsiveness Summaryattached to this Record of Decision (Appendix A).

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL was divided into 10 Waste Area Groups (WAGs) to better manage the investigation of potential waste sites. Each WAG contains several operable units (OUs) which consist of one or more potential waste sites. This strategy allows the DOE, EPA, and IDHW to focus available cleanup resources on those areas that potentially pose an unacceptable risk to human health and the environment. WAG 4 consists of 13 OUs located at CFA. The CFA Motor Pool Pond is designated as OU 4-11.

OU 4-11 includes the excavated sediments along the ditch and the sediments at the discharge pipe outlet, in the ditch, and in the pond. Data collected for the RI risk assessment indicate that the contaminated sediments within these areas of the CFA Motor Pool Pond do not pose an unacceptable risk to human health and the environment. Therefore, based on the results of the RI and risk management considerations, it was determined that the CFA Motor Pool Pond required no further action to protect human health and the environment. Any impacts from past releases to the pond that may affect the subsurface (vadose zone) or groundwater will be evaluated in OU 4-13, the WAG 4 Comprehensive Remedial Investigation/Feasibility Study (RI/FS).

5. SITE CHARACTERISTICS

The results of the 1982, 1988, and 1989 site investigations indicate that the CFA Motor Pool Pond sediments are contaminated with metals, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and radionuclides. The contamination appears to be concentrated in sediments in the ditch and the excavated sediments adjacent to the ditch.

In 1989, 41 samples (excluding replicate samples) of the Motor Pool Pond sediments were collected and analyzed for metals and for VOCs. Thirty-eight of the samples were analyzed for gamma-emitting radionuclides, and three for

alpha-emitting radionuclides (See Table 1). Four samples were also collected and analyzed for a broad range of metals and organic compounds (Appendix IX of 40 Code of Federal Regulations 264). In addition, 10 soil samples were collected south of the pond and analyzed to establish background concentrations of metals (Figure 3).

Barium, beryllium, cadmium, chromium, lead, mercury, and thallium were found in concentrations exceeding background levels in the Motor Pool Pond area. Beryllium, cadmium, chromium and lead were most frequently detected above background levels. Beryllium concentrations ranged from 0.22 to 1.4 mg/kg (milligrams per kilogram or parts per million), cadmium from 0.53 to 38.8 mg/kg, chromium from 8.2 to 91.3 mg/kg, and lead from 10.6 to 631 mg/kg. The highest metals concentrations were found in the sediments in the ditch from 0 to 2 m (0 to 7 ft) in depth, and in sediments excavated from the ditch.

In addition, four organic compounds (acetone, 2-butanone, 4-methyl 2-pentanone, and methylene chloride) were detected at a depth of 4 m (13 ft) in the pond sediments. The maximum concentrations in the sediments were 85 ug/kg (micrograms per kilogram or parts per billion), 90 ug/kg, 40 ug/kg, and 40 ug/kg, respectively. Methylene

chloride and tetrachloroethylene were also detected in two samples collected from excavated sediments, with maximum concentrations of 40 ug/kg and 76 ug/kg, respectively. The PCB Aroclor-1260 was detected in the sample and its replicate collected from the ditch near the pipe outlet. The maximum concentration was 1,470 ug/kg. The radionuclides americium-241, cesium-137, and plutonium-239 were detected in surface sediments in the ditch and pond area. Thehighest concentrations of each detected radionuclide were 2.72 pCi/g for americium-241, 8.4 pCi/g for cesium-137, and 4.29 pCi/g for plutonium-239.

Metals of potential concern in the sediments are:

- Americium-241, chromium-VI, cesium-137, and plutonium239, which are classified as Group A human carcinogens

- Cadmium, a Group B1 probable human carcinogen

- Beryllium and lead, Group B2 probable human carcinogens

- Barium and chromium-III, noncarcinogens which may have adverse human health effects.

Another contaminant of concern is the PCB Aroclor-1260, which is classified as a Group B2 probable human carcinogen.

The potential for migration of contaminants to groundwater was evaluated by two methods. The first method was the use of conservative assumptions and conventional flow equations to estimate the travel time to the aquifer. The second method was the use of a simplified contaminant transport model, GWSCREEN (See Section 5.2 of the RI Report). This evaluation indicates that regulatory standards for groundwater would not be exceeded due to migration of contaminants from the CFA Motor Pool Pond sediments.

The potential pathways for exposure to humans at the CFA Motor Pool Pond and those selected for risk assessment include (1) direct atmospheric transport (inhalation), (2) dermal contact with contaminants, (3) direct ingestion by workers or future residents, and 4) exposure to ionizing radiation emitted by radioactive contaminants in pond sediments.

Potential exposure scenarios for which the pathways were evaluated at the

CFA Motor Pool Pond were limited to present occupational and future residential users. The potential for exposure to the pubic is currently limited due to the restricted access policy at the INEL. However, a residentialscenario was evaluated because it is possible a home could be built on the site in the future. For the risk assessment, it was assumed that residential development will not occur for at least 30 years so a 30-year scenario was evaluated. A 100-year residential scenario was also evaluated. The timing of the residential scenario is considered in the radiological risk assessment because radionuclides decay over time.

6. SUMMARY OF SITE RISKS

The risk assessment for the CFA Motor Pool Pond considered both human health and ecological risks. The human health risk assessment was conducted in accordance with the EPA Risk Assessment Guidance for Superfund as supplemented by the EPA Region 10 risk assessment guidance. A qualitative ecological risk assessment was also conducted. Risk assessment results are summarized in the following sections.

6.1 Human Health Risk

The contaminants found in the CFA Motor Pool Pond were evaluated to identify those that contribute the greatest potential risk. A concentration-toxicity screen was used which involved ranking each contaminant by its highest detected concentration multiplied by a chemical-specific risk factor developed by EPA. Using this methodology, any contaminant that contributed more than 1% to the total risk was retained for consideration in the baseline risk assessment. The concentration-toxicity screen identified chromium, barium, and lead as the main contributors of noncarcinogenic risk. The main contributors to carcinogenic risk are chromium-VI, cadmium, beryllium, Aroclor-1260, and all detected radionuclides. The contaminant concentrations used in the risk assessment calculations are listed in Table 2.

A human health risk assessment was performed to evaluate currentuse (occupational) and future-use (residential) scenarios. For eachscenario, health risks were estimated using EPA default parameters and sitespecific parameters. The EPA default exposure parameters are conservative and are used to establish a baseline for comparison. A site-specific risk assessment was then developed that reflects site conditions as they exist today and are likely to exist in the future.

The site-specific assessments used lower exposure frequencies (EF) than the default risk assessment (Table 3). These lower exposure frequencies were based on observations at CFA. The default EF value for the occupational scenario was 250 days per year for all exposure routes. Under the site-specific occupational scenario, the EF was

12.5 days per year for inhalation and 2.5 days per year for the other exposure routes. The 12.5 day figure represents the 5 percent of the time the buildings at CFA are downwind of the Motor Pool Pond. The 2.5 day figure is 1 percent of the default value of 250 days and is based on the fact that CFA workers do not occupy the pond to perform necessary work duties and therefore, are not expected to be exposed more than 2.5 days per year.

The default EF for the future residential scenario was 350 days per year for all exposure routes. Under the site-specific future residential scenario, the EF was 350 days per year for inhalation and 50 days per year for the other exposure routes. The time future residents would spend outdoors is the limiting factor for direct ingestion, dermal contact, and direct

ionizing/radiation exposures. The amount of time spent outdoors has been estimated to be at 50 days per year for men and women (Exposure Factors Handbook, Final Report, U.S. EPA, EPA/600/8-89/043, May 1989). Limited data for children suggest the maximum average time spent outdoors during the school year is 14 days per year for boys, ages 12 to 17 years. This average only includes days of the schoolyear; summer vacation time is not included (EPA, U.S. Environmental Protection Agency, Exposure Factors Handbook, EPA/600/8-89/043, March 1990b). The exposure frequency during the 12-week summer vacation was estimated to be three days outdoors per week, for a total of 36 days.

Contaminant intake rates were calculated for inhalation, ingestion, and dermal contact for metals and radionuclides. The parameters used to calculate intakes were based on EPA methods found in the Risk Assessment Guidance for Superfund, Volume I, "Human Health Evaluation Manual, Part A." For noncarcinogens, the calculated contaminant intake rates and absorbed doses for each contaminant and exposure route were compared to reference doses (RfDs) obtained from the EPA Integrated Risk Information System and the Health Effects Assessment Summary Tables or RfDs calculated using regulatory and occupational limits. The hazard quotients, which are the ratio of the calculated intake and the RfD for each contaminant, were summed by exposure route and scenario to obtain hazard indices. The hazard indices were compared to the EPA threshold value of 1 to determine whether non-carcinogenic effects from exposure to the contaminant may occur. No hazard indices greater than 1 were identified for the occupational scenarios, indicating that the contaminants at the CFA Motor Pool Pond do not pose unacceptable noncarcinogenic health effects to CFA workers. The hazard index for the default future residential scenario using EPA default parameters was 1.4; however, using site-specific parameters, the hazard index was 0.7 (Table 4).

Carcinogenic health effects were evaluated by multiplying the intake rates of each carcinogen by a body absorption factor and the pertinent EPA slope factor. The result is an estimated excess lifetime cancer risk. The excess cancer risks for each carcinogen are then summed to determine the total excesscancer risk for the given scenario. For the occupational scenario, the current total carcinogenic risk to workers near the CFA Motor Pool Pond is 1 in 10,000 (1 x 10[-4]) using the default parameters, and 1 in 1,000,000 (1 x 10[6]) using site-specific parameters (see Table 4).

For the default 30-year future residential scenario, the total carcinogenic risk from radionuclides and inorganic metals is 3 in 10,000 (3 x 10[4]), and 3 in 100,000 (3 x 10[-5]) for the site-specific scenario. For the default 100-year future residential scenario, the total carcinogenic risk is 1 in 10,000 (1 x 10[-4]), and 2 in 100,000 (2 x 10[-5]) for the site-specific scenario (see Table 4).

Several sources of uncertainty, such as those associated with sampling and analysis and the use of EPA established toxicity values, are common to risk assessments and generally have a low potential for adding uncertainty to the results. Other assumptions specific to the CFA Motor Pool Pond are more important to analysis of uncertainty. For example, exclusion of lead from the carcinogenic toxicity assessment may have resulted in underestimation of the carcinogenic risk. This effect is difficult to evaluate because toxicity values are not available for lead. The use of biased samples collected in the ditch and the pond is expected to overestimate total contaminant concentration in the Motor Pool Pond, making the risk assessment more conservative. Because the potential effects of the assumptions used in the risk assessment are not quantified, it is difficult to measure the effect on total risk in numerical terms. However, on a qualitative basis, it appears there is a greater potential for overestimation of exposures and

risks.

6.2 Environmental Risk

A qualitative ecological risk assessment was performed to the extent practicable on a scale as small as the CFA Motor Pool Pond. The assessmentincluded a review of available literature on contaminant toxicity to animal species. Based on the limited distribution of the contaminants, discontinued use of the pond, sparse vegetation, and limited habitat value, it is unlikely that contaminants will be accumulated in the food chain. For these reasons, the CFA Motor Pool Pond sediments are not expected to have significant disruptive effects on animal or plant populations or the local ecosystem. Ecological effects will be further evaluated in the WAG 4 RI/FS and the WAG 10 comprehensive RI/FS. These studies are broader in scope and will enable a more representative evaluation of varied and mobile populations.

7. DECISION

The DOE has determined that no further remedial action is necessary at the CFA Motor Pool Pond to ensure protection of human health and the environment. This decision is based on the results of the human health and ecological risk assessments, which indicate that conditions at the site pose no unacceptable risk to human health or the environment. The EPA has approved the DOE decision; the IDHW concurs.

8. EXPLANATION OF SIGNIFICANT CHANGES

The Proposed Plan for the CFA Motor Pool Pond sediments was released for public comment on June 26, 1992. The Proposed Plan identified No Action as the alternative preferred by the DOE, EPA, and IDHW. The three agencies have reviewed and considered all written and verbal comments submitted during the public comment period. Upon review of comments concerning the proposed action, it was determined that no significant changes to the preferred alternative as it was presented in the Proposed Plan were necessary.

APPENDIX A

Responsiveness Summary

Overview

On June 26, 1992, a "Dear Citizen" document containing Proposed Plans for three sites at the Idaho National Engineering Laboratory (INEL) was released to the public. This document included a Proposed Plan for the Central Facilities Area (CFA) Motor Pool Pond. The document solicited comments from the public on the plan and announced the public comment period, which was originally July 6 to August 5, 1992. The comment period was later extended to September 8, 1992 in response to a request made due to errors identified in a table in the Proposed Plan. On August 6, 1992, an errata sheet was sent to the individuals who were on the mailing list for the Proposed Plan. Comments from the public on the Proposed Plan were sought by the U.S. Department of Energy, U.S. Environmental Protection Agency, and Idaho Department of Health and Welfare.

The Federal Facility Agreement and Consent Order (FFA/CO) between the three agencies designates the CFA Motor Pool Pond as Waste Area Group (WAG) 4 Operable Unit (OU) 4-11. The FFA/CO identified the site for a Remedial Investigation/Feasibility Study (RI/FS).

The Proposed Plan discussed the operable unit background and the risks

associated with exposure to contaminants found in the pond sediments. The Remedial Investigation Report, available in the Administrative Record, presents the risk assessment calculations and results. Because the Remedial Investigation Report (and accompanying risk assessment) indicated that contaminants at the site do not pose unacceptable risks to human health or the environment, the DOE, EPA, and IDHW recommended "No Action" for the CFA Motor Pool Pond in the Proposed Plan.

Background on Community Involvement

During the weeks of June 29 and July 13, 1992, a Notice of Availability advertisement for the Proposed Plan was published in the following Idaho newspapers:

- The Post Register (Idaho Falls)
- The Idaho State Journal (Pocatello)
- Times News (Twin Falls)
- Idaho Statesman (Boise)
- Daily News (Moscow-Pullman)
- South Idaho Press (Burley)
- The Lewiston Morning Tribune (Lewiston).

The Proposed Plan was mailed to 6,500 individuals on the INEL mailing list with a cover letter from the Director of the Environmental Restoration Division of the DOE Idaho Field Office, urging citizens to comment on the plan and to attend public meetings. Copies of the plan are available in the Administrative Record file in the INEL Technical Library, 1776 Science Center Drive, Idaho Falls. Copies of the file are also available in the INEL Information Repository section of public libraries in Idaho Falls, Pocatello, Twin Falls, Boise, Shoshone-Bannock Library at Fort Hall, Idaho State Library in Boise, and the University of Idaho Library in Moscow.

Articles about the Proposed Plan for the CFA Motor Pool Pond were printed in the May and July 1992 issues of the INEL Reporter newsletter. Public meetings on the Proposed Plan were held July 20 in Idaho Falls, July 21 in Burley, July 22 in Boise, and July 23 in Moscow. An INEL press release was distributed to state-wide media to inform the public of upcoming meetings in their areas. Personal telephone calls were made by INEL Outreach Office personnel in Pocatello, Twin Falls, and Boise to inform community leaders and other interested individuals and groups of the opportunity for public comment.

At the meetings, representatives from the DOE, EPA, and IDHW discussed the CFA Motor Pool Pond, answered questions, and received public comment. Verbatim transcripts were prepared by a court reporter at each meeting, and are available in the Administrative Record.

Technical briefings on the Proposed Plan were held July 13 in Twin Falls, July 14 in Moscow, and July 15 in Pocatello. A newspaper advertisement announcing the Moscow briefing appeared in the Moscow/Pullman Daily News on July 11. The briefing in Twin Falls was presented to the Twin Falls City Council and general public; the Moscow and Pocatello briefings were presented to the general public.

Summary of Comments Received During Public Comment Period

All oral comments, transcribed verbatim at the public meetings, and all written comments, as submitted, are in the Administrative Record for the Record of Decision. The comments are annotated to indicate which response in this Responsiveness Summary addresses each comment. Responses to the comments received during the public comment period are included in this Responsiveness Summary, and were considered during development of the Record of Decision.

Predominant public opinions on the "No Action" recommendation, as described in the Proposed Plan, were: (1) The "No Action" proposal is unacceptable and contaminants in the pond should be cleaned up, (2) The "No Action" proposal is acceptable and the risk calculations are adequate, and (3) Fragmentation of the INEL into several operable units makes it difficult to evaluate the cumulative risks posed by the various operable units.

Comments and questions raised during the comment period are summarized in this Responsiveness Summary. Oral comments received at the public meetings and submitted written comments have been organized according to the general subject of the comments.

Comments and questions on a variety of subjects not specific to the CFA Motor Pool Pond were also received. These subjects included nuclear waste issues at the INEL, EPA drinking water standards, and the government's recognition of the public's opportunity to participate in the cleanup process.

Comments on public participation have been referred to the INEL Community Relations Plan Coordinator for consideration in the update of the INEL Community Relations Plan. General comments on INEL activities have been referred to the INEL Public Affairs Office. Additional information on these topics may be obtained from the INEL Public Affairs Office in Idaho Falls or from INEL Outreach Offices in Pocatello, Twin Falls, and Boise.

Summarized Comments on the CFA Motor Pool Pond

A comment tracking system has been utilized to aid the public in finding responses to individual comments on the Proposed Plan that were provided during the comment portion of the public meetings or submitted in writing. This system has been initiated by the DOE to respond to public comments concerning responsiveness summaries and is intended to aid the public in reviewing this Record of Decision and Responsiveness Summary. This system is described below.

- During the comment period held on the Proposed Plan, DOE received oral and written comments submitted by members of the public and public officials. A number of common topics and questions emerged.

- To provide a manageable response to comments, questions and comments with similar themes were condensed into a single comment or question. Immediately after each summarized comment, are series of letters and numbers grouped in parentheses. This series of numbers identifies individual comments from the transcripts or written comments. The first two characters of each comment code identifies the transcript, or written document in which the comment is found. (For example, the "T1" in comment T1-01 identifies the comment as being from the first or Idaho Falls transcript.) The second set of numbers (following the hyphen) represents the sequence of the individual comments in the transcript ("T1-1" is the first comment identified in the Idaho Falls transcript).

- Each comment is identified by brackets, the comment code, and the response number to assist individuals in finding their comments and the corresponding responses. A set of indices is also provided that identifies comments by commenter name, comment code, response number, and the page number of the comment.

- The bracketed transcripts and written comments are available for review in the Administrative Record file. Appendix B of the Record of Decision provides the index for cross referencing the Responsiveness Summary with the transcripts and written comments. Appendix C of the Record of Decision contains the Administrative Record index.

Public Comments on the CFA Motor Pool Pond Proposed Plan

1. Comment: The "No Action" proposal is unacceptable because the risk to human health is too great. No action should be considered as an alternative only if the risk to human health is deemed to be one or less than one increased cancer per one million people. The risk to human health as presented in Table 2 of the June 26, 1992, "Dear Citizen" letter or its revision, exceeds one in one million increased cancers. It is a simple cleanup that should be done. (T1-2, T4-1, T4-2, T4-3, T4-4, T4-5, T4-10, W6-1, W6-2, W6-3, W6-8)

Response: Although removal of the sediments in the pond is possible, the purpose of doing so under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), program, would be to reduce contaminant levels sufficiently to bring the risks to within the acceptable range. The risks to human health and the environment from exposure to CFA Motor Pool Pond sediments were evaluated in accordance with EPA guidance and are within the 10[-4] to 10[-6] acceptable risk range established in National Oil and Hazardous Substances Pollution Contingency Plan (NCP)(40 Code of Federal Regulations 300). A summary of the risk assessment is in Section 6 of the Record of Decision; a more comprehensive discussion is included in the RI report.

2. Comment: The agency decision of "No Action" is noncompliant with applicable or relevant and appropriate requirements. The PCB Aroclor-1260 in concentrations of 1,470 ug/kg alone dictates enforceable remedial action of exhuming contaminants to prevent further migration to the aquifer. (T2-1, T4-22, W1-8)

Response: Although the PCB standard does not apply as an ARAR where no action is being taken, it may be instructive to compare contaminant levels to available standards. The cleanup standard for PCBs in soils, as established by the Toxic Substances and Control Act (TSCA) program, is 10 parts per million or 10,000 parts per billion. The highest concentration of Aroclor-1260 detected was 1.470 parts per million or 1,470 parts per billion. Therefore, no further action would be required to meet the TSCA standard. However, the "No Action" recommendation was not based on meeting the TSCA standard, but on the results of the risk assessment which indicate that risks from exposure to Aroclor-1260 are within the NCP acceptable range for both carcinogenic and noncarcinogenic effects.

3. Comment: Based on the risk calculations and facts presented, DOE, EPA, and IDHW have made the right recommendation. This is especially true in light of the risk calculation that assumes a 250-day exposure, which in itself seems unrealistic [conservative]. (T1-1, T1-3, W2-1, W2-2, W2-3)

Response: On the basis of the data collected and the risk assessment calculations, the DOE, EPA, and IDHW agree that the estimated risks are within the acceptable range and that no further action is necessary for the

CFA Motor Pool Pond sediments. 4. Comment: Either of the following alternatives to the "No Action" proposal are suggested: (a) incineration of contaminated soils under controlled conditions with cement stabilization and disposal of the residuals, or (b) exhuming contaminants, containerizing, and storing the containers at monitored retrievable storage sites, or placing the containers in a permitted repository. (T3-1, T4-6, T4-12, T4-23, W6-4)

Response: The objective of evaluating and implementing cleanup alternatives such as those suggested would be to reduce risks to within the acceptable range. Because estimated risks for this OU were within the acceptable range, an evaluation of cleanup alternatives is not required by CERCLA or the NCP.

5. Comment: For the following reasons, the model's assumptions for occupational and residential exposures understate risk:

a) Risk calculations for worker exposure only allow for inhalation at five percent and direct contact at one percent. This is grossly understated due to the close proximity of the pond to the CFA.

b) Exposure frequencies are based on estimates of outdoor activity of 50 days per year; therefore, exposure beyond 50 days increases the risk. In addition, the risk for houses built on this land was not considered. (T4-11, T4-17, W1-3, W6-2)

Response: The site-specific scenarios evaluated for the CFA Motor Pool Pond sediments represent the reasonable maximum exposure, given the limited area of the pond and extent of associated contamination.

a) The inhalation exposure frequency used for CFA workers was five percent of the EPA default value because data from the meteorology station at CFA indicate that CFA is downwind of the CFA Motor Pool Pond approximately five percent of the time. The exposure frequency for direct contact and other exposure routes was set at one percent (2.5 days per year) of the default valuebecause there are no activities at the CFA Motor Pool Pond that require CFA workers to be routinely on the site. The CFA Motor Pool Pond is permanently deactivated and there are no plans for additional activities. In addition, risk assessment calculations were performed for CFA workers using the more conservative default scenarios as recommended in the EPA risk assessment guidance.

b) Future residential scenarios assumed a house is constructed adjacent to the pond. The time future residents would spend outdoors is the limiting factor for direct ingestion, dermal contact, and direct ionizing radiation exposures. The amount of time spent outdoors has been estimated in EPA guidance at 50 days per year for men and women (Exposure Factors Handbook, Final Report, U.S. EPA, EPA/600/8-89/043, May 1989). Limited data for children suggest the maximum average time spent outdoors is 14 days per year for boys, ages 12 to 17 years. This average only includes days of the school year; summer vacation time is not included. An average of three days per week outdoors was used as a reasonable estimate at the CFA Motor Pool Pond during the 12-week summer vacation, for totals of 36 days for the summer and 50 days for the entire year. Values of 50 days per year for adults and children are considered to be reasonable for estimating exposures by ingestion, dermal contact, and direct ionizing radiation. Risk assessment calculations using default scenarios were also done on the Motor Pool Pond. Even using the default scenarios, carcinogenic risks were within the acceptable 10[-4] to 10[-6] range. The Hazard Index for noncarcinogenic risk for the default future residential scenario was 1.4 which is slightly above the threshold of 1. The Hazard Indices were added across all pathways for all contaminants.

6. Comment: It was noted that EPA had the following concerns with regard to the risk assessment methodology in the plan:

a) Heavy metals such as silver and selenium are not acknowledged.
b) Cesium is not included in the exposure assessment nor was testing done for alpha and beta emitters at the waste pit.

c) The use of average values is inconsistent with EPA guidance which requires the use of a 95 percent upper level confidence limit.

d) The soil to groundwater pathway for contaminant migration was dismissed. (T4-18, T4-19, T4-20, W1-4, W1-5, W1-6, W1-7)

Response: Comments from EPA Region 10 and the Idaho Department of Health and Welfare on the Draft Remedial Investigation Report were incorporated into the Final Remedial Investigation Report. The final report was revised to ensure consistency with EPA guidance.

a) The metals silver and selenium were not included in the risk assessment because they were not detected above naturally occurring levels (or background).

b) Historical radiation surveys of the Motor Pool Pond included gamma and high-energy beta radiation surveys. Results were slightly above background in surveys of the area conducted prior to 1982. The most recent survey, performed in September 1991, showed only background levels of radiation.

During the remedial investigation, samples were analyzed using both gamma- and alpha-spectroscopy. The radionuclides americium-241, cesium-137, and plutonium-239 were detected in surface sediments in the ditch and pond area. The highest concentrations of each detected radionuclide were 2.72 pCi/g for americium-241, 8.4 pCi/g for cesium-137, and 4.29 pCi/g for plutonium-239.

Radionuclide concentrations were evaluated in the risk assessment for both current occupational and future residential scenarios. Exposure to cesium was included. However, for direct radiation exposure, cesium-137 is not a significant contributor to risk as compared to its daughter product, barium-137, which was also included in the assessment (barium-137 is also commonly reported as cesium-137). The calculated risks from exposure to all detected radionuclides were within the acceptable risk range of 10[-4] to 10[-6].

c) The Final Remedial Investigation Report was revised to indicate that the risk assessment was performed using the upper 95 percent confidence interval values.

d) The Final Remedial Investigation Report was revised to include an evaluation of the soil to groundwater pathway. However, based on the groundwater modeling results, regulatory standards for groundwater would not be exceeded. The groundwater pathway was not included further in this remedial investigation. The potential for groundwater contamination from wastewater previously disposed of at the CFA Motor Pool Pond will be evaluated further in the WAG4 final RI/FS, which is scheduled to begin in 1996.

7. Comment: Averaging the concentrations of contaminants found in different areas seems inappropriate. Using the highest concentrations would change the picture drastically. Revisions to "safe" concentrations for these contaminants have always been downward instead of upward, and it makes more sense to err on the conservative side. (W7-3)

Response: For metals and gamma emitting radionuclides, the contaminant

concentrations used in the risk assessment were the 95% Upper Confidence Limit (UCL) of the arithmetic mean. The 95% upper confidence limit is "on the conservative side" and in most cases represents the reasonable maximum exposure over the time used to calculate risk.

Because only one sample and its duplicate were available for the PCB Aroclor-1260, the average of these two samples was used for the exposure concentration. There were insufficient data to calculate a representative value for plutonium-123 and americium-241. Therefore, the highest concentration detected by alpha analysis was used.

8. Comment: What are "safe" concentrations for all populations, flora, and fauna found on the INEL? The safe concentration level for the harvester ant, for example, is unknown. Yet the conclusion is made that no harm will occur to humans or the environment. This seems inappropriate. (W7-4)

Response: It is recognized that risk based contaminations are not established for all flora and fauna found in the INEL. However, a qualitative ecological risk assessment was performed to the extent practicable on a scale as small as the CFA Motor Pool Pond. The assessment included a review of available literature on contaminant toxicity to animal species. Based on the limited distribution of the contaminants, and the lack of water, vegetation, and habitat value, it is unlikely that contaminants will be accumulated in the food chain. For these reasons, the contaminants identified in the CFA Motor Pool Pond sediments are not expected to have significant disruptive effects on animal or plant populations or the local ecosystem. Ecological effects will be further evaluated in the WAG 4 RI/FS and the WAG 10 Comprehensive RI/FS. These studies are broader in scope and will enable a more representative evaluation of varied and mobile populations.

9. Comment: Agency plans to clean up the CFA Motor Pool Pond do not accurately acknowledge the source of nor the quantities of significant radioactive contamination of the pit. The DOE's plan states only that on several occasions vehicles and equipment with small amounts of radioactive contamination were decontaminated at the station. Concentrations of cesium-137, americium-241 and plutonium-238, and plutonium-239 as well as cobalt-60, potassium40, lead-212, and radium-226 are not adequately accounted for. There is already tritium under CFA, so additional contaminant loading from the Motor Pool Pond must not be allowed. (T4-15, W1-1)

Response: Washing of vehicles and equipment at the Service Station is considered to be the only likely source for radioactive contamination detected at the CFA Motor Pool Pond because the Service Station is the only facility that was connected to the CFA Motor Pool Pond. The CFA, especially the Service Station, is not an area where large amounts of radioactive materials are routinely handled. The risk assessment for the pond was based on the concentration of contaminants in the sediments. The results of groundwater modeling show that regulatory standards, would not be exceeded by contaminants migrating to the aquifer from the pond sediments.

10. Comment: The Proposed Plan does not accurately state the volatile organic ranges detected in the pond. The Oak Ridge Survey sampling found 2-butanone at 190 ug/kg, trichloroethane at 25 ug/kg, toluene at 23 ug/kg, methylene chloride at 460 ug/kg, acetone at 85 ug/kg, tetrachloroethylene at 76 ug/kg, and 4-methyl-2-pentanone at greater than 8,300 ug/kg. Nine of the organic contaminants exceed EPA Contract Required Quantification Limit criteria. (T4-16, W1-2)

Response: The Proposed Plan is intended to be a summary of highlights of the Remedial Investigation Report, which served as the basis for the

Agencies' recommendation. The Remedial Investigation Report is available in the Information Repositories. The 1989 data were used rather than the Oak Ridge data for risk calculations because the 1989 sampling effort was more comprehensive and data quality was better documented. The 1989 maximum concentrations for the contaminants referenced above are: 90 ug/kg for 2-butanone, 25 ug/kg for trichloroethane, 2 ug/kg for toluene, 40 ug/kg for methylene chloride, 85 ug/kg for acetone, 76 ug/kg for tetrachloroethylene, and 40 ug/kg for 4-methyl-2-pentanone. It is acknowledged that several of the contaminants listed in the comments were detected during the Oak Ridge sampling; however, concentrations for tetrachloroethylene and 4-methyl-2pentanone stated in the comment could not be found.

The volatile organic compounds detected during the 1989 sampling effort were subjected to a concentration-toxicity screen to evaluate their contribution to total risk. The concentration-toxicity screen, which was performed according to EPA guidance, indicated that the volatile organic compounds do not contribute significantly, less than one percent, to total risk. Therefore, these compounds were not evaluated further in the toxicity assessment.

Contract-required quantification limits (CRQLs) are chemicalspecific levels that a laboratory contracted to EPA must be able to routinely and reliably detect and quantify. This limit is not a risk-related value.

11. Comment: The preliminary assessments of WAG 10 should begin immediately. It is not in the best interest of public health for all toxic, hazardous, and radioactive materials to continue to contaminate the Snake River Aquifer for another seven years before the cumulative consequences of these "No Action" decisions will begin to be evaluated. Continuing evaluation of the cumulative consequences of contamination from each subsequent "No Action" alternative will allow for the earliest detection of an unacceptable risk. This information should be included in the Proposed Plans for each OU in each WAG. This procedure will allow the public to comprehend and track the cumulative risk of the cleanup program as it progresses, rather than wait until the end as it is now scheduled. (T4-7, W6-6, W7-2)

Response: It is recognized that cumulative risks from the various sites are an important issue and that it is possible for several sites which do not pose an unacceptable risk on an individual basis to do so if evaluated on a cumulative basis. However, it would depend on several factors such as the percentage of exposure an individual received from each site, and the toxicological effects of the contaminants and exposure pathways at each site. For example, it would not be reasonable to assume that one individual obtains his drinking water from two different wells at the same time. To effectively evaluate the risks in the WAG 10 comprehensive RI/FS, it is necessary to first collect and evaluate data from the individual OUs. This approach was developed in the INEL FFA/CO and agreed upon by the DOE, EPA, and IDHW in accordance with the NCP. The intent was to ensure that all potential contamination sources were evaluated before the comprehensive RI/FS was completed. Data collection for the comprehensive RI/FS has been initiated; however, it is too early to draw conclusions regarding the contribution of individual OUs to overall risk.

12. Comment: OUs are related and are not three separate facilities where "No Action" is proposed. DOE needs to treat them as systems that work together, not divide them up and expect the public not to make the connection. The public wants to see how each element fits together. If a source of contamination or portion of a facility will be considered under a separate plan or a separate OU, these relationships must be spelled out in detail in the information provided to the public. The appropriate OU and

time-frame for consideration must be identified in the text or as a note. (T4-8, T4-14, W6-7, W7-2)

Response: The INEL was divided into several WAGs and OUs to provide an efficient, systematic method for collecting and evaluating information and to focus resources on high priority sites first. This approach was developed by DOE, EPA, and IDHW for the FFA/CO in accordance with the NCP. The FFA/CO was presented to the public for comment during the months of August through October 1991. Section 300.430 of the NCP states that complex sites should generally be addressed in OUs to simplify and expedite investigations and any necessary remedial action at the sites. In recognition, that risk should be evaluated from a larger perspective than each individual site or OU, a comprehensive RI/FS will be performed for each WAG and subsequently, for the entire INEL (WAG 10) to evaluate the contribution of individual elements to cumulative risk. Schedules for addressing each OU and for the comprehensive evaluations are provided in the FFA/CO, which is included in the Administrative Record file. The WAG 4 Comprehensive RI/FS for CFA is scheduled to begin in 1996. This study, along with other WAG-level RI/FSs will then feed into the INEL-wide RI/FS, scheduled to begin in 1998.

13. Comment: More information should be provided to the public so that informed decisions can be made; not everyone is able to obtain information from the Administrative Record. (T4-9, T4-13)

Response: The purpose of the Proposed Plan is to provide the public with a summary of the Remedial Investigation Report. More detailed information regarding the investigation is included in the Administrative Record, as required by the NCP. Prior to beginning the comment period, copies of the Administrative Record file were placed in Information Repository sections of public libraries, and remain available at the six locations listed on page B -7 of the Proposed Plan.

14. Comment: Are new waste ponds being built to replace the Motor Pool Pond? (T3-2)

Response: No new pond is planned or needed to replace the CFA Motor Pool Pond. Use of the pond was discontinued in 1985. Wastes that were previously sent to the CFA Motor Pool Pond are now sent to the CFA Sewage Treatment Plant.

15. Comment: A 30-day extension to the comment period on the Proposed Plan is requested so that the three agencies may notify the public of an error in the risk assessment summary data in Table 2 of the June 26, 1992, "Dear Citizen" letter. This error came to light at the public meeting held in Moscow on July 23, 1992. To our knowledge, those members of the public who were not in attendance at that meeting have no way of knowing the informationon which they are making their comments is in error. The public should be notified of the error and provided with the correct data. (W9-1, W9-2)

Response: On August 6, 1992, an errata sheet was sent to the individuals who received the Proposed Plan by mail. These individuals were also notified at that time that the comment period would be extended as requested. The comment period was extended from August 5 to September 8, 1992. The extension was required due to errors in a table in the Proposed Plan which overstated risk values.

APPENDIX B

Public Comment/Response List

Name	Comment#	Transcript Page	Category
Chuck Broscious	T4-2	381	ARA08
Chuck Broscious	T4-3	381	ARA02
Chuck Broscious	T4-3	382	ARA02
Chuck Broscious	T4-4	382	ARA10
Chuck Broscious	T4-5	382	ARA10
Chuck Broscious	T4-6	382	ARA02
Chuck Broscious	T4-6	383	ARA02
Chuck Broscious	T4-7	383	ARA01
Chuck Broscious	T4-8	383	ARA01
Chuck Broscious	T4-8	384	ARA01
Chuck Broscious	W1-1	400	ARA08
Chuck Broscious	W1-2	400	ARA02
Chuck Broscious	W1-3	400	ARA10
Chuck Broscious	W1-4	400	ARA10
Chuck Broscious	W1-5	400	ARA02
Chuck Broscious	W1-6	400	ARA01
Chuck Broscious	W1-7	400	ARA01
Chuck Broscious	W1-8	401	ARA03
Chuck Broscious	W1-9	401	ARA05
Dennis Donnelly	T1-2	105	ARA08
John Horan	T1-1	77	ARA07
John Horan	T1-1	78	ARA07
Lynn Mineur	T4-1A	373	ARA09
Lynn Mineur	T4-1B	373	ARA09
Lynn Mineur	T4-1B	374	ARA09
Lynn Mineur	W6-1	417	ARA09
Lynn Mineur	W6-2	417	ARA09
Lynn Mineur	W6-2	418	ARA09
Bruce Schmalz	W2-1	402	ARA07
Bruce Schmalz	W2-2	402	ARA07
Bruce Schmalz	W2-3	402	ARA07
Patricia and Donald Scott	T4-1	322	ARA08
Patricia and Donald Scott	W7-1	419	ARA08
Patricia and Donald Scott	W7-2	419	ARA09
Patricia and Donald Scott	W7-3	419	ARA03
Patricia and Donald Scott	W7-4	419	ARA04
John E. Tanner	T1-3	105	ARA07
Michael J. Ushman	T3-1	233	ARA06

APPENDIX C

Administrative Record Index

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX

CENTRAL FACILITY AREA MOTOR POOL POND
REMEDIAL INVESTIGATION/FEASIBILITY STUDY OPERABLE UNIT 4-11

FILE NUMBER

AR1.1 BACKGROUND

. Document#: 5134
Title: Technical Memorandum - Future Land Use Scenarios for the Central Facilities Area, INEL
Author: Pigott, W.R.
Recipient: N/A

Date: 07/01/92

AR3.3 RI/FS WORK PLAN

. Document#: 5105
Title: Transmittal - CFA-05 Motor Pool Pond and ARA-01 Chemical Evaporation Pond Schedule
Author: EPA, Pierre, W.
Recipient: DOE, Lyle, J.J.
Date: 02/24/92

AR3.4 RI REPORTS

. Document#: EGG-WM-9973
Title: Final RI for the CFA Motor Pool Pond
Author: Spry, M.J.
Recipient: N/A
Date: 06/01/92

AR5.1 RECORD OF DECISION

. Document#: 5232
Title: Record of Decision for the CFA Motor Pool Pond
Author: INEL Community Relations
Recipient: N/A
Date: 12/10/92

AR6.1 COOPERATIVE AGREEMENTS

. Document#: ERDI-070-91[*]
Title: Pre-signature Implementation of the CERCLA Interagency Agreement Action Plan
Author: EPA, Findley, C.E.
Recipient: DOE, Solecki, J.E.
Date: 04/19/91

CFA MOTOR POOL POND RI/FS
OPERABLE UNIT 4-11
01/22/93

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS(continued)

. Document#: 2919[*]
Title: INEL Action Plan For Implementation of the Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 07/22/91

. Document#: 3205[*]
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order (FFA/CO)
Author: N/A
Recipient: N/A
Date: 07/22/91

. Document#: 1088-06-29-120[*]
Title: U.S. DEO INEL Federal Facility Agreement and Consent Order (FFA/CO) W/Citizen's Guide

Author: N/A
Recipient: N/A
Date: 12/04/91

. Document#: 3298[*]
Title: Response to comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

. Document#: 5163[*]
Title: Administrative Record List of Guidance Documents
Author: EPA
Recipient: N/A
Date: 08/12/92

AR10.1 COMMENTS AND RESPONSES

. Document#: 5139
Title: Request for an extension of the comment period on the Proposed Plan for the Motor Pool Pond at the Central Facilities Area
Author: League of Woman Voters of Moscow
Recipient: Nygard, Dean
Date: 07/24/92

CFA MOTOR POOL POND RI/FS
OPERABLE UNIT 4-11
01/22/93

FILE NUMBER

AR10.3 PUBLIC PARTICIPATION

. Document#: 5130
Title: Dear Citizen Pamphlet, Proposed Plan for the Motor Pool Pond
Author: INEL Community Relations
Recipient: N/A
Date: 06/26/92

. Document#: 5136
Title: Attention: Agencies Seek Public Comment on Three Proposed Plans
Author: INEL Community Relations
Recipient: N/A
Date: 07/01/92

. Document#: 5141
Title: Page B-6 Correction of the Dear Citizen Pamphlet, Proposed Plan for the Motor Pool Pond
Author: INEL Community Relations
Recipient: N/A
Date: 08/05/92

AR10.4 PUBLIC MEETING TRANSCRIPTS

. Document#: 5164-CFA
Title: Public Comments on the Proposed Plan
Author: N/A

Recipient: N/A
Date: 07/20/92

AR10.6 PRESS RELEASES

. Document#: 5142
Title: DOE NEWS - Public Comment Period Extended on Proposed Plan for Motor Pool Pond Sediments at INEL
Author: Coe, M
Recipient: N/A
Date: 08/05/92

<Footnote>
* Document filed in INEL Federal Facility Agreement and Consent Order (FFA/CO) Administrative Record Binder
</footnote>

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/24/1993
Operable Unit: 18
ROD ID: EPA/ROD/R10-93/070

Media: Soil, Debris

Contaminant: VOCs, Other Organics, Metals, Radioactive Materials

Abstract: The USDOE Idaho National Engineering Laboratory (Operable Unit 18) is part of the 890-square mile USDOE facility located in Idaho Falls, Idaho. Operable Unit 18 is part of the Idaho National Engineering Lab and addresses source contamination at the Radioactive Waste Management Complex (RWMC). The primary mission of the Idaho National Engineering Lab (INEL) is nuclear reactor technology development and waste management. Land use in the area is mixed industrial, agricultural, and recreational. Approximately 11,700 people are employed at the INEL, with approximately 100 employed at the RWMC. Drinking water for the employees is obtained from onsite production wells. The site is contained within the northeastern portion of the Eastern Snake River Plain, borders a floodplain to the west and north, and overlies the Snake River Plain Aquifer, a sole-source aquifer. The 144-acre RWMC is located in the southwestern portion of the INEL, and includes two storage areas, the Transuranic Storage Area (TSA) and the Subsurface Disposal Area (SDA). In the early 1950s, the RWMC was established as the disposal site for solid, low-level radioactive waste (LLW) generated by INEL operations. The SDA was used to bury radioactive waste materials in underground pits, trenches, and soil vault rows, and to store waste on one aboveground pad. The TSA was used for interim storage of transuranic waste, and continues to be used for that purpose. From 1952 to 1970, TRU waste, from both the INEL and the USDOE Rocky Flats facility, was disposed of

in the SDA. The USDOE Rocky Flats facility was primarily engaged in the production of plutonium components for nuclear weapons. Between 1967 and 1969, drums, boxes, and large items were placed in the 1-acre Pit 9 at the SDA, and a soil cover was applied over the waste. Approximately 110,000 ft[3] of the waste buried in Pit 9 was generated at the Rocky Flats facility and consisted of drums of sludge contaminated with a mixture of TRU elements and organic solvents, drums of assorted waste, and cardboard boxes containing empty contaminated drums. Currently, LLW contaminated with TRU isotopes less than or equal to 100 pCi/g, but greater than 10 pCi/g, is excluded from disposal at the RWMC and is placed in interim storage. LLW contaminated with TRU isotopes less than 10 pCi/g is currently disposed of in the SDA; however, no waste disposal has occurred in Pit 9 at the SDA since its closure in 1969. Since the early 1970s, USDOE has conducted subsurface monitoring at the RWMC to determine if radionuclides, or other hazardous contaminants, have migrated deeper into the subsurface. In 1987, EPA required USDOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL, and set up a process for conducting any necessary corrective actions. In 1990 and 1991, it was discovered that current levels of VOCs in the groundwater below the RWMC were not exceeding SDWA MCLs. This ROD addresses the eighth of thirteen planned remedial actions for this site and specifically addresses source contamination at Pit 9 of the SDA, within the RWMC, as OU18. The primary contaminants of concern affecting the soil and debris are VOCs, including PCE and TCE; other organics, including PCBs; metals, including lead; and radioactive materials. SELECTED REMEDIAL ACTION: The selected interim remedial action for this site includes selecting a suitable subcontractor proposal from those submitted to USDOE in order to determine the exact sequence of treatment process(es) that will be used; excavating the waste, soil, and debris from Pit 9 using a doublecontained structure that will be built over the Pit to contain emissions; physically separating the waste into different waste streams based on whether treatment is required; placing the waste streams into the appropriate onsite treatment processes; using chemical extraction processes to remove contaminants from the waste; stabilizing the waste using a thermal processing unit similar to a plasma heating unit, or using an alternate solidification process; temporarily storing onsite treated residuals with TRU isotopes of equal to or less than 100 pCi/g; returning treated residuals with TRU isotopes of less than 10 pCi/g to Pit 9; monitoring the ground water onsite; and implementing institutional controls, including deed and land use restrictions. The estimated capital cost for this interim remedy is $20,661,000, which includes an estimated total O&M cost of $29,102,000. PERFORMANCE STANDARDS OR GOALS: Soil

and debris cleanup goals are based on Federal and State standards. Chemical-specific soil and debris goals for treated waste containing less than or equal to 100 pCi/g, and being returned to Pit 9, are based on maximum allowable leachate concentrations (MALs) for RCRA delisting and health-risk based levels, and include carbon tetrachloride 18 mg/kg; PCE 45 mg/kg; potassium cyanide 119 mg/kg; sodiumcyanide 122 mg/kg; 1,1,1-TCA 2,910 mg/kg; and TCE 15 mg/kg. Chemical- specific soil and debris goals for treated waste residuals containing less than 10 pCi/g and being temporarily stored onsite are based on RCRA LDRs, and include carbon tetrachloride 5.6 mg/kg; lead 5 mg/l; mercury 260 mg/kg; PCE 5.6 mg/kg; potassium cyanide 122 mg/kg; 1,1,1-TCA 5.6 mg/kg; and TCE 5.6 mg/kg. INSTITUTIONAL CONTROLS: Deed and land use restrictions will be implemented to restrict access, maintain the integrity of the soil cover, and ensure protection of human health and the environment.

Remedy: This ROD addresses the contamination of Pit 9 at the RWMC, Subsurface Disposal Area (SDA), at the Idaho National Engineering Laboratory (INEL). The RWMC has been designated as Waste Area Group (WAG) 7 of the ten WAGs at the INEL that are under investigation pursuant to the Federal Facility Agreement and Consent Order (FFA/CO) between the Idaho Department of Health and Welfare (IDHW), the EPA, and the U.S. Department of Energy Idaho Operations Office (DOE-ID). Pit 9, designated Operable Unit (OU) 7-10, is located within WAG 7. The selected remedy for Pit 9 will use a combination of chemical extraction, physical separation, and/or stabilization technologies to recover contaminants and reduce the source of contamination.

The major components of the remedy are:
. Proof-of-Process (POP) to demonstrate that designated performance objectives and cleanup criteria are attainable;
. Limited Production Test (LPT) to give a high degree of confidence that performance objectives and cleanup criteria can be met and all systems are reliable before full-scale remediation;
. Excavation and segregation of waste with greater than 10 nanocuries per gram (> 10 nCi/g) TRU elements for input into the treatment process;
. Treatment of waste using chemical extraction, physical separation, and/or stabilization to remove radionuclides and hazardous constituents and to reduce the toxicity, mobility, and/or volume of those wastes that remain;
. Treatment of listed hazardous waste to levels which will allow for delisting of the waste (for material being returned to the pit) in accordance with the Resource Conservation and Recovery Act

(RCRA) and the Idaho Hazardous Waste Management Act (HWMA);
. Return of treated materials to Pit 9 (treated materials will contain less than or equal to ( ) 10 nCi/g TRU elements and meet regulatory standards for hazardous substances of concern);
. Volume reduction by approximately 90% (for material undergoing treatment); and
. Onsite storage of concentrated waste residuals in accordance with ARARs until final disposal.

Because some aspects of the remedial technologies have not been proven on radioactively contaminated, hazardous waste sites like Pit 9, implementation of the preferred remedial alternative is contingent upon successful demonstration that the cleanup criteria and other performance objectives can be met in the POP and LPT test phases. If processes are not successful in the POP or LPT test phases, then Pit 9 will be reevaluated for remediation at a later date but no later than the TRU-Contaminated Pits and Trenches OU 7-13 Remedial Investigation/Feasibility Study (RI/FS)as identified in Table A-1 of the FFA/CO. Additionally, if the POP results demonstrate the process is not cost-effective, then Pit 9 will be reevaluated by DOE, IDHW, and EPA for remediation.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements (ARARs), and is cost-effective. This remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedieswhich employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The effectiveness of the Pit 9 interim action remedy as a final action will be further evaluated in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS which will commence within a five-year period.

Signature sheet for the foregoing Pit 9 located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and

Welfare.

Text: Full-text ROD document follows on next page.

Text:
DECLARATION FOR PIT 9 AT THE RADIOACTIVE WASTE MANAGEMENT COMPLEX SUBSURFACE DISPOSAL AREA AT THE IDAHO NATIONAL ENGINEERING LABORATORY Idaho Falls, Idaho

September 1993

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Pit 9
Radioactive Waste Management Complex
Subsurface Disposal Area
Idaho National Engineering Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This document presents the selected interim remedial action for Pit 9, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the Pit 9Interim Action.

Interim Action

The U.S. Environmental Protection Agency (EPA) approves of this remedy and the State of Idaho concurs with the selected interim remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment. Implementation of the interim remedial action selected in this ROD will facilitate ultimate cleanup of the Radioactive Waste Management Complex (RWMC), transuranic (TRU) pits and trenches by reducing the concentration and volume of radioactive and hazardous wastes previously disposed in Pit 9. These wastes may have the potential for migrating from the pit, contaminating the subsurface area or the Snake River Plain Aquifer, and creating a threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses the contamination of Pit 9 at the RWMC, Subsurface Disposal Area (SDA), at the Idaho National Engineering Laboratory (INEL). The RWMC has been designated as Waste Area Group (WAG) 7 of the ten WAGs at the INEL that are under investigation pursuant to the Federal Facility Agreement and Consent Order (FFA/CO) between the Idaho Department of Health

and Welfare (IDHW), the EPA, and the U.S. Department of Energy Idaho Operations Office (DOE-ID). Pit 9, designated Operable Unit (OU) 7-10, is located within WAG 7. The selected remedy for Pit 9 will use a combination of chemical extraction, physical separation, and/or stabilization technologies to recover contaminants and reduce the source of contamination. The major components of the remedy are:

- Proof-of-Process (POP) to demonstrate that designated performance objectives and cleanup criteria are attainable;

- Limited Production Test (LPT) to give a high degree of confidence that performance objectives and cleanup criteria can be met and all systems

- Excavation and segregation of waste with greater than 10 nanocuries per gram (> 10 nCi/g) TRU elements for input into the treatment process;

- Treatment of waste using chemical extraction, physical separation, and/or stabilization to remove radionuclides and hazardous constituents and to reduce the toxicity, mobility, and/or volume of those wastes that remain;

- Treatment of listed hazardous waste to levels which will allow for delisting of the waste (for material being returned to the pit) in accordance with the Resource Conservation and Recovery Act (RCRA) and the Idaho Hazardous Waste Management Act (HWMA);

- Return of treated materials to Pit 9 (treated materials will contain less than or equal to (ó) 10 nCi/g TRU elements and meet regulatory standards for hazardous substances of concern);

- Volume reduction by approximately 90% (for material undergoing treatment); and

- Onsite storage of concentrated waste residuals in accordance with ARARs until final disposal.

Because some aspects of the remedial technologies have not been proven on radioactively contaminated, hazardous waste sites like Pit 9, implementation of the preferred remedial alternative is contingent upon successful demonstration that the cleanup criteria and other performance objectives can be met in the POP and LPT test phases. If processes are not successful in the POP or LPT test phases, then Pit 9 will be reevaluated for remediation at a later date but no later than the TRU-Contaminated Pits and Trenches OU 7-13 Remedial Investigation/Feasibility Study (RI/FS) as identified in Table A-1 of the FFA/CO. Additionally, if the POP results demonstrate the process is not cost-effective, then Pit 9 will be reevaluated by DOE, IDHW, and EPA for remediation.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements (ARARs), and is cost-effective. This remedy uses permanent

solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The effectiveness of the Pit 9 interim action remedy as a final action will be further evaluated in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS which will commence within a five-year period.

Signature sheet for the foregoing Pit 9 located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

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DECISION SUMMARY

1. SITE DESCRIPTION

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

5. SUMMARY OF SITE CHARACTERISTICS

6. SUMMARY OF SITE RISKS

7. DESCRIPTION OF ALTERNATIVES

SUMMARY OF REMEDIAL ACTION OBJECTIVES
For Untreated Wastes Remaining in the Pit
For Treated Waste 10 nCi/g TRU to be Returned to the Pit
For Concentrated Waste Residuals > 10 nCi/g TRU to be Stored Awaiting Final Disposal

Alternative 1 - No Action
Alternative 2 - In Situ Vitrification
Alternative 3 - Ex Situ Vitrification
Alternative 4 - Physical Separation/Chemical Extraction/Stabilization
Process Alternative 5 - Complete Removal, Storage, and Offsite Disposal

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Threshold Criteria
Overall Protection of Human Health and the Environment
Compliance with Applicable or Relevant and Appropriate Requirements

Balancing Criteria
Long-Term Effectiveness and Permanence
Reduction of Toxicity, Mobility, or Volume through Treatment
Short-Term Effectiveness
Implementability
Cost

Modifying Criteria
State Acceptance
Community Acceptance
Original Proposed Plan
Revised Proposed Plan

9. THE SELECTED REMEDY

Description of Remedial Technologies
Alternative 4 - Subcontractor Process 1

Retrieval/Segregation
Treatment System

Alternative 4 - Subcontractor Process 2

Retrieval/Segregation System
Treatment System

Treatment Standards for Subcontractor Processes 1 and 2
Preliminary Evaluation of 10 nCi/g TRU

10. STATUTORY DETERMINATION

Protection of Human Health and the Environment
Compliance with ARARs

Chemical-Specific ARARs
Action-Specific ARARs
Location-Specific ARARs
To-Be-Considered Guidance

Cost Effectiveness
Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible Preference for Treatment as a Principal Element

11. DOCUMENTATION OF SIGNIFICANT CHANGES

FIGURES

1. The RWMC at the INEL

2. Pit 9 located within the SDA at the RWMC

3. Subcontractor 1 Simplified Process Diagram

4. Subcontractor 2 Simplified Process Diagram

TABLES

1. Pit 9 Radiological Inventory in 1991 and 1992

2. Estimate of Organic Content of Sludge Drums Buried in Pit 9

3. Estimate of Inorganic Compounds in Sludge Buried in Pit 9

4. Delisting Levels for Pit 9 Listed Wastes

5. Treatment Standards for Concentrated Treatment Residuals

6. Total Cost Comparison (in thousands of dollars)

7. Summary of Applicable or Relevant and Appropriate Requirements

8. Evaluation of Alternatives

9. Summary of Health Risks Associated with Routine Operations for Cleanup of Pit 9

ACRONYMS

ACGIH American Conference of Governmental Industrial Hygienists

ALARA As Low As Reasonably Achievable

AOC Area of Contamination

ARAR	Applicable or Relevant and Appropriate Requirement
BDAT	Best Demonstrated Available Technology
BLM	Bureau of Land Management
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CERCLA Act	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
COCA	Consent Order and Compliance Agreement
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EBR-I	Experimental Breeder Reactor I
EDE	Estimated Dose Equivalent
EDTA	Ethylenediaminetetraacetic Acid
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ESV	Ex Situ Vitrification
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
HEPA	High-Efficiency Particulate Air Filter
HI	Hazard Indice
HQ	Hazard Quotients
HWMA	Idaho Hazardous Waste Management Act
IDAPA	Idaho Administrative Procedures Act
IDHW	State of Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
ISV	In Situ Vitrification

K[d]	Linear Sorption Coefficient
LDR	Land Disposal Restriction
LLW	Low-Level Waste
LPT	Limited Production Test
MAP	Mixed Activation Product
MCL	Maximum Concentration Level
MEI	Maximum Exposed Individual
MFP	Mixed Fission Product
NCP	National Contingency Plan
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
OSHA	Occupational Safety and Health Act
OSWER	U.S. EPA Office of Solid Waste Emergency Response
OU	Operable Unit
PCB	Polychlorinated Biphenyl
POP	Proof-of-Process
PPE	Personal Protective Equipment
ppm	Parts Per Million
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
RWMIS	Radioactive Waste Management Information System
SARA	Superfund Amendments and Reauthorization Act
SARS	Safety Analysis and Review System
SDA	Subsurface Disposal Area

SRPA Snake River Plain Aquifer

TBC To-Be-Considered Guidance

TCLP Toxicity Characteristic Leachate Procedure

TLV Threshold Limit Values

TRU Transuranic

TSA Transuranic Storage Area

TSCA Toxic Substances Control Act

TSD Treatment, Storage, and Disposal

TU Temporary Unit

USGS United States Geological Survey

VOC Volatile Organic Compound

WAG Waste Area Group

DECISION SUMMARY

1. SITE DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE) located 51.5 km (32 mi) west of Idaho Falls, Idaho, and occupies 2305.1 km[2] (890 mi[2]) of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEL (Figure 1). Pit 9 is located in the northeast corner of the Subsurface Disposal Area (SDA) and is approximately 115.5 x 38.7 m (379 x 127 ft) (Figure 2). The SDA is 35.6-ha (88-acre) area located within the RWMC.

Current land use at the INEL is primarily nuclear research and development (R&D) and waste management. Surrounding areas are managed by the Bureau of Land Management (BLM) for multipurpose use. The developed area within the INEL is surrounded by a 1295-km[2] (500-mi[2]) buffer zone used for cattle and sheep grazing.

Approximately 11,700 people are employed at the INEL, with approximately 100 employed at the RWMC. The nearest offsite populations are in the cities of Atomic City [19.2 km (12 mi) southeast of RWMC], Arco [25.7 km (16 mi) northwest], Howe [30.6 km (19 mi) north], Mud Lake [58 km (36 mi) northeast], and Terreton [59.5 km (37 mi) northeast].

The INEL property is located on the northeastern edge of the Eastern Snake River Plain, a volcanic plateau, that is primarily composed of silicic and basaltic rocks and relatively minor amounts of sediment. Underlying the

RWMC are a series of basaltic lava flows with sedimentary interbeds. The basalts immediately beneath the Site are relatively flat and covered by 6.1 to 9.1 m (20 to 30 ft) of alluvium.

The depth to the Snake River Plain Aquifer underlying the INEL varies from 61 m (200 ft) in the northern portion to 274.3 m (900 ft) in the southern portion of the INEL. The depth to the aquifer at the RWMC is 176.8 m (580 ft). Regional groundwater flow is generally to the southwest.

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 23.1 cm/yr (9.1 in./yr), with estimated evapotranspiration of 15.2 to 22.8 cm/yr (6 to 9 in./yr). Twenty distinctive vegetative cover types have been identified at the INEL, with big sagebrush the dominant species, covering approximately 80% of ground surface. The variety of habitats on the INEL supports numerous species of reptiles, birds, and mammals.

The RWMC encompasses 58.3 ha (144 acres) [0.59 km[2] (approximately 0.23 mi[2])] and consists of two main disposal and storage areas: (a) the Transuranic Storage Area (TSA) and (b) the SDA. Within these areas are smaller, specialized disposal and storage areas.

Waste was placed in Pit 9 at the SDA from November 1967 to June 1969. It presently has an overburden that averages about 1.8 m (6 ft) thick. Approximately 7,079.2 m[3] (250,000 ft[3]) of overburden, 4,247.5 m[3] (150,000 ft[3]) of packaged waste, and 9,910.9 m[3] (350,000 ft[3]) of soil were between and below the buried waste at the time of Pit 9 closure. The depth of the pit from ground surface to the bedrock is approximately 5.3 m (17.5 ft), and the horizontal dimensions are approximately 115.5 x 38.7 m (379 x 127 ft).

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The RWMC was established in the early 1950s as a disposal site for solid, low-level waste (LLW) generated by INEL operations. Within the RWMC is the SDA where radioactive waste materials have been buried in underground pits, trenches, soil vault rows, and one above ground pad (Pad A), and the TSA where interim storage of TRU waste occurs in containers on asphalt pads. TRU waste was disposed in the SDA from 1952 to 1970 and was received from the Rocky Flats Plant for disposal in the SDA from 1954 through 1970. The Rocky Flats Plant is a DOE-owned facility located west of Denver, Colorado, and was used primarily for the production of plutonium components for nuclear weapons. The TSA accepted TRU waste from offsite generators for storage from 1970 through 1988. TRU waste generated at the INEL is still received and stored in the TSA. The location of Pit 9 within the SDA is shown in Figure 2.

Since 1970, solid TRU waste received at the RWMC has been segregated from non-TRU solid waste and placed into the interim retrievable storage at the TSA. RWMC LLW that is contaminated with TRU isotopes less than or equal to 100 nanocuries per gram (100 nCi/g) but greater than 10 nanocuries per gram (> 10 nCi/g) is excluded from disposal at the RWMC and is placed in interim storage at the RWMC. LLW contaminated with TRU isotopes 10 nCi/g is disposed of in the SDA. No waste disposal has occurred in Pit 9 at the SDA

since its closure in 1969.

A Consent Order and Compliance Agreement (COCA) was entered into between DOE and the U.S. Environmental Protection Agency (EPA) pursuant to ResourceConservation and Recovery Act (RCRA) Section 3008(h) in August 1987. The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL and set up a process for conducting any necessary corrective actions.

On July 14, 1989, the INEL was proposed for listing on the National Priorities List (NPL) [54 Federal Register (FR) 29820]. The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The final rule that listed the INEL on the NPL was published on November 21, 1989, in 54 FR 44184.

As a result of the INEL's listing on the NPL in November 1989, DOE, EPA, and IDHW entered into the Federal Facility Agreement and Consent Order (FFA/CO) on December 9, 1991.

Pit 9 was identified for an interim action under the FFA/CO. This Record of Decision (ROD) documents the decision to perform that interim action and the remedy selected. The Pit 9 interim action will be evaluated for adequacy as a final remedial action in the TRU-Contaminated Pits and Trenches OU 7-13 Remedial Investigation/Feasibility Study (RI/FS).

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A series of opportunities for public participation in the decision process for an interim action at Pit 9 were provided beginning in November of 1991 for the original Proposed Plan and in October of 1992 for the revised Proposed Plan. These activities were conducted in accordance with public participation requirements of CERCLA 113(k)(2)(B)(i)-(v) and 117. For the public, the activities ranged from receiving a fact sheet and an original and revised Proposed Plan, to having telephone briefings, public informationalmeetings, and public meetings to offer oral or written comments during two separate 60-day public comment periods.

On November 19, 1991, a fact sheet concerning Pit 9 conveyed through a "Dear Citizen" letter was included in a mailing to 5,600 individuals of the general public and 11,700 INEL employees. On November 20, the DOE issued a news release to more than forty news media contacts concerning the availability of the Proposed Plan for Pit 9. Both the letter and news release gave notice to the public that the plan would be available before the beginning of the comment period in the Administrative Record section of INEL Information Repositories located in the INEL Technical Library in Idaho Falls, as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Display advertisements announcing the same information appeared in eight major Idaho newspapers. Advertisements appeared in the following newspapers from November 22 to 27: Post Register (Idaho Falls); Idaho State Journal (Pocatello); South Idaho Press (Burley); Times News (Twin Falls); Idaho Statesman (Boise); Idaho Press Tribune (Nampa); Lewiston Morning Tribune (Lewiston); and Idahonian (Moscow).

Similar display advertisements appeared in local newspapers several days preceding each local meeting to encourage citizens to attend and provide verbal or written comments. All three media-the Dear Citizen letter, news release, and newspaper advertisements-gave public notice of four informational meetings concerning the cleanup of Pit 9 and the beginning of a 30-day public comment period, which was to begin December 4, 1991. Additionally, two radio stations in Idaho Falls and newspapers in Idaho Falls and other communities repeated announcements from the news release to the public at large. A total of seven radio advertisements were made by local stations where meetings were scheduled several days before and the day of the meetings. Personal phone calls concerning the availability of the plan and public meetings were made to individuals, environmental groups, and organizations by INEL outreach office staff in Pocatello, Twin Falls, and Boise. The Community Relations Plan coordinator made calls to people in Idaho Falls and Moscow.

Informational meetings on Pit 9 were held in conjunction with two other scoping investigations proposed for Waste Area Group (WAG) 7 at the RWMC. The meetings were held December 9, 10, 11, and 12, 1991, in Boise, Moscow, Twin Falls, and Idaho Falls, respectively. An informal open house was held one hour prior to each of the meetings to allow the public to informally discuss Pit 9 with IDHW, EPA, and DOE. On the afternoon of December 9, a telephone briefing concerning the Pit 9 Proposed Plan was held between DOE and a resident in Twin Falls.

Copies of the Pit 9 Proposed Plan were distributed to those attending the informational meetings and mailed to 5,600 individuals on the INEL Community Relations Plan mailing list on December 9, 1991. Citizens attending the meetings were informed that the 30-day comment period on the plan would begin December 13, 1991. Copies of the plan and documents in the Administrative Record were made available to the public in six regional INEL Information Repositories: INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Copies of the Administrative Record file for the Pit 9 interim action were placed in the Information Repository sections or at the reference desk in each of the libraries the week of December 9, 1991. Newspaper advertisements were placed in the same eight newspapers noted earlier during the week of December 15, giving notice that the 30-day open public comment period on the plan would run from December 13, 1991, through January 12, 1992. Notice was also given concerning the public meeting scheduled for January 7, 1992, in Idaho Falls to receive verbal comments on the plan. Advertisements concerning this meeting were placed in local newspapers during the first week of January.

An open house was held in Idaho Falls on January 7, 1992, for one hour before the public meeting to allow citizens an opportunity for informal discussion with IDHW, EPA, and DOE representatives concerning Pit 9. During the meeting that followed, representatives from the DOE, EPA, and IDHW discussed the project, answered both verbal and written questions, and received public comments. A court reporter prepared a verbatim transcript of the public meeting. Written comment forms were distributed at the meeting. Both the meeting transcript and written comments were placed in the Administrative Record section of the INEL Information Repositories under

the heading of Pit 9, Operable Unit 7-10.

In response to requests received, the comment period was extended for an additional 30 days through February 11, 1992. On January 14, 1992, a DOE news release was sent to more than forty news media contacts announcing the extension. An additional newspaper display advertisement was placed between January 21 and 23, 1992, with the same eight Idaho newspapers announcing the extension. In addition, a postcard was mailed on January 13, 1992, to each of the 5,600 individuals who had received a copy of the plan to notify them of the extension and to invite written comments.

Regular reports concerning the status of the Pit 9 project were included in the INEL Reporter and mailed to those who attended the meetings and who were on the mailing list. Reports on the Pit 9 project appeared in the March, May, July, and November 1992 issues of the INEL Reporter. Those on the mailing list, those who attended the meetings, and all INEL employees received issues of the INEL Reporter.

After reviewing public comments and learning new details about the processes that could be used in association with the preferred remedialalternative, the agencies concluded that a revised Proposed Plan was warranted. On October 16, 1992, the revised Proposed Plan for Pit 9 was mailed to 5,600 individuals on the mailing list for review and comment. The mailing, along with a DOE news release dated October 19, 1992, and newspaper advertisements, gave the general public notice of the availability of the revised Proposed Plan and public meeting schedule. The notices indicated that the 30-day public comment period would begin October 22 and end on November 21, 1992. Display advertisements were placed in the following papers during the week of October 19, 1992: Post Register (Idaho Falls), Idaho State Journal (Pocatello), South Idaho Press (Burley), Times News (Twin Falls), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and Daily News (Moscow).

Another series of advertisements were placed in the same local papers several days before the public meetings to encourage citizens to attend and comment on the revised Proposed Plan. Additionally, a special feature article in the November issue of the INEL Reporter was mailed to 5,600 individuals on October 30 and November 2, 1992, to remind citizens about the meetings and the opportunity to comment on the revised Proposed Plan.

After the revised Proposed Plan was distributed, the agencies corrected two statements made in the plan. A "Notice of Errors" was placed on the front cover of the November issue of the INEL Reporter and mailed to 5,600 individuals who had earlier received the revised Proposed Plan and to INEL employees on October 30 and November 2. Additionally, an "Errata Sheet" was mentioned at each of the meetings and made available to those attending the meetings.

Personal telephone calls were placed to individuals, environmental groups, and organizations concerning the meetings by INEL outreach office staff to citizens in northern, southwestern, and southeastern Idaho. In the days and weeks leading up to the meetings, local radio stations and newspaperscarried meeting announcements and short descriptions of the revised Proposed Plan.

On November 2, 1992, a telephone briefing concerning the agencies' Proposed Plan for Pit 9 was conducted between the DOE, League of Women Voters of Moscow, and Environmental Defense Institute to describe the revised Proposed Plan and answer questions. IDHW and EPA representatives also participated via conference call.

Public meetings on the revised Proposed Plan were held on November 4, 5, 9, 10, and 12, 1992, in Idaho Falls, Pocatello, Boise, Moscow, and Twin Falls, respectively. An informal open house was held one-half hour before the meeting at each location to allow citizens an opportunity to informally discuss concerns or questions about the Pit 9 project. During the meeting that followed, representatives from the DOE, EPA (with the exception of Twin Falls), and IDHW discussed elements of the revised Proposed Plan, answered questions, and received verbal comments from citizens. Written comment forms, including a postage-paid business reply form, were made available to those attending the meetings. The forms were used to turn in written comments at the meeting and, by some, to mail in comments later. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep a verbatim transcript of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for Pit 9, Operable Unit 7-10, in eight INEL Information Repositories, including the two newest repositories established at the State of Idaho Library in Boise and the Shoshone-Bannock Library at Fort Hall.

On November 12, 1992, the DOE Buried Waste Program Manager participated in a radio talk show in Twin Falls concerning the revised Proposed Plan. The program was broadcast to listeners in the Magic Valley area and focused on Pit 9 information to be discussed in the public meeting that evening.

In response to a public request to extend the comment period, the agencies extended the comment period by 30 days, ending on December 21, 1992. Public notice of the extension included: (a) placing display advertisements in the same seven newspapers that were used to announce the public comment period in October 1992, (b) sending postcard mailings to 5,600 individuals who had received a copy of the revised Proposed Plan and those who attended the meetings, and (c) making personal phone calls to interested parties. These public notifications occurred during the week of November 22, 1992.

A Responsiveness Summary has been prepared for both the original and revised Proposed Plans as part of the ROD. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL is divided into 10 WAGs. The WAGs are further subdivided into operable units (OUs). The RWMC has been designated WAG 7 and consists of 14 OUs. Data from shipping records, along with process knowledge and written correspondence, were available to identify Pit 9 as a potential threat to human health and the environment and to select a remedial technology. Therefore, Pit 9 was designated OU 7-10 to expedite an

interim action.

This interim action is intended to remove the source of contamination to a level that is protective of human health and the environment, to expedite the overall cleanup at the RWMC, and to reduce the risks associated with potential migration of hazardous substances to the Snake River Plain Aquifer. This cleanup will provide information regarding technologies potentially applicable to remediation of similar waste types located at the SDA.

The Pit 9 Process Demonstration, which includes this interim action, is designated as OU 7-10. The Pit 9 interim action is part of the overall strategy for addressing contamination at the RWMC and is expected to be consistent with any planned future actions. By addressing the source of contamination, this interim action is intended to reduce the risks and potential releases associated with the Pit 9 waste including contaminated soil and debris within the physical boundaries of Pit 9. Organic contamination in the vadose zone at the SDA, including past releases from Pit 9, is being evaluated under the OU 7-08 RI/FS. Similarly, radionuclide and metal contamination in the vadose zone at the SDA will be evaluated in OU 7-07. An evaluation of all risks associated with CERCLA activities for all contaminated pits and trenches, including any residual contamination in Pit 9, will be conducted as part of the TRU Contaminated Pits and Trenches OU 7-13 RI/FS. Finally, the cumulative risk associated with CERCLA activities at WAG 7 will be conducted as part of the WAG 7 Comprehensive OU 7-14 RI/FS to ensure that all issues have been addressed adequately.

5. SUMMARY OF SITE CHARACTERISTICS

Pit 9 was operated as a waste disposal pit from November 1967 to June 1969. Approximately 7,079.2 m[3] (250,000 ft[3]) of overburden, 4,247.5 m[3] (150,000 ft[3]) of packaged waste, and 9,910.9 m[3] (350,000 ft[3]) of soil were between and below the buried waste at the time of Pit 9 closure. The pit was excavated to the basalt bedrock, and approximately 1.1 m (3.5 ft) of soil was placed on the bedrock before waste was placed into the pit. Approximately 1.8 m (6 ft) of clean soil overburden is located on top of the buried waste within the one-acre pit. The average depth of the pit from ground surface to the bedrock (i.e., top of the basalt) is approximately 5.3 m (17.5 ft).

While Pit 9 was operational, drums and boxes were generally dumped in the pit by truck or bulldozer. Large items were placed in by crane. Soil cover was applied over the waste after weekly or daily operations, depending on the required procedures at the time of disposal. After the waste was placed in the pit, the pit was backfilled with another layer of soil.

The inventory of contaminants in Pit 9 is based on available shipping records, process knowledge, written correspondence, and the Radioactive Waste Management Information System (RWMIS). The waste in Pit 9 is primarily TRU waste (as defined in 1969, > 10 nCi/g) generated at the Rocky Flats Plant with additional low-level and other miscellaneous wastes from generators located at the INEL. Approximately 3,114.8 m[3] (110,000 ft[3]) of the waste buried in Pit 9 was generated at the Rocky Flats Plant and consisted of drums of sludge (contaminated with a mixture of TRU elements

and organic solvents), drums of assorted solid waste, and cardboard boxes containing empty contaminated drums. Buried at the site were 3,937 drum containers, 2,452 boxes (of which 1,471 boxes contain empty contaminated drums), and 72 unspecified containers of waste. The boxes were generally disposed of at the north end of the pit, and the drums were generally dumped in the south end, although intermixing of containers in the pit did occur as a result of pit flooding in 1969.

Six TRU radionuclides-plutonium (Pu)-238, Pu-239, Pu-240, Pu-241, Pu-242, and americium (Am)-241-compose 99.9% of the radioactivity originally emplaced in Pit 9. Pit 9 also contains the following uranium (U) and thorium (Th) isotopes: U-234, U-235, U-238, and Th-234. Other categories of radionuclides in Pit 9 are mixed activation products (MAPs) and mixed fission products (MFPs). Cobalt (Co)-60 is the MAP and barium (Ba)-137, cesium (Cs)-137, strontium (Sr)-90 and yttrium (Y)-90 are the MFPs. Table 1 summarizes the radiological inventory decay corrected to 1991 and 1992.

Table 2 estimates the organic content of sludge buried in Pit 9, and Table 3 estimates the inorganic compounds in sludge buried in Pit 9. Shipping records indicate that there were 2,106-208.2-L (55-gal) drums of sludge buried in Pit 9 but do not identify the type of 74 Series sludge in each drum. Containers of TRU waste from the Rocky Flats Plant were buried in Pit 9 from February 1968 through September 1968. The 74 Series sludge generated in 1967 and 1968 may have been sent to Pit 9, depending on the holding time of the sludge drums at the Rocky Flats Plant. Therefore, it was assumed that the relative fraction of each sludge type in Pit 9 was equal to the relative fraction of each sludge type generated and packaged in 208.2-L (55-gal) drums at the Rocky Flats Plant in 1967 and 1968.

All 74 Series sludge was placed inside double polyethylene bags within a 208.2-L (55-gal) drum. Series 741 and 742 sludge were wet sludge consisting of water (approximately 50 to 70%) and a precipitate of hydrated oxides of iron, magnesium, aluminum, silicon, plutonium, and americium. Each drum of 741 and 742 sludge was layered with 18.1 to 22.7 kg (40 to 50 lb) of Portland cement to absorb any free liquid. Prior to 1969, at least two 11.3 -kg (25lb) packs of sodium or potassium cyanide pellets were distributed in 742 Series waste drums.

Some drums of 741 sludge contained low concentrations of beryllium, on the order of 1,000 mg/kg [1,000 parts per million (ppm)]. Based on shipping records and process knowledge, an average concentration of beryllium across all drums of 741 sludge was estimated to be 500 mg/kg (500 ppm). The drums of 742 sludge packaged at the Rocky Flats Plant before Pit 9 closure may contain other waste items, such as electric motors, containers of liquid chemical waste, and other materials. Chemical wastes (generally liquids) contained in polyethylene or glass bottles were

periodically included in the 742 Series drums. Before Pit 9 closure, small amounts of contaminated mercury in half-liter bottles were periodically placed in drums. In addition, mercury and lithium batteries were periodically included in these waste drums.

Series 743 sludge consisted of a mixture of 113.6 L (30 gal) of organic liquid and 45.4 kg (100 lb) of calcium silicate along with 4.5 to 9.1 kg (10

to 20 lb) of oil absorbent. The organic liquid was described as consisting of about 47% lathe coolant (60% Texaco Regal oil, 40% carbon tetrachloride), 10% degreasing agents (trichloroethane), and 43% miscellaneous organic compounds consisting of unspecified amounts of carbon tetrachloride; chloroethylenes; hydraulic, gear box, and spindle oils; Freon; Varsol; and trace amounts of laboratory wastes (organophosphates, nitrobenzene). In addition, an unknown amount of oil contaminated with polychlorinated biphenyls (PCBs) was processed with the other organic wastes in 743 sludge. Low concentrations of beryllium are present in some of the Series 743 sludge.

In each drum containing Series 744 sludge, approximately 98.4 L (26 gal) of waste were mixed with 86.2 kg (190 lb) of Portland cement and 22.7 kg (50 lb) of magnesia cement. Approximately 4.5 to 6.8 kg (10 to 15 lb) of additional Portland cement was placed on top of the cement mixture before sealing in a plastic bag. The contents of Series 745 sludge are described to be 60% sodium nitrate, 30% potassium nitrate, and 10% miscellaneous. The miscellaneous mass consisted of organic wastes and used items. Examples of the miscellaneous contents are odds and ends like rags, paper, and gloves, and organic compounds like alcohols, organic acids, and ethylenediaminetetraacetic acid (EDTA).

The types and estimated quantities of organics and inorganics in the sludge shipped to INEL and buried in Pit 9 are listed in Tables 2 and 3,respectively. A number of items identified as atypical waste. For example, the presence of a 1.8 m (6 ft) steel vault in Pit 9 has been reported. A large PM-2A carbon steel reactor vessel weighing approximately 100,000 kg (220,462 lb) and sized into 12 sections with a total container volume of 243.5 m[3] (8,600 ft[3]) is in Pit 9. Approximately 399.2 kg (880 lb) of asbestos may be in the pit. The asbestos was buried in containers with other materials, and the exact composition of the materials in the containers is unknown.

The condition of other layers of waste containment, such as plastic bags and liners, in the drums and boxes is unknown. Earlier retrieval efforts from other locations in the RWMC and Pit 9 did observe some leaking containers indicating unabsorbed or desorbed free liquid in drums.

Pit 9 does not lie in a floodplain. However, in 1969, local runoff from rapid spring thaws caused flooding that covered part of the SDA with water for a few days. During this flooding event, Pit 9 was partly open and meltwater filled the pit. Subsequent flooding events were contained in the SDA in areas away from Pit 9. A 4.6-m (15-ft) dike has since been built around the SDA to prevent future flooding.

Two subsidence events at Pit 9 have occurred since pit closure. In 1985, 9.9 m[3] (351 ft[3]) of soil and in 1987, 0.06 m[3] (2ft[3]) of soil were added to the surface of Pit 9 to fill a localized depression. In both cases, soil placement occurred near the center of the pit area to eliminate local low spots where water and snow could accumulate.

6. SUMMARY OF SITE RISKS

The National Contingency Plan (NCP) expresses a preference for early

response action where the action will expedite the completion of total Site cleanup. This preference has also been incorporated into the FFA/CO. The primary objective of the interim action at Pit 9 is to reduce the potentialfor migration of Pit 9 contaminants into the environment. The Pit 9 interim action will stabilize the site, prevent further degradation, and achieve risk reductions; thus, the interim action advances the goal of expediting total Site cleanup. A baseline risk assessment will be performed as part of the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS in order to quantify the residual risks associated with contamination in Pit 9 at postremediated levels. In addition, an ecological risk assessment characterizing risks to the environment will be conducted as a part of the Comprehensive WAG 7 OU 7-14 RI/FS.

Subsurface monitoring at the RWMC to determine if radionuclides, or other hazardous contaminants, had migrated into the subsurface began in the early 1970s and is currently ongoing. Analytical results indicate that minute amounts of man-made radionuclides have migrated from the SDA toward the Snake River Plain Aquifer (SRPA). An independent review of all analytical data from core drilling in the basalt below the SDA supports the conclusion that americium-241, cobalt-60, plutonium-238, plutonium-239, and plutonium-240 are present in the clay/soil interbed sediments 33.5 m (110 ft) below the surface. The results of the data analyses do not support the presence of man-made radionuclides in the discontinuous interbed at 9.1 m (30 ft) below ground level nor the clay/soil interbed sediments at 73.2 m (240 ft) below ground level. The report titled Compilation and Summarization of the Subsurface Disposal Area Radionuclide Transport Data at the Radioactive Waste Management Complex contains the results of the data analyses.

The ranges of concentrations encountered in the drilling programs are listed below:

- The concentrations of americium-241 observed ranged from 1.3 x 10[-5] 0.3 x 10[-5] to 9.08 x 10[-4] 0.07 x 10[-4] nCi/g.

- ù The concentrations of cobalt-60 observed ranged from 5.2 x 10[-5] 1.7 x 10[-5] to 2.8 x 10[-4] 0.2 x 10[-4] nCi/g.

- The concentration of plutonium-238 observed ranged from 1.18 x 10[-6] 0.17 x 10[-6] to 1.7 x 10[-5] 0.2 x 10[-5] nCi/g.

- The concentrations of plutonium-239, -240 observed ranged from 1.0 x 10[-5] 0.0 to 7.4 x 10[-4] 0.4 x 10[-4] nCi/g.

The presence of these radionuclides are likely attributed to waste buried at the SDA since the concentrations observed are significantly above background concentrations.

Trace levels of volatile organic compounds (VOCs) have been detected in samples from the SRPA near the RWMC. Detectable quantities of carbon tetrachloride, chloroform, 1,1,1-trichlorethane, and trichloroethylene were found in several RWMC wells. The 1987 analysis indicated carbon tetrachloride was present at a concentration of 6 g/L (ppb). Carbon tetrachloride was the only volatile organic contaminant found above the maximum concentration level (MCL) [5 g/L (ppb)]. In 1990 and 1991, RWMC

groundwater monitoring data from the USGS indicated that current levels of volatile organic contaminants are below proposed and established maximum contaminant levels established by the Safe Drinking Water Act. Organic contamination in the vadose zone at the SDA will be evaluated in the OU 7-08 RI/FS and remedial action undertaken, if necessary.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the interim remedial action selected in this ROD, may present a current or future threat to public health, welfare, or the environment because of the potential for radioactive and hazardous material from wastes within Pit 9 to contaminate the SRPA. This interim action will reduce the potential for releases to the environment through treatment and/or containment of the contents of Pit 9. 7. DESCRIPTION OF ALTERNATIVES

SUMMARY OF REMEDIAL ACTION OBJECTIVES

This interim action will use treatment to address the principal threats associated with Pit 9 by treating Pit 9 waste source material including contaminated soil and debris within the physical boundaries of the pit.

Approximately 14,158.4 m[3] (500,000 ft[3])of soil and other material in Pit 9 are estimated to be contaminated with RCRA hazardous waste and TRU radionuclides. It is estimated that 7,079.2 m[3] (250,000 ft[3]) of material contains 10 nCi/g TRU and would not undergo treatment. This material would not be removed from the area of contamination (AOC) (typically delineated by the areal extent of contamination). Materials 10 nCi/g would remain in the pit consistent with current LLW disposal practices at the SDA. In the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS, the baseline risk assessment will evaluate the residual risk associated with the material remaining in the pit or returned to the pit to demonstrate that residual contamination in Pit 9 is protective of human health and the environment.

For Untreated Wastes Remaining in the Pit

RCRA closure requirements are applicable when (a) the waste is hazardous; and (b) the unit (or AOC) received the waste after RCRA requirements became effective. As such, RCRA closure requirements are not applicable to the untreated waste that remains in the pit or the AOC. However, certain RCRA closure requirements in 40 CFR Subpart N, specifically 264.310, are considered to be relevant and appropriate. Because the residual contamination in the pit may pose a direct contact threat but does not pose a groundwater threat, relevant and appropriate requirements include: (a) a cover, which may be permeable, to address the direct contact threat; (b) limited longterm management including site and cover maintenance and groundwater monitoring; and (c) institutional controls (e.g., land-use restrictions or deednotices) to restrict access.

Alternatives 3 and 4 will result in some untreated wastes remaining in the pit and would be subject to the requirements described in this paragraph. Although Alternative 2 involves essentially treating in place all waste materials in Pit 9 by application of an in situ vitrification process, some wastes will still remain following that treatment. Therefore, Alternative 2

will also be subject to the requirements described in this paragraph for the untreated wastes remaining in the pit.

For Treated Waste 10 nCi/g TRU to be Returned to the Pit

For waste that is expected to undergo treatment, LDR requirements are potentially applicable when the Pit 9 wastes are excavated and placed into a separate treatment unit. To date, EPA has specified the use of specific treatment technologies or numerical standards for four subcategories of characteristic wastes: toxicity characteristic leachate procedure (TCLP) pesticides, reactive sulfides, reactive cyanides, and ignitable liquid nonwastewater wastes. None of these types of characteristic wastes have been identified in the Pit 9 wastes. For all other characteristic wastes, including those in Pit 9, demonstrating that the waste is no longer characteristic (i.e., the waste no longer exhibits any of the characteristics outlined in 40 CFR 261 Subpart C) complies with LDR requirements.

The residuals resulting from the treatment process would still be defined as listed wastes under RCRA. However, delisting is the compliance option that will be used to meet LDR requirements. Delisting requires a demonstration that the wastes meet risk-based levels and no longer present a threat to the public or the environment. In addition, the wastes would be treated to meet characteristic hazardous waste standards in accordance with 40 CFR 261 Subpart C. Treatment residuals to be managed onsite as part of the Pit 9 interim action that are treated to the levels specified in Table 4 are being delisted through this ROD and satisfy the substantive requirements of 40 CFR 260.20 and .22 and A Guide to Delisting of RCRA Wastes for Superfund Remedial Responses, OSWER Superfund Publication 9347.3-09FS, September 1990. The delisting levels were developed through use of the EPACML model (refer to 56 FR July 19, 1991; 58 FR December 30, 1991), the Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions Submitted under 40 CFR 260.20 and .22, July 1992; and Use of EPACML for Delisting, undated. The results of the POP and LPT tests will be used to demonstrate the ability of the treatment processes to meet the treatment standards.

Wastes that meet delisting levels and characteristic hazardous waste standards exit the RCRA hazardous waste management system, and LDRs and RCRA Subtitle C requirements are no longer applicable. Because RCRA Subtitle C requirements are not ARARs, these treatment residuals could be managed as solid wastes under RCRA Subtitle D. However, as discussed previously, certain RCRA closure requirements in 40 CFR 264 Subpart N are considered to be relevant and appropriate with respect to the untreated waste materials remaining in the pit. Since Pit 9 will be closed in accordance with the relevant and appropriate requirements of 40 CFR 264.310, the treated residual being returned to the pit (that contains 10 nCi/g TRU and has met delisting and characteristic hazardous waste standards) would also be managed in accordance with these closure standards.

Alternative 4 is the only alternative that would involve return of treated waste residual 10 nCi/g TRU to Pit 9. Therefore, the requirements described in this paragraph apply to this alternative.

For Concentrated Waste Residuals > 10 nCi/g TRU to Be Stored Awaiting Final Disposal

The treatment goal for the concentrated waste residuals that are > 10 nCi/g is to achieve LDR BDAT levels. Table 5 identifies the LDR prohibited wastes at Pit 9 along with the appropriate LDR standard. However, if these LDR standards are not achieved, the concentrated waste residual will be temporarily stored onsite consistent with LDR storage requirements pending a final decision on its ultimate disposition in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS. Temporary storage used during CERCLA actions to facilitate proper disposal, e.g., while selecting and designing a remedy (under the TRUContaminated Pits and Trenches RI/FS), is allowable storage under LDR storage requirements (Superfund LDR Guide #1, Overview of RCRA Land Disposal Restrictions, OSWER Superfund Publication 9347.01FS, July 1989).

Alternatives 3 and 4 will both involve treatment of excavated Pit 9 wastes followed by storage of concentrated waste residual > 10 nCi/g TRU. Alternative 5 will involve storage of all waste material from excavation of Pit 9, but does not involve treatment prior to storage. This stored waste material under all three of these alternatives is subject to the LDR treatment goal described above. All three of these alternatives will involve temporary storage onsite as described in this paragraph.

Description of Alternatives

The interim action alternatives evaluated for cleanup of Pit 9 are as follows:

Alternative 1 - No Action

Alternative 2 - In Situ Vitrification (ISV)

Alternative 3 - Ex Situ Vitrification (ESV)

Alternative 4 - Physical Separation/Chemical Extraction/Stabilization Process

Alternative 5 - Complete Removal, Storage, and Offsite Disposal.

Section 121 of CERCLA mandates that remedies be protective of human health and the environment. In addition, the remedies should use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical and be cost-effective.

Cleanup standards for remedial actions must meet any applicable or relevant and appropriate requirements (ARARs). For alternatives that meet those criteria, a more detailed evaluation was conducted. Implementation of the interim remedial action is contingent upon the successful demonstration of a costeffective technology that meets the cleanup criteria.

Alternative 1 - No Action

The No Action alternative leaves the Site in its current state. This option

does nothing to restrict future access to the Site or restrict the pathways through which the contaminants may be transported. This alternative is included, as required by CERCLA, to establish a baseline for comparison. No cost or implementation time is involved with this alternative. Under No Action, no further action would be taken until Pit 9 is evaluated under the TRU-Contaminated Pits and Trenches RI/FS.

Alternative 2 - In Situ Vitrification

In situ vitrification is a process in which the contaminated material is heated to its melting temperature then allowed to cool and solidify to a solid, stable mass that has properties similar to glass. In the ISV process, electricity is applied to electrodes placed in the ground over the waste mass. Electrical current flowing between the electrodes heats the adjacent soil to temperatures above 1,600 C (2,912 F). As the high-temperature melt moves slowly downward and outward through the contaminated solids [3,628.7 to 5,443.1 kg/hr (4 to 6 tons/hr), yielding an advance rate of 2.5 to 5.1 cm/hr (1 to 2 in./hr)], the solids and contaminants undergo physical changes and decomposition reactions including chemical or thermal destruction (organics) and chemicalor physical incorporation within the resulting mass of fused material (inorganics). A hood to catch gases is placed over the zone, and the gases are treated or removed to prevent air releases. In theory, the radionuclides (i.e., americium and plutonium) would be trapped by the surrounding vitrified mass.

Five major subsystems comprise the process equipment to perform ISV: (a) electrical power supply, (b) off-gas hood, (c) off-gas treatment, (d) off-gas support, and (e) process control. Except for the off-gas hood, all components are contained in three transportable trailers. The off-gas hood and off-gas line are installed at Pit 9 for collecting gaseous effluent.

Under this alternative, Pit 9 would not be excavated. The entire pit would be vitrified in place from the surface down approximately 5.3 m (17.5 ft) to bedrock. Vitrification of the pit would result in a volume reduction of the contents causing subsidence on the surface of the pit. After vitrification, the pit would be backfilled to ground surface with clean INEL soil.

Institutional controls such as access/land use restrictions will continue to be implemented under this alternative to aid in protecting human health and the environment. These restrictions would reduce the likelihood of the occurrence of onsite activities that allow direct exposure to contaminants in Pit 9.

Uncertainties associated with the effectiveness of ISV include its effectiveness on heterogeneous materials such as those in Pit 9 and the ability to confirm complete vitrification/stabilization of the pit contents. Some of the specific difficulties with ISV are: (a) gases generated from combustible materials (i.e., wood, cardboard, and combustible organic liquids) may carry contaminants to the glass surface and away from the melt with the potential for overwhelming the off-gas system; (b) metals such as mercury and cadmium may be undesirable because of their inability to incorporate into the melt, or a reduction of product quality because of the metals; (c) a potential for contaminants to migrate into the surrounding soil preceding the melt during vitrification; and (d) a possibility for

shorting between the electrodes because of the presence of metals in the pit materials resulting in incomplete vitrification.

Table 7 presents a summary of the major ARARs for Alternative 2.

The estimated costs for this alternative are presented in Table 6. For Alternative 2, operations and maintenance costs are $6,563,000; capital costs are $22,837,000; and there are no long-term storage/offsite disposal costs since the material remains in the pit. The cost estimate basis is contained in Engineering Design File ERD-BWP-076, "Pit 9 Comprehensive Demonstration Project Cost Estimate Basis of Alternatives Listed in the Revised Proposed Plan" and EGG-WM-10153, Summary of Conceptual Cost for Pit 9. These documents are in the Administrative Record. It is estimated that Alternative 2 would achieve remedial objectives in approximately 2 to 4 years for a mature process. Since a mature process is not presently available, additional research and development time would be required.

Alternative 3 - Ex Situ Vitrification

Ex situ vitrification could also be performed on excavated materials onsite in an ESV unit. The vitrification process would be similar to that described above although the wastes would be excavated from the pit, vitrified in a plasma arc ex situ heating unit, and containerized and stored onsite until permanent storage is available. Excavation of the wastes would take place in a double-contained structure using a remotely operated excavator. The excavated materials would be sized and screened to provide a uniform feed material for the vitrification unit. Wastes that were unsuitable for vitrification (i.e., nuclear reactor vessel) would be left in the pit.

Plasma heating is an electrical heating process that relies on the conversion of a gas into a plasma through the application of energy by an electric arc. Plasma would be created by passing a gas through an electrical arc. Gases used in generating a plasma arc include nitrogen, oxygen, noble gases, air, and mixtures of these gases. Plasma heating offers high operating temperatures and high power densities. The temperature of the plasma would be about 1,093.3 C (2,000 F). Organics and other volatiles emitted during the plasma heating process pass from the reactor chamber to a secondary combustion chamber into which an oxidizing gas is added, allowing for further destruction of any organics remaining in the gas phase. Resulting off-gases are then transferred to an off-gas treatment system to ensure safe emissions.

The treatment process will be able to handle approximately 54,431.1 kg/day (60 tons/day). The amount of material that would be treated is estimated to be 7,079.2 m[3] (250,000 ft[3]). If a 50% volume reduction is achieved through ESV, then approximately 3,539.6 m[3] (125,000 ft[3]) [approximately 18,000-208.2-L (55-gal) drum-equivalents] of concentrated waste residual would result from the treatment process and would be stored onsite pending final disposal.

Institutional controls such as access/land use restrictions will continue to be implemented under this alternative to aid in protecting human health and the environment. These restrictions would reduce the likelihood of the

occurrence of onsite activities that allow direct exposure to contaminants in Pit 9.

Uncertainties associated with the effectiveness of ESV include the following items that may limit the effectiveness of vitrification and excavation of the pit: operation of the plasma melter, feed moisture content, feed material composition, feed compatibility, presence of combustible material, potential volatilization of contaminants, potential shorting caused by metals, and reliable operation of the remote excavators. Other uncertainties involved with ESV are that metals such as mercury and cadmium may be undesirable because of their inability to incorporate into the melt, or a reduction of product quality because of the metals, and the length of time the waste will be stored and managed pending final disposal.

Table 7 presents a summary of the major ARARs for Alternative 3.

The estimated costs for this alternative are presented in Table 6. For Alternative 3, Operations and Maintenance Costs are $4,063,000; capital costs are $25,337,000; and long-term storage/offsite disposal costs are $130,815,000. The cost estimate basis is contained in Engineering Design File ERD-BWP-076, "Pit 9 Comprehensive Demonstration Project Cost Estimate Basis of Alternatives Listed in the Revised Proposal Plan" and EGG-WM-10153, Summary of Conceptual Cost for Pit 9. These documents are in the Administrative Record. It is estimated that Alternative 3 would achieve remedial objectives in approximately 3 to 4 years for a mature process. Since a mature process is not presently available, additional research and development time would be required.

Alternative 4 - Physical Separation/Chemical Extraction/Stabilization Process

Remediation of Pit 9 under this alternative would consist of the following steps: (a) physical separation, (b) treatment, and (c) stabilization. In response to a DOE request for proposals issued in November 1991, DOE received two suitable subcontractor proposals consisting of unique combinations of chemical extraction, physical separation, and stabilization components. The actual remedial process implemented may consist of a single subcontractor process, or combination of subcontractor process elements, and will be chosen on the basis of its ability to achieve technical performance requirements as well as on its cost-effectiveness. A detailed description of Alternative 4 is contained in Section 9 of this ROD.

Under Alternative 4, Pit 9 would be remotely excavated in a doublecontained structure that would be built over the pit. The contaminated materials requiring treatment would be physically separated into waste streams. The separated waste streams would then be placed in the appropriate processing units. Additional physical separation would occur using mechanical methods such as flotation, gravity concentration, sedimentation, and filtration to separate mixtures of solids and concentrate the contaminants. In addition, chemical extraction processes would be used to remove contaminants. The objective of the separation technology is to remove the organic contaminants and concentrate the radioactive contaminants in heavy metals by chemical extraction or physical separation, with the aim of reducing the volume of waste requiring disposal. Alternative 4 would also include a stabilization

process that would consist of a thermal processing unit similar to the plasma heating unit described under Alternative 3, or an alternate solidification process.

The amount of material that would be treated is estimated to be 7,079.2 m[3] (250,000 ft[3]). The treatment process will be able to handle approximately 54,431.1 kg/day (60 tons/day). The volume of concentrated waste residual will be approximately 10% of the 7,079.2 m[3] (250,000 ft[3]) of waste that is treated [approximately 3,600-208.2-L (55-gal) drum-equivalents] and would be stored onsite pending final disposal.

Institutional controls such as access/land use restrictions will continue to be implemented under this alternative to aid in protecting human health and the environment. These restrictions would reduce the likelihood of the occurrence of onsite activities that allow direct exposure to contaminants in Pit 9. Uncertainties with this alternative are associated with operation of the remote excavators, plasma melter (see uncertainties listed under Alternative 3), ability of the chemical separation processes to achieve the 10 nCi/g TRU criteria, and length of time the waste will be stored and managed pending final disposal. These processes will be tested to demonstrate their reliability in a proof-of-process (POP) test and a limited production test (LPT). A determination to proceed with the interim action will be made based on the results of the POP and LPT. Initiation of the action is contingent upon the successful demonstration of a cost-effective technology that meets the cleanup criteria.

Table 7 presents a summary of the major ARARs for Alternative 4.

The estimated costs for this alternative are presented in Table 6. For Alternative 4, Operations and Maintenance Costs are $29,102,000; capital costs are $20,661,000; and long-term storage/offsite disposal costs are $61,950,000. The cost estimate basis is contained in Engineering Design File ERD-BWP-076, "Pit 9 Comprehensive Demonstration Project Cost Estimate Basis of Alternatives Listed in the Revised Proposal Plan" and EGG-WM-10153, Summary of Conceptual Cost for Pit 9. These documents are in the Administrative Record. It is estimated that Alternative 4 would achieve remedial objectives approximately in 3 to 4 years.

Alternative 5 - Complete Removal, Storage, and Offsite Disposal

This alternative would require the complete removal of all the waste and contaminated soil within Pit 9. Approximately 14,158.4 m[3] (500,000 ft[3]) of soil and waste that are contaminated with TRU and RCRA hazardous waste would be excavated, containerized, and stored as part of Alternative 5. Excavation or the pit would occur in a double containment building using remotely operated excavators. The waste would then be placed in interim storage onsite pending final disposal.

RCRA Closure requirements are applicable when: (a) the waste is hazardous; and (b) the unit (or AOC) received the waste for disposal after RCRA requirements became effective. As such, RCRA closure requirements are not applicable to the waste that was disposed of in Pit 9 from 1967 through 1969. However, certain RCRA closure requirements, specifically Subpart G 40 CFR 264.111 and Subpart L 40 CFR 264.258, are considered to be relevant and

appropriate. The complete removal of all hazardous waste and hazardous waste residue from Pit 9 would constitute clean closure under RCRA Subtitle C Part 264 and is used when leachate will not impact the groundwater and the site does not pose a direct contact threat. Clean closure standards assume there will be unrestricted use of the site and no maintenance is required after the closure has been completed; therefore, no covers or long-term management are required.

Uncertainties with this alternative are the risks associated with operation of the remote excavators and with storing the entire hazardous waste contents of the pit, untreated, at the SDA. Other uncertainties involve the length of time waste must be stored and managed, pending the availability of offsite treatment and disposal; availability of treatment capacity prior to final disposal; and a potential lack of availability of offsite disposal locations.

Table 7 presents a summary of the major ARARs for Alternative 5.

The estimated costs for this alternative are presented in Table 6. For Alternative 5, Operations and Maintenance Costs are $59,660,000; capital costs are $26,768,000; and long-term storage/offsite disposal costs are $261,623,000. The cost estimate basis is contained in Engineering Design File ERD-BWP-076, "Pit 9 Comprehensive Demonstration Project Cost Estimate Basis of Alternatives Listed in the Revised Proposal Plan" and EGG-WM-10153; Summary of Conceptual Cost for Pit 9. These documents are in the Administrative Record. It is anticipated that all material would be in temporary storage awaiting a decision on final disposition in approximately 2 to 4 years.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires that each remedial alternative be compared according to nine criteria. Those criteria are subdivided into three categories: (a) threshold criteria that relate directly to statutory findings and must be satisfied by each chosen alternative; (b) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction of toxicity, mobility, and volume, and cost; and (c) two modifying criteria that measure the acceptability of the alternatives to State agencies and the community. The following sections summarize the evaluation of the candidate remedial alternatives according to these criteria.

Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the ROD. The threshold criteria must be met for a final remedial action (unless an ARARs waiver is invoked), and this interim action is intended to meet those criteria, if possible. The effectiveness of this remedial action will be evaluated in both the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS and in the WAG 7 Comprehensive OU 7-14 RI/FS.

Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

A primary purpose of this interim action is to reduce the risksassociated with potential migration of Pit 9 wastes to the Snake River Plain Aquifer. Alternatives 2, 3, 4, and 5 would reduce the possibility of migration of contaminants, thus reducing the risk of exposure to the public and the environment. Alternatives 2, 3, 4, and 5 would be designed to provide long-term protection to the public and the environment although the long-term effectiveness of Alternative 2 has not been proven, and currently no offsite disposal facilities are available for treatment residuals or wastes from Alternatives 3, 4, and 5. With the exception of No Action, all alternatives would provide adequate overall protection of human health and the environment by minimizing potential contaminant migration from Pit 9.

Institutional controls such as access/land use restrictions will continue to be implemented under Alternatives 2, 3, and 4 to aid in protecting human health and the environment. These restrictions would reduce the occurrence of onsite activities that allow direct exposure to contaminants in Pit 9.

Compliance with Applicable or Relevant and Appropriate Requirements

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with Federal and State laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable but are relevant and appropriate, in other words, requirements that pertain to situations sufficiently similar to those encountered at a Superfund site so that their use is well suited to the site. Combined, these are referred to as ARARs. State ARARs are limited to those requirements that are: (a) promulgated, (b) uniformly applied, and (c) more stringent than Federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical, location, and action-specific ARARs, or justification for a waiver.

All alternatives (with the exception of no action) would be designed to meet ARARs of Federal and State environmental laws as identified in the previous discussion of each alternative. Section 7 of this ROD identifies the major ARARs for each of the remedial alternatives.

DOE orders that are to-be-considered (TBC) guidance for the Pit 9 interim action include DOE 5820.2A and DOE 5400.5. DOE 5820.2A, "Radioactive Waste Management," establishes standards for "external exposure to the waste and concentration of radioactive material that may be released into surface water, groundwater, soil, plants, and animals results in an effective dose equivalent that does not exceed 25 mrem/year to any member of the public ... and assures that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/year for a continuous exposure or 500 mrem/year for a single acute exposure."

DOE 5400.5, "Radiation Protection of the Public and the Environment," establishes standards and requirements for operations of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.

Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Each alternative is evaluated using all of the balancing criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the Site. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Each criterion is further explained in the following sections. Table 8 includes a summary of the comparative analysis, or relative ranking, of the alternatives.

Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternative 4 includes waste reduction through physical separation/chemical extraction before stabilizing the waste and, therefore, results in a smaller volume of residuals requiring long-term monitoring than Alternatives 2, 3, or 5. Currently no disposal facilities are available for disposal of the concentrated treatment residuals from Alternatives 3, 4, and 5. The materials would be stored until such a disposal facility becomes available. The longterm protectiveness and permanence of Alternative 2 is not well defined at this time because of uncertainties and difficulty in evaluating the effectiveness of ISV on the heterogeneous wastes found in Pit 9. Alternative 2 would require analysis of the treatment residuals in the pit to confirm complete vitrification of the pit contents and to evaluate long-term effectiveness and permanence. Under Alternatives 3 and 4, wastes and materials in the pit that contain 10 nCi/g TRU would remain in the pit and not be treated. The risks that result from the 10 nCi/g TRU-contaminated material and the other hazardous waste in the pit will be

quantified in the baseline risk assessment to be performed under the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS. Alternative 5 does not reduce the amount of contamination until the materials are treated and disposed. Alternatives 3, 4, and 5 require extensive long-term management and monitoring of the stored waste. The amount of waste under Alternative 5 [14,158.4 m[3] (500,000 ft[3])] that requires long-term management and monitoring is approximately twenty times that of Alternative 4 [7,620 m[3] (25,000 ft[3])] and four times that of Alternative 3 [3,539.6 m[3] (125,000 ft[3])]. In addition, there is a high degree of uncertainty associated with the availability of a disposal facility that would be able to accept untreated mixed waste. Alternative 1 does not address the potential threat to the Snake River Plain Aquifer posed by the contaminants in Pit 9.

Transport modeling was conducted for the 10 nCi/g TRU residuals that will be

left in or returned to Pit 9 after remediation to evaluate potential contaminant migration to the aquifer. This modeling indicates that the Safe Drinking Water Act standard for gross alpha of 15 pCi/L will not be exceeded if a 0.6-m (2-ft) layer of clean soil with a linear sorption coefficient (k[d]) of at least 500 mL/g is added to the bottom of the pit and if the pit is backfilled to grade with clean INEL soil. The transport modeling is described in Engineering Design File RWMC-92-005, "GWSCREEN Modeling for the Pit 9 Project Sensitivity to K[d] in the Source and Attenuation Layer," and is included in the Administrative Record.

The Pit 9 Residual Risk Assessment in the Administrative Record evaluated potential residual human health risks from 10 nCi/g TRU residuals left in the pit after the cleanup. Modeling of radionuclide transport to the Snake River Plain Aquifer indicated that radionuclides from Pit 9 are not expected to migrate to the aquifer during the evaluated time period of 1,000 years. The preliminary evaluation also indicated the highest risk to human health occurred after the 100-year institutional control period due to plants and burrowing animals providing a mechanism to move waste up to the surface. The preliminary evaluation indicated that cancer risks from the surface pathway were below the target risk range listed in the NCP of 1 additional cancer per ten thousand to 1 additional cancer per one million. These risks were calculated for a receptor living at the edge of Pit 9. The residual risk assessment assumed the pit would be backfilled with clean soil after remediation. To ensure that this interim action is successful in reducing risk to levels protective of human health and the environment, residual contamination will be reevaluated in the baseline risk assessment to be performed as part of the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Evaluation of alternatives based on the reduction of toxicity, mobility, or volume through treatment requires analysis of the following factors: treatment process used; toxicity and nature of the material treated; amount of hazardous material destroyed or treated; irreversibility of the treatment; type and quantity of treatment byproducts; and statutory preference for treatment as a principal element.

Alternatives 2, 3, and 4 include treatment processes that would address the principal threats from Pit 9. Alternative 4 adds physical separation/chemical extraction to the stabilization treatment and, therefore, achieves a greater reduction in waste volume and toxicity before stabilization of the reduced waste stream. Alternative 4 also results in a smaller volume of treatment residuals. Alternatives 2 and 3 reduce toxicity, mobility, and volume but to a lesser degree than Alternative 4. Alternatives 1 and 5 do not treat the principal threats and do not reduce the toxicity, mobility, or volume of the waste through treatment until the waste is moved offsite for treatment and disposal. The results of this evaluation are summarized in Table 8.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

All alternatives would be implemented using available engineering controls to protect workers and the public during implementation of the remedy. Alternative 2 does not require excavation of the waste material but would require significant additional study before full-scale remediation and an increased time until cleanup objectives are achieved. Alternatives 3 and 4 both require excavation and handling of the waste but require less study and development before full-scale remediation. Alternatives 3, 4, and 5 require interim storage of the treatment residuals pending availability of a disposal facility.

The proposed action includes provisions to protect workers and members of the public during routine excavation, retrieval, and waste treatment operations that would be conducted at Pit 9. During all operations, air emission controlling systems would keep releases of contaminants to within applicable State and Federal requirements. Construction and routine operational activities would proceed according to regulations of the Occupational Safety and Health Act (OSHA) regulations (29 CFR 1900-1999). Worker exposures would be in compliance with DOE and occupational safety requirements. Exposure to radioactivity would be as low as reasonably achievable (ALARA) and below the radiation protection standards set forth in DOE orders. The use of robotics and extensive monitoring equipment would minimize the risk to workers and the public. The work environment would be monitored and personnel and area exposure monitoring data would be obtained to verify that workplace air contaminant levels are below those prescribed by the American Conference of Governmental Industrial Hygienists (ACGIH), OSHA, and applicable DOE standards. To ensure regulatory compliance, the proposed action was evaluated for potential impactsand consequences that could result from routine operations associated with the cleanup of Pit 9 wastes.

This evaluation is intended to provide a reasonable upper bound of potential impacts; therefore, the source terms for activities are based on conservative assumptions. The activities that were evaluated were those associated with the excavation of material from Pit 9 and the incineration of the waste. Excavation was selected because it is common to both processes and could result in airborne emissions of radiological and nonradiological hazardous constituents. Incineration of the waste was evaluated because it provided a reasonable upper bound for the treatment processes under consideration. The following sections identify consequences of the routine operations.

For routine operations, radiological and nonradiological impacts were evaluated for (a) a worker at 100 m (328 ft) from Pit 9; (b) a member of the public visiting the Experimental Breeder Reactor I (EBR-I) Historic Landmark, 2.9 km (1.8 mi) east northeast of the RWMC; and (c) a member of the public at the nearest INEL site boundary, 5.9 km (3.7 mi) south southwest of the RWMC. A minimum distance of 100 m (328 ft) is frequently used in environmental impact analysis modeling because Gaussian equations used in most dispersion codes are not intended, nor do they function

properly, for determining impacts to people closer than 100 m (328 ft). Furthermore, elevated releases such as from high stacks or from lower stacks with high exit velocity will typically not reach ground level for a considerable distance downwind.

Airborne emissions of radiological and nonradiological hazardous constituents of retrieved wastes/soil, during both retrieval and treatment processes, would represent the greatest potential environmental impacts from the proposed action. Modeling has been conducted to determine the potential impacts to air quality from waste retrieval and treatment. This modeling determined thatimpacts to air quality from excavation and treatment of Pit 9 wastes would be well within Clean Air Act Standards and occupational exposure limits. Likewise, doses to the public and workers from radionuclide releases would be well below limits set by the NESHAPs. Releases would be minimized by various control measures, including dust suppression and use of high-efficiency particulate air (HEPA) filters and other filtration (e.g., carbon bed) of airborne effluents from the retrieval enclosure.

Confinement systems and contamination controls would be developed to minimize contaminant releases during cleanup of the pit. Excavation of Pit 9 would take place within a double confinement structure. The operations and processes would be controlled remotely. Devices would be used to detect and monitor radioactive and hazardous materials within and around the buildings.

Conservative assumptions were used to estimate releases to the atmosphere when excavating the pit (see page 12 of the revised Proposed Plan). Two HEPA filters were assumed for emissions calculations but more may be used during remediation. Also, air emissions control equipment such as activated carbon filters for removing VOCs are planned for actual operations but were not considered in emissions calculations. Each HEPA filter has a removal efficiency of 99.97%, but 99% efficiency was assumed for the model. Similar conservative assumptions were used to estimate releases from incineration of retrieved wastes and soil. This analysis is intended to determine the maximum potential risk.

Estimated health risks to workers outside the retrieval enclosure [100 m (328 ft)] and to the maximum exposed individual (MEI) from routine Pit 9 operations are presented in Table 9. The MEI is a hypothetical member of the public living at the nearest INEL boundary and who would receive maximum air concentrations of contaminants released from the proposed project (as identified by air dispersion modeling).

For the purpose of estimating the health and safety impacts of routine operations, hazard indices (HIs), nonradiological carcinogenic risks, and radiological cancer risk are used. Those exposed would include Pit 9 workers, other RWMC workers, MEI at the INEL boundary, and the general public. HIs [the sum of the hazard quotients (HQs) (EPA, 1989a)] for a remedial worker and for the MEI are listed in Table 9. Each HQ was calculated using one of two methods, depending upon the receptor. For the worker at 100 m (328 ft), the ambient concentrations of hazardous constituents were divided by appropriate ACGIH threshold limit values (TLVs). For the MEI, the ambient concentrations of nonradiological hazardous constituents were divided by onehundredth of the appropriate TLV,

a guideline that the IDHW has recently set for granting permits to construct, modify, or operate air pollution sources (Idaho Air Quality Bureau, 1989).

A HI > 1 implies that the ambient concentration would result in an unacceptable health risk to workers or members of the general public at the exposure point. Conversely, a HI < 1 implies that ambient concentrations of hazardous substances would result in an acceptable noncarcinogenic health risk at the exposure point. The HIs for the public and remedial workers from excavation and incineration for the Pit 9 cleanup are < 1. As with carcinogenic risks, the exposure duration is estimated to be for 1 year. The following summarizes the risks identified from routine Pit 9 activities:

- Worker Hazard Index: The HI for workers from excavation is 0.000003 (3/1,000,000) and from incineration is 0.0001 (1/10,000) for a total HI of 0.0001 (1/10,000). The total HI is < 1 which implies that routine activities would result in acceptable health risks.

- Worker Cancer Risk: The nonradiological cancer risk tothe worker is 1E-08 (1/100,000,000) and radiological cancer risk is 1.5E-07 (1.5/10,000,000) for a total cancer risk to the worker of 1.6E-07 (1.6/10,000,000) from both excavation and incineration.

- MEI HI: The MEI HI from excavation is 0.00001 (1/100,000) and from incineration is 0.03 (3/100) for a total HI of 0.03 (3/100). The total HI is < 1 which implies that routine activities would result in acceptable health risks.

- MEI Cancer Risk: The nonradiological cancer risk to the MEI is 4E-09 (4/1,000,000,000) and radiological cancer risk is 6.8E-08 (6.8/100,000,000) for a total cancer risk to the MEI of 7.2E-08 (7.2/100,000,000) from both excavation and incineration.

Worker exposures to radiation under routine operations would be controlled under established procedures that require doses to be kept as low as reasonably achievable (ALARA) and that limit any individual's dose to < 5 rem (5,000 mrem) per year. Based on relevant experience with other projects, DOE expects doses from this proposed project to be maintained well below the limit on average. The annual estimated average dose is typical of those received by RWMC workers during recent years. The average estimated annual dose equivalent would be 39.7 mrem/worker (range 0 to 251 mrem). The number of Pit 9 workers to be exposed in the course of normal operations would not exceed 150. Based on an occupational risk factor of 4 x 10[-4] fatal cancers per person-rem, or 1 fatal cancer per 2,500 person-rem, workers engaged in the proposed project would not be expected to incur any harmful health effects from radiation exposures they receive during normal operations. These doses can also be compared to the estimated annual dose to an individual living in Southeast Idaho of 350 mrem/year from natural background and medical radiation sources. Estimated dose equivalents (EDEs) to all receptors from routine activities would be below exposure levels expected to cause any adverse health effects and below doses received from background radiation in Southeastern Idaho.

The risks associated with implementation of the remedy will be refined

during the design stage through the DOE Safety Analysis and Review System (SARS). Under the SARS, analyses are performed to identify and assess the risk of potential hazards and to identify methods for eliminating or controlling the hazards. Hazards that will be considered include cumulative exposure to hazardous and radionuclide contamination during routine operations as well as during hypothetical accident scenarios. Hazards associated with aspects of the selected remedy would be reduced through the use of engineering and administrative controls including implementation of health and safety procedures and the use of appropriate personal protective equipment (PPE).

The SARS is designed to identify unacceptable risks associated with implementation of the selected remedy and will be prepared based on detailed process data from the POP testing phase and detailed design information. A factor in the determination to proceed with the interim action is the SARS evaluation, which will be completed before an LPT. During LPT all monitoring systems will be tested and full-scale remediation of Pit 9 will be initiated only upon successful completion and review of POP and LPT test phases.

Implementability

The implementability criterion has the following three factors requiring evaluation: (a) technical feasibility, (b) administrative feasibility, and (c) the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. Administrative feasibility includes activities needed to coordinate with other offices or agencies. In terms of services and materials, an evaluation of thefollowing availability factor is required: treatment, storage capacity, and disposal services; necessary equipment and specialists; and prospective technologies.

Alternative 4 involves the use of processes that have been demonstrated in field operations, some of which have been used to remediate similar radiologically contaminated sites. The use of physical/chemical treatment before stabilization decreases the amount of material requiring stabilization and increases the efficiency of stabilization of the refined, well-characterized waste stream. Alternatives 3 and 4 both require additional demonstration testing but do not require the extensive technology development that would be needed to implement Alternative 2 on the types of waste materials found in Pit 9. An offsite disposal facility is currently not available to accept the untreated mixed waste that would result from Alternative 5.

Uncertainties associated with Alternative 2 include its effectiveness on heterogeneous materials such as those in Pit 9 and the ability to confirm complete vitrification/stabilization of the pit contents. Some of the specific difficulties with ISV are: (a) gases generated from combustible materials (i.e., wood, cardboard, and combustible organic liquids) may carry contaminants to the glass surface and away from the melt with the potential for overwhelming the off-gas system; (b) metals such as mercury and cadmium may be undesirable because of their inability to incorporate into the melt,

or a reduction of product quality because of the metals; (c) a potential exists for contaminants to migrate into the surrounding soil preceding the melt during vitrification; and (d) a possibility exists for shorting between the electrodes because of the presence of metals in the feed materials resulting in incomplete vitrification.

Cost

In evaluating project costs, an estimation of capital costs andoperation and maintenance costs is required. The cost estimates for these alternatives are listed in Table 6 (see Section 7, "Description of Alternatives"). The cost estimate basis is contained in Engineering Design File ERD-BWP-076, "Pit 9 Comprehensive Demonstration Project Cost Estimate Basis of Alternatives Listed in the Revised Proposed Plan" and EGG-WM-10153, Summary of Conceptual Cost for Pit 9. These documents are in the Administrative Record.

The costs presented in Table 6 are rough estimates. Actual costs would vary based on the final design and detailed cost itemization. Cost estimates show Alternative 2 to be the lowest cost alternative, and Alternative 5 to be the highest cost alternative. The estimated costs for Alternative 2 are based on costs that would need to be verified in R&D before implementation. Alternatives 3, 4, and 5 include interim storage and offsite disposal costs (Table 6). Long-term and offsite disposal costs for Alternative 2 were not included in the table but may be necessary if the final vitrified (in situ) waste form is not acceptable for long-term storage and disposal.

Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are State acceptance and community acceptance. For both of these criteria, the factors that are considered include the elements of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

State Acceptance

The IDHW concurs with the selected remedial alternative. IDHW has been involved with the development and review of the original and revised Proposed Plans, this ROD, and other project activities including public meetings.

Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the original and revised Proposed Plans. Specific comments are responded to in the Responsiveness Summary portion of this document, which is attached.

Original Proposed Plan

Thirty-three sets of written comments were received from twentynine individuals and organizations, in addition to the seven verbal comments

received during the public meeting held in Idaho Falls on January 7, 1992. Seven of the commenters concurred with the choice of Alternative 4 (Chemical Extraction and/or Physical Separation) as the preferred alternative as described in the Proposed Plan. Several commenters have requested public review and comment of the preferred alternative, in comparison with the other alternatives, once the specific process of the preferred alternative is known. Two of the commenters asked to delay the remediation of Pit 9. Two of the commenters preferred Alternate 2 (In Situ Vitrification) as the method of Pit 9 remediation. One of the commenters preferred Alternative 3 (Ex Situ Vitrification) as the method of Pit 9 remediation, and another thought remediation was not necessary.

In general, there were three predominant public opinions of the preferred alternative and one predominant public opinion on the Proposed Plan. The three predominant public opinions, not in order of preference, of the preferred alternative were: (a) it was too expensive, (b) it was the best alternative presented, and (c) it was too vague. One predominant public opinion of the Proposed Plan was that the preliminary risk evaluation was inadequate, too conservative, did not reflect actual conditions at Pit 9, and should not be used to as a basis for this interim action. Those who felt the preferred alternative was too expensive usually expressed concern that a large sum of money was being spent to reduce potential risks that did not reflect the actual risks posed by Pit 9.

Revised Proposed Plan

Thirty-nine written comments were received on the revised Proposed Plan from thirty-seven members of the public; verbal comments were received from five individuals. Thirty-five of the commenters concurred with the choice of Alternative 4 (Physical Separation/Chemical Extraction/Stabilization) as the preferred alternative as described in the revised Proposed Plan. Thirty-two of the commenters believed the treatment criteria of 10 nCi/g TRU was protective of human health and the environment. A preponderance of public opinion was in favor of Alternative 4, the preferred alternative.

9. THE SELECTED REMEDY

The selected remedy is Alternative 4. Under Alternative 4, the Pit 9 remedial action would consist of the following three phases:

1. Proof-Of-Process (POP) Test

2. Limited Production Test (LPT)

3. Full-scale remediation.

The test phases would be performed within the interim action for Pit 9 before full-scale remediation to confirm treatment standards can be met and identify the most cost-effective technique, or combination of techniques, that will be used in the interim action. The POP phase would require extensive demonstration of critical aspects of the process to prove that innovative technology from the proposed processes would be effective in the protection of workers, public health, safety, and in the remediation of Pit 9.

The data generated in the POP test would be used to identify the specific processes that perform best on the Pit 9 waste types. The POP phase would test critical aspects of the processes to prove that they would be effective in treating the americium and plutonium, as well as other hazardous constituents located within Pit 9. The POP test will use surrogate material, not actual Pit 9 wastes. The results from the POP tests will be used to evaluate the ability of the proposed processes to meet or exceed the following performance requirements:

- Treatment residual contamination levels of 10 nCi/g TRU or less;

- Volume reduction - approximately 90% for material undergoing treatment;

- Treatment residuals that will not be hazardous (i.e., do not contain hazardous constituents above delisting levels specified in Table 4 and do not exhibit a hazardous characteristics);

- Waste minimization, as demonstrated, which results in an overall lower cost to the government; and

- Demonstration of integrity and long-term stability of the final waste form.

Based upon the results of the POP test, the agencies will determine whether to proceed to the LPT phase. If the processes are not shown to be successful in the POP test phase, Pit 9 will be reevaluated for cleanup and be addressed in an Explanation of Significant Differences (ESD), an amendment to the ROD, or in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS. Additionally, if the POP results demonstrate the process is not cost -effective, then Pit 9 will be reevaluated for remediation.

The LPT phase would demonstrate that all integrated systems function as proposed to give a high degree of confidence that all systems are reliable before full-scale remediation would begin. The LPT phase would involve the same processes and area as the remediation phase, first using surrogate material, followed by a limited quantity of actual Pit 9 waste. Following the LPT phase, the agencies will determine whether to proceed with full scaleremediation of Pit 9. If the goals of the LPT are not met, Pit 9 contamination will be addressed in an ESD, amendment to this ROD, or in the RI/FS for the TRU-Contaminated Pits and Trenches (OU 7-13).

The interim action also includes decontamination and demobilization of the facilities and equipment used to remediate Pit 9.

Description of Remedial Technologies

In November 1991, a request for proposal (RFP) was released to industry to obtain subcontractor proposals for a cleanup of Pit 9. In response to the request, two suitable subcontractor proposals were received and both consisted of unique combinations of chemical extraction, physical separation, and stabilization components. Section 7, "Description of Alternatives," contains the description of the chemical extraction, physical

separation/stabilization technologies. The following section contains a separate, detailed description of each of the subcontractor processes that may be implemented as Alternative 4. Modifications to details of the system presented here may be made during the remedial design/remedial action (RD/RA) phase based on the results of the POP and LPT phases. These modifications or changes fall within the normal scope of changes occurring during the RD/RA engineering process and are made to optimize performance and minimize costs. Insignificant changes or modifications do not significantly affect the scope, performance, or cost of the remedy. Examples include changes to the type and/or cost of materials, equipment, facilities, services, and supplies used to implement the remedy. In implementing Alternative 4, each of the subcontractor teams have been contracted to perform the POP test demonstration described above to verify that their proposed remedial process would perform as indicated in the RFP. Following evaluation of the performance of each of the subcontractor's processes in the POP test, the agencies will determine whether to proceed with the LPT phase. Following the LPT phase, the agencies will determine whether to proceed with full scale remediation of Pit 9.

Alternative 4 - Subcontractor Process 1

Retrieval/Segregation for Subcontractor Process 1

Under this approach, hazardous substances would be retrieved in a fixed, double-contained structure under negative pressure that is built over the entire pit at the start of the project. The pit would be worked using remotely operated excavating equipment that is enclosed in a curtained area to separate the excavation area from the rest of the pit. The curtain area ventilation enclosure would confine contaminated dust and the buildup of volatile organic contaminants at the dig site. The excavator (and associated manipulating equipment) would perform an initial segregation of waste materials in the pit into the following five waste streams: (a) combustibles (paper, plastics, and rags), (b) wood, (c) drums and metals, (d) soil and sludge, and nonsoils (e.g., glass bottles, plastic, wood), and (e) large items (e.g., reactor vessel and truck bed). This initial segregation would simplify the overall material handling and processing systems downstream.

A dig face radiation monitor would be used to make a gross radioactivity level assessment of the waste at the dig face during excavation activities. The radiation monitor would have sufficient mobility to allow placement within a few inches of any area of the dig face. The readings would determine how the material would be handled as it is excavated and processed. In this way, the overall treatability of the material would be enhanced and potential criticality concerns eliminated.

Following initial segregation, wastes would be placed in specialized, color-coded tram containers that enter the waste transport system, which includes a conveyer system for transporting the trams to the material handling facility from the dig site. Additional retrieval system process equipment includes a compactor to compact drums, a specialized grapple to pick up drums and drum remnants, and teleoperated manipulators to provide waste handling and segregation tasks in the pit such as cutting and drilling.

Once wastes arrive in the material handling facility the following operations would be performed:

- Segregation of the waste for processing or storage;
- Size-segregation of the soil and sludge wastes [to <5.1 cm (<2 in.)] for processing in the treatment system;
- Delivery of treatable soils to the processing facility for treatment;
- Compaction of appropriate waste to minimize volume; and
- Shredding and sizing of large items and combustibles (including wood, metals, rags, paper, and plastic) before decontamination in a specialized washing process that will be designed to meet ARARs.

Materials contaminated with PCBs will be segregated and accumulated until a sufficient volume is collected to permit cost-effective treatment. The PCBs will then be destroyed in a dechlorination process that chemically converts them to a nonhazardous form.

Treatment System for Subcontractor Process 1

Waste materials that are <5.1 cm (<2.1 in.) in size (including contaminated soil, sludge, and nonsoil wastes) would be sent to the treatment system for processing. The proposed treatment involves three principal subsystems. The extraction subsystem includes a carbonate/EDTA chemical leach system for removal of actinides (plutonium and americium) and heavy metals from the soil. Dissolution effectiveness is affected by soil size, feed makeup, and contact time. This subsystem also includes a surfactant-enhanced soil wash system for organics removal. The primary function of the extraction subsystem would be to move the contaminants from a solid to aqueous phase.

Extraction system overflows and slurries would be routed to the filtration subsystem consisting of a clarifier, filter tank, and filter press. Clarifier sludge would be sent to the filter tank for preparation before entering the filter press. After processing in the filter press, the solids would be separated from the liquids and a high solids (60% or greater) filter cake would be produced. Near the end of the filtration cycle, cleaned process water would be used for a final wash of the pressed cake before discharge. The dried solids from the filter press will meet treatment standards of 10 nCi/g TRU and delisting levels. In addition, the residual must be shown to meet characteristic hazardous waste standards. The filtrate from the filter press is returned to the extraction subsystem.

Clarifier overflow will contain plutonium, americium, heavy metals, and organics and would be sent to a final subsystem consisting of an evaporator, a catalytic oxidizer, and a scrubber/condenser. The evaporator concentrates and volume reduces the process water (from the clarifier feed) into a volatilized and nonvolatilized fraction. The organics in the volatilized fraction would be destructively oxidized resulting in a pure water stream that could be reused in the process or eventually discharged along with some CO_2 gas. Off-gases from the oxidizer would be wet scrubbed and would meet

the ARARs described in Section 10, "Compliance with ARARs." The nonvolatilized fraction, referred to as waste product, contains nonvolatile organics, concentrated salts, heavy metals, and radionuclides. The goal is that this waste product would contain a solids fraction around 65%, depending on the nature of the feed. If necessary, the waste product would undergo a stabilization process before packaging in drums for TRU storage. The goal is that this waste product would meet the INEL TRU Waste Acceptance Criteria. This document is included in theAdministrative Record. Figure 3 is the simplified process flow diagram for the treatment system for Subcontractor Process 1.

Alternative 4 - Subcontractor Process 2

Retrieval/Segregation System for Subcontractor Process 2

Under this remedial process, retrieval would be performed inside a movable, redundant containment structure with a flexible skirt and a remote teleoperated bridge crane system to prevent dispersion of contaminants into the environment and to protect operators/workers from exposure to radiation, hazardous substances, and other hazards associated with excavating the pit. Separated materials would be transported from the pit to the processing building via an enclosed track in sealed containers on wheeled carts.

Inside the process building, the containers would be stockpiled awaiting processing in an area served by a bridge crane for handling. Contaminated soil would be separated from nonsoil wastes (e.g., glass, plastic, and wood) and inventory tracking would be maintained using codes on the containers that identify the content of fissile material and all special handling requirements.

Treatment System for Subcontractor Process 2

Soil processing would begin with removal of VOCs using a low temperature solvent extraction with triethylamine. This would be followed by gravimetric and physical removal of particulate radioactive (e.g., plutonium and americium) and heavy metals from the coarse soil fraction. The fine

fraction that exits the gravimetric system in the tailings would be leached with nitric acid to dissolve the contained radioactive and other hazardous materials. The metal nitrates in the resultant solution would be removed using a countercurrent ion exchange system.

The clean soil would be transferred from the leach circuit after dewatering to a rotary kiln to remove residual nitrates. The rotary kiln would be operated in compliance with ARARs as identified in Section 10, "Compliance with ARARs." Nitrate-bearing liquid process wastes would be treated by electrodialysis for recovery of nitric acid, sodium hydroxide, and cleaned water. These materials would be returned to the process. The concentrated residues from this system would be transferred to the plasma melter for stabilization as a cast slag. After denitrification, the soil would be sampled and stockpiled until analysis verifies it meets the delisting levels identified in Table 4 and is shown to meet characteristic hazardous waste standards [IDAPA 16.01.05005 (40 CFR 261 Subpart C, 261.20-.24). Figure 4 depicts the simplified process flow for the treatment system for

Subcontractor Process 2.

The nonsoil wastes and residual concentrates from the soil treatment system would be sent directly to the plasma melter that would destroy the organics and produce a virtually nonleachable cast slag that immobilizes both the heavy metals and TRU. To prevent the possibility of plutonium release with the process off-gases, the melter would be equipped with an emissions control system that employs high temperature cross flow sintered metal or ceramic filters to capture plutonium particles after condensation, scrubbers to abate acid gases, and HEPA filters. All of the plant emissions would meet ARARs as identified in Section 10, "Compliance with ARARs." A final radioactive/nonradioactive sort would then be made on the plasma furnace slag to determine whether to return it to Pit 9 (10 nCi/g TRU) or to store it as a TRU waste (> 10 nCi/g).

Treatment Standards for Subcontractor Processes 1 and 2

This interim action will use treatment to address the principal threats associated with Pit 9 by treating Pit 9 waste source material including contaminated soil and debris within the physical boundaries of the pit.

For Untreated Wastes Remaining in the Pit

RCRA closure requirements are applicable when (a) the waste is hazardous; and (b) the unit (or AOC) received the waste after RCRA requirements became effective. As such, RCRA closure requirements are not applicable to the untreated waste that remains in the pit or the AOC. However, certain RCRA closure requirements in 40 CFR Subpart N, specifically 264.310, are considered to be relevant and appropriate. Because the residual contamination in the pit may pose a direct contact threat but does not pose a groundwater threat, relevant and appropriate requirements include: (a) a cover, which may be permeable, to address the direct contact threat; (b) limited longterm management including site and over maintenance and groundwater monitoring; and (c) institutional controls (e.g., land-use restrictions or deed notices) to restrict access.

For Treated Waste 10 nCi/g TRU to be Returned to the Pit

For waste that is expected to undergo treatment, LDR requirements are potentially applicable when the Pit 9 wastes are excavated and placed into a separate treatment unit. To date, EPA has specified the use of specific treatment technologies for four subcategories or characteristic wastes: TCLP pesticides, reactive sulfides, reactive cyanides, and ignitable liquid nonwastewater wastes. None of these types of characteristic wastes have been identified in the Pit 9 wastes. For all other characteristic wastes, including those in Pit 9, demonstrating that the waste is no longer characteristic (i.e., the waste no longer exhibits any of the characteristics outlined in 40 CFR Part 261 Subpart C) complies with LDR requirements.

The residuals resulting from the treatment process would still be defined as listed wastes under RCRA. However, delisting is the compliance option that will be used to meet LDR requirements. Delisting requires a demonstration that the wastes meet risk-based levels and no longer present a threat to the public or the environment. In addition, the wastes would be treated to meet

characteristic hazardous waste standards in accordance with 40 CFR 261 Subpart C. Treatment residuals to be managed onsite as part of the Pit 9 interim action that are treated to the levels specified in Table 4 are being delisted through this ROD and satisfy the substantive requirements of 40 CFR 260.20 and .22 and a Guide to Delisting of RCRA Wastes for Superfund Remedial Responses, OSWER Superfund Publication 9347.3-09FS, September 1990. The delisting levels were developed through use of the EPACML model (refer to 56 FR December 30, 1991), the Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions Submitted under 40 CFR 260.20 and .22, July 1992; and Use of EPACML for Delisting, undated. The results of the POP and LPT tests will be used to demonstrate the ability of the treatment processes to meet the treatment standards.

Wastes that meet delisting levels and characteristic hazardous waste standards exit the RCRA hazardous waste management system, and LDRs and RCRA Subtitle C requirements are no longer applicable. Because RCRA Subtitle C requirements are not ARARs, these treatment residuals should be managed as solid wastes under RCRA Subtitle D. However, as discussed previously, certain RCRA closure requirements in 40 CFR 264 Subpart N are considered to be relevant and appropriate with respect to the untreated waste materials remaining in the pit. Since Pit 9 will be closed in accordance with the relevant and appropriate requirements of 40 CFR 264.310, the treated residual being returned to the pit (that contains 10 nCi/g TRU and has met delisting and characteristic hazardous waste standards) would also be managed in accordance with these closure standards.

For Concentrated Waste Residuals > 10 nCi/g TRU to Be StoredAwaiting Final Disposal

The treatment goal for the concentrated waste residuals that are > 10 nCi/g is to achieve LDR BDAT levels. Table 5 identifies the LDR prohibited wastes at Pit 9 along with the appropriate LDR standard. However, if these LDR standards are not achieved, the concentrated waste residual will be temporarily stored onsite consistent with LDR storage requirements pending a final decision on its ultimate disposition in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS. Temporary storage used during CERCLA actions to facilitate proper disposal, e.g., while selecting and designing a remedy (under the TRUContaminate Pits and Trenches RI/FS), is allowable storage under LDR storage requirements (Superfund LDR Guide #1, Overview of RCRA Land Disposal Restrictions, OSWER Superfund Publication 9347.01FS, July 1989).

Preliminary Evaluation of 10 nCi/g TRU

Transport modeling was conducted for the 10 nCi/g TRU residuals that will be left in or returned to Pit 9 after remediation to evaluate potential contaminant migration to the aquifer. This modeling indicates that the Safe Drinking Water Act standard for gross alpha of 15 pCi/L will not be violated if a 0.6-m (2-ft) layer of clean soil with a linear sorption coefficient (k[d]) of at least 500 mL/g is added to the bottom of the pit and if the pit is backfilled to grade with clean INEL soil. The transport modeling is described in Engineering Design File RWMC-92-005, "GWSCREEN Modeling for the Pit 9 Project Sensitivity to K[d] in the Source and Attenuation Layer," and is included in the Administrative Record.

The Pit 9 Residual Risk Assessment in the Administrative Record evaluated potential residual human health risks from 10 nCi/g TRU residuals left in the pit after the cleanup. Modeling of radionuclide transport to the Snake River Plain Aquifer indicated that radionuclides from Pit 9 are notexpected to migrate to the aquifer during the evaluated time period of 1,000 years. The preliminary evaluation also indicated the highest risk to human health occurred after the 100-year institutional control period due to plants and burrowing animals providing a mechanism to move waste up to the surface. The preliminary evaluation indicated that cancer risks from the surface pathway were below the target risk range listed in the NCP of 1 additional cancer per ten thousand to 1 additional cancer per one million. These risks were calculated for a receptor living at the edge of Pit 9. The residual risk assessment assumed the pit would be backfilled with clean soil after remediation. To ensure that this interim action is successful in reducing risk to levels protective of human health and the environment, residual contamination will be reevaluated in the baseline risk assessment to be performed as part of the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS.

10. STATUTORY DETERMINATION

Remedy selection is based on CERCLA statutory criteria (as amended by SARA) and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP, protection of human health and the environment and attainment of ARARs (or justify a waiver). CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practical and that the implemented action must be cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

As described in Section 9, the selected remedy will eliminate or reduce identified risks at Pit 9 by treating the wastes and contaminatedsoils to the extent necessary for protection of human health and the environment. The remedy will reduce the cumulative carcinogenic risk posed by contaminants within Pit 9 to within the 1 additional cancer in 10,000 to 1 additional cancer in 1,000,000 range, reduce the cumulative HI to < 1 as required by the NCP, and provide protection of groundwater. Storage and/or disposal of the concentrated residuals will meet all applicable waste acceptance standards.

Protectiveness will be achieved by excavating the wastes within the pit and treating radioactive materials and hazardous waste constituents. In brief, waste materials will be extracted from the soils, VOCs will be volatilized; nonvolatile organics, toxic metals, and radioactive metals will be concentrated and stabilized. The resulting volume of contaminated wastes would be reduced by approximately 90% using the selected alternative, and contaminant concentrations in treatment residuals returned to Pit 9 would be reduced to achieve acceptable risk levels. Monitoring will be continued to determine whether releases are occurring. Additionally, institutional

controls such as access/land use restrictions will continue to be implemented under this alternative to aid in protecting human health and the environment. These restrictions would reduce the likelihood of the occurrence of onsite activities that allow direct exposure to contaminants in Pit 9.

The safety related risks associated with implementation of the remedy will be refined during the design stage through the DOE SARS. Under the SARS, analyses are performed to identify and assess the risk of potential hazards and to identify methods for eliminating or controlling the hazards. Hazards that will be considered include cumulative exposure to hazardous and radionuclide contamination during routine operations as well as during hypothetical accident scenarios. Hazards associated with aspects of the selected remedy would be reduced through the use of engineering controls includingimplementation of health and safety procedures and the use of appropriate PPE.

The SARS is designed to identify unacceptable risks associated with implementation of the selected remedy and is prepared based on detailed process data from the POP testing phase and detailed design information. The interim action will be initiated only if it can be demonstrated that the action presents no unacceptable risks to workers or the public.

Compliance with ARARs

The selected remedy consisting of chemical extraction, physical separation, and stabilization components will be designed to meet all ARARs of Federal and State environmental laws.

The primary ARARs that will be achieved by the selected alternative are as follows:

Chemical-Specific ARARs

The substantive requirements of the LDR treatment standards, IDAPA 16.01.05011 (40 CFR 268.41-.43), are a goal for the concentrated waste residual that exceeds 10 nCi/g TRU and that will be placed into temporary onsite storage. These requirements specify technology and concentration-based treatment standards for constituent concentrations and extracts of restricted hazardous wastes.

The substantive requirements of IDAPA 16.01.05004 (40 CFR 260.20, .22) must be met for excavated wastes that are treated before they can be returned to the pit.

The substantive requirements of IDAPA 16.01.05005 (40 CFR 261 Subpart C - Characteristic Hazardous Wastes, 261.20-.24) must be met for potential RCRA characteristic wastes. Treatment residuals that are delisted must also be shown not to exhibit a hazardous characteristic before material containing 10 nCi/g TRU is returned to the pit.

The relevant and appropriate substantive requirements of IDAPA16.01.01101,05.a (Prevention of Significant Deterioration Increments) will be met for total suspended particulates and sulfur dioxide.

The substantive standards of the CAA NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities (40 CFR 61.92-.93) must be met. These applicable requirements specify 10 mrem/yr for radiation exposures for the general public from ambient air concentrations of radionuclides.

The relevant and appropriate substantive standards of the National Emission Standard for Mercury [40 CFR 61.52(b)] must be met. This requirement specifies that emissions to the atmosphere from subjected stationary sources shall not exceed 3,200 g (112.9 oz) of mercury per 24-hr period.

The relevant and appropriate substantive standards of the National Emission Standard for Beryllium [40 CFR 61.32(a)] must be met. This requirement specifies that emissions to the atmosphere shall not exceed 10 g of beryllium over a 24-hr period or exceed an ambient concentration limit on beryllium in the vicinity of the stationary source of 0.01 g/m[3], averaged over a 30-day period.

The relevant and appropriate substantive standards of the National Emission Standard for Asbestos [40 CFR 61.151(a)] must be met. These requirements specify standards for inactive waste disposal sites for asbestos mills and manufacturing/fabrication operations. Although not applicable to Pit 9, the substantive provisions in 61.151(a) provide control measures for asbestos-containing materials. To the extent such materials are encountered during implementation of this remedy, these standards are relevant and appropriate for application to similar materials at Pit 9.

Action-Specific ARARs

The relevant and appropriate substantive standards of IDAPA 16.01.05008 [40 CFR 264.341-.343 .345, .347(a)(1),(2), .351 (Subpart O - Incinerator Requirements)], which specify operating requirements for incineration of hazardouswaste, must be complied with.

The relevant and appropriate substantive standards of RCRA, 40 CFR 264.1032-.1034 (Subpart AA), must be met. These requirements specify total organic emission performance standards for equipment associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations. Implementation of these requirements will also take into account radiological considerations.

The relevant and appropriate substantive standards of RCRA, 40 CFR 264.1052-.1063 (Subpart BB), must be met. These requirements specify air pollutant emission standards for equipment leaks at TSD facilities. Implementation of these requirements will also take into account radiological considerations.

The relevant and appropriate substantive requirements of IDAPA 16.01.01502, which specify emission limits for particulate matter from incinerators, must be met.

The applicable substantive requirements of the rules for the Control of Fugitive Dust, IDAPA 16.01.01251 and 16.01.01252, which specify that all reasonable precautions be taken to prevent the generation of fugitive dusts,

must be complied with.

The relevant and appropriate substantive standards of TSCA, 40 CFR 761.60 and .70, which specify requirements for incineration/disposal of PCBs, must be met where PCB concentrations are 50 mg/L (ppm) or greater.

The relevant and appropriate substantive requirements of TSCA, 40 CFR 761.40(a)(1), (10), .45, .65, and .79 must be met for storage of PCBs where PCB concentrations are 50 mg/L (ppm) or greater.

The applicable substantive standards of IDAPA 16.01.05008 (40 CFR 264.171-.178), which specify requirements for use and management of containers for RCRA hazardous wastes, must be met.

The applicable substantive standards of IDAPA 16.01.05008 (40 CFR 264.192-.199) must be met. These requirements specify standards for management of hazardous wastes in tank systems.

The applicable substantive standards of IDAPA 16.01.05008 (40 CFR 264.601) must be met. These requirements specify standards for management of hazardous wastes in miscellaneous units that are not addressed by other unitspecific standards of 40 CFR Part 264.

The relevant and appropriate substantive standards of IDAPA 16.01.05008 [40 CFR 264 Subpart N, 264.310(a), (b)(1), (4)-(6)] must be met for closure and post-closure care of the pit. These requirements specify standards for final cover and monitoring of the post-remediated pit.

Location-Specific ARARs

There are no location-specific ARARs identified for this interim action.

To-Be-Considered Guidance

DOE 5480.2A, "Radioactive Waste Management."

DOE 5400.5, "Radiation Protection of the Public and the Environment."

OSWER 9347.3-01FS, July 1989, "Superfund LDR Guide #1, Overview of RCRA Land Disposal Restrictions (LDRs)."

OSWER 9347.3-09FS, September 1990, "A Guide to Delisting of RCRA Wastes for Superfund Remedial Responses."

OSWER 9234.2-04FS, October 1989, "RCRA ARARs: Focus on Closure Requirements."

The requirements of CERCLA, NCP Final Rule Preamble (55 FR 8743), will be met for closure of the pit. The referenced portion of 55 FR 8743 references hybrid clean closure and landfill closure. These are pertinent to untreated waste left in the pit and to Alternative 5.

State of Idaho "New Source Review Policy for Toxic Air Pollutants."

Cost Effectiveness

Based on expected performance, the selected remedy has been determined to be cost-effective because it would provide overall effectiveness proportional to its costs. The estimated costs of the selected remedy are just over four times the costs associated with ISV, the lowest cost alternative. Although the estimated cost for the selected remedy is higher than that for ISV, the chemical extraction, physical separation, and stabilization process will provide a long-term solution that compensates for the additional costs by removing the majority of the contaminants of concern and thereby providing potentially permanent protection of human health and the environment. By reducing the volume of contaminants that will ultimately require storage and monitoring, the selected alternative also achieves greater long-term cost efficiency than the ESV or complete removal alternatives.

Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy meets the statutory requirements to use permanent solutions and treatment technologies to the maximum extent possible for this interim action. The agencies prefer a potential permanent solution whenever possible and, in the case of Pit 9, it is possible to meet the objectives of an interim action and provide a potentially permanent treatment solution. The selected remedy significantly reduces the volume of contaminated material. Based on evaluation of the CERCLA remedial alternative criteria and, in particular, the five balancing criteria, chemical extraction, physical separation and stabilization will provide the best long-term solution in terms of reducing toxicity, mobility and volume of the contaminants, implementability, short-term effectiveness, cost, and State and community acceptance.

Due to the current state of development of the ISV process (Alternative 2), the agencies were not able to determine the efficiency and long-termeffectiveness of ISV on the heterogeneous wastes found within Pit 9. Alternative 3 uses a stabilization component to immobilize the contaminants, thereby achieving some degree of long-term effectiveness; and Alternative 4, through removal of contamination from the pit in addition to stabilization of the final waste product, will also provide long-term effectiveness. Alternative 4 does provide a greater reduction of waste volume and toxicity before stabilization through the use of the physical/chemical treatment process. Because of the volume reduction of the final waste form achieved in the selected alternative, the amount of waste that ultimately must be monitored during storage will be greatly reduced. The effect of the smaller volume of waste requiring longterm monitoring and storage is an increase in the overall long-term effectiveness of the selected alternative in comparison to Alternatives 3 and 5. Alternative 5 would involve no contaminant reduction and would require extensive long-term management and monitoring of the stored waste.

The implementability of the selected remedy is superior to all alternatives with the exception of Alternative 3 (see discussion of implementability in the Comparison of Alternatives section) and is at least as implementable as that alternative and, as discussed, the selected alternative is judged to be the most cost efficient in consideration of the remedial benefits described above. In summary, the criteria that were most critical in selecting the

preferred alternative were a greater reduction in contaminant toxicity, mobility, and volume, superior implementability of the alternative, and satisfactory long-term effectiveness and cost efficiency. Using chemical extraction and/or physical separation will increase the likelihood that no future remedial actions will be required for Pit 9.

Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as aprincipal element is satisfied for the Pit 9 interim action through selective excavation of Pit 9 wastes, treatment of radioactive substances and hazardous waste material with physical separation and chemical extraction processes, and stabilization of the concentrated waste product.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Pit 9 interim action was released for public comment in December 1991. The Proposed Plan identified Alternative 4, Chemical Extraction/Physical Separation, as the preferred alternative. Upon review of public comment, it was determined that a revision to the original Proposed Plan was necessary to describe changes to a component of the preferred alternative presented in the original Proposed Plan. Specifically, the agencies determined that the addition of a stabilization component to the preferred alternative would provide enhanced protection of human health and the environment following pit remediation. Therefore, in compliance with statutory requirements for ensuring the public has the opportunity to comment on major remedy selection decisions, a revised Proposed Plan was prepared presenting chemical extraction/physical separation/stabilization as the preferred alternative. The second plan was made available to the public in mid-October 1992. The comments received during the second public comment period, held from October 22 through December 21, 1992, are included in the Responsiveness Summary portion of this ROD.

On February 16, 1993, EPA published a final rule for Corrective Action Management Units (CAMUs) and Temporary Units (TUs) (58 FR 8658). The specific provisions of this rule were originally proposed as part of the more comprehensive RCRA corrective action rulemaking ("Subpart S") on July 27, 1990 (55 FR 30796-30884). The rule establishes two new units that are intended to be used for remedial purposes. A document summarizing a review of this rule has been placed in the Administrative Record ["An Evaluation of Corrective Action Management Unit (CAMU) Rule's Application to the Pit 9 Interim Action"]. The agencies have decided not to designate a CAMU for the Pit 9 interim action at this time.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 01/27/1994
Operable Unit: 14
ROD ID: EPA/ROD/R10-94/073

Media: soil (not documented), landfill (not documented)

Contaminant: Methylene chloride, Chloroform, TCE, Bromo-dichloromethane, Toluene, PCE, 1,2-dichloroethane

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The 2,305 square kilometer Idaho National Engineering Laboratory (INEL), is located 32 miles west of Idaho Falls, Idaho. This government facility is currently managed by the U.S. Department of Energy. Current land use at the INEL is primarily focused on nuclear research, development and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEL is surrounded by a buffer zone used for cattle and sheep grazing. The INEL property is located on the northeastern edge of the Eastern Snake River Plain, a volcanic plateau, that is primarily composed of silicic and basaltic rocks and relatively minor amounts of sediment. One hundred out of 11,700 people from INEL are employed at the Radioactive Waste Management Complex (RWMC).

Contamination at the site includes two areas: Pad A and the Naval Reactors Facility (NRF). Pad A is located in the north-central portion of the Subsurface Disposal Area (SDA), an 88-acre disposal area

located within the RWMC. Surface water is present at the RWMC only during periods of heavy rainfall or snowmelt, which generally occur in January through April. To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. The NRF is located on the west-central side of the INEL, outside the perimeter OU 8-07. Also located on NRF are an Industrial Waste Ditch (IWD) and landfill units.

The Naval Reactors Facility was established in 1949 as a testing site for the navy's nuclear propulsion program. In 1953, the Navy completed work on its Submarine Thermal Reactor Prototype (SIW) which became operational in 1953. To accommodate the disposal of the waste byproducts produced by this prototype, the Navy dug an IWD. Three landfill units received solid waste similar to that of municipal landfills (construction, petroleum, cafeteria, and small quantities of paint products) from the prototype and support facility operations.

The landfill areas were used intermittently from the time construction started at NRF. In general, construction debris and waste material was burned, then covered with soil. The volume of construction debris decreased after the construction of A1W and ECF in 1958, and after the construction of S5G in 1965. Use of the last NRF landfill ceased by 1971.

In November 1989, the INEL was listed on the National Priorities List (NPL). The DOE, EPA, and State of Idaho Department of Health and Welfare (IDHW) entered into the Federal Facility Agreement and Consent Order (FFA/CO) on December 9, 1991. The entire NRF area will be evaluated in the Waste Area Group (WAG) 8 Comprehensive RI/FS, which is scheduled to begin in 1995. The RI/FS performed on the IWD evaluated potential risks to both human health and the environment.

For the Landfill, the EPA agreed that the Presumptive Remedy for CERCLA Municipal Landfill Sites was applicable. The assessment of the associated risk presents a large amount of uncertainty due to the volume and heterogeneity of landfill contents make characterization extremely difficult, constituent concentrations in the landfill contents are assumed.

The remedy status for the media addressed in this ROD are as follows: The remedy status for Soil is not documented. The media volume associated with the Landfill - Primarily Industrial Waste site

is not documented. The state concurs with the selected remedy.

Remedy: The alternative selected for landfill sites 8-05-01, 8-05-51, and 8-06-53 is the Presumptive Remedy for CERCLA Municipal Landfill Sites. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. The specific actions are to survey and mark the areas, restrict land use, monitor soil gases, and install and maintain a two-foot thick native soil cover over the landfill contents. Groundwater monitoring will be performed to evaluate these and other areas at NRF.

Text: Full-text ROD document follows on next page.

Text:

PB94-964601
EPA/ROD/R10-94/073
July 1994

EPA Superfund
Record of Decision:

Radioactive Waste Management Complex,
Idaho Falls, ID

<Figure>

Record of Decision

Declaration for Pad A
at the Radioactive Waste Management Complex
Subsurface Disposal Area

at the Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION FOR PAD A
AT THE RADIOACTIVE WASTE MANAGEMENT COMPLEX
SUBSURFACE DISPOSAL AREA
AT THE IDAHO NATIONAL ENGINEERING LABORATORY
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Pad A
Radioactive Waste Management Complex
Subsurface Disposal Area
Idaho National Engineering Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This document presents the selected remedial action for Pad A, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution

Contingency Plan (NCP). This decision is based on the Administrative Record for the Pad A Remedial Action.

The U.S. Environmental Protection Agency (EPA) approves of this remedy and the State of Idaho concurs with the selected remedial action.

ASSESSMENT OF THE SITE

Threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment. Implementation of the remedial action selected in this ROD will provide recontouring, maintenance, monitoring of the cover, and institutional controls at Pad A to ensure effectiveness of the existing cover and to minimize potential future exposure and migration of contaminants from the pad. If contaminants from Pad A were to migrate from the pad, they may potentially contaminate the subsurface area or groundwater.

DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses Pad A at the Radioactive Waste Management Complex (RWMC), Subsurface Disposal Area (SDA), at the Idaho National Engineering Laboratory (INEL). The RWMC has been designated as Waste Area Group (WAG) 7 of the 10 WAGs at the INEL that are under investigation pursuant to the Federal Facility Agreement and Consent Order (FFA/CO) between the Idaho Department of Health and Welfare (IDHW), the Environmental Protection Agency (EPA), and the U.S. Department of Energy Idaho Operations Office (DOE-ID). Pad A, designated Operable Unit (OU) 7-12, is located within WAG 7. The selected remedy for Pad A will provide for soil cover contouring and slope correction, routine maintenance, and monitoring. The function of this remedy would be to reduce the risks associated with potential exposure to and migration of the contaminated wastes.

The major components of the selected remedy include:

- Recontouring and slope correction of the existing Pad A soil cover, followed by maintenance, including subsidence and erosion control, to ensure effectiveness.

- Monitoring of groundwater, soil, surface water, and air to provide early detection of a potential release from Pad A to the subsurface, groundwater, or surface pathways.

- Maintaining institutional controls, including maintaining existing signs and postings, restricting access, and maintaining existing fences/barriers. It is presumed that institutional controls would remain in place indefinitely and this presumption will be reviewed every 5 years.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements (ARARs), and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site; however, because the wastes can be reliably controlled in place, treatment of the principal sources of contamination was not found to be necessary. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within two years after commencement of remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature sheet for the foregoing Pad A located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

1-27-94
Date

GERALD A. EMISON
Acting Regional Administrator, Region 10
U.S. Environmental Protection Agency

Signature sheet for the foregoing Pad A located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

1/27/94
Date

AUGUSTINE A. PITROLO
Manager
U.S. Department of Energy, Idaho Operations Office

Signature sheet for the foregoing Pad A located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

2/17/94
Date

JERRY L. HARRIS

Director
Idaho Department of Health and Welfare

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ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BRA	Baseline Risk Assessment
CAM	Continuous Air Monitor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCA	Consent Order Compliance Agreement
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EA	Environmental Assessment
EBR	Experimental Breeder Reactor

EG&G Idaho	EG&G Idaho, Inc.
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER&WM	Environmental Restoration and Waste Management
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
LLW	Low-level Waste
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
NPV	Net Present Value
NRF	Naval Reactor Facility
NRC	U.S. Nuclear Regulatory Commission
OU	Operable Unit
RCG	Radiation Concentration Guide
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
RWMIS	Radioactive Waste Management Information System

SARA	Superfund Amendments and Reauthorization Act
SDA	Subsurface Disposal Area
SF	Slope Factor
SRPA	Snake River Plain Aquife
TBC	To-Be-Considered
TDA	Transuranic Disposal Area
TRA	Test Reactor Area
TRU	Transuranic
TRA	Transuranic Storage Area
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WAG	Waste Area Group
WIPP	Waste Isolation Pilot Plant

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE) located 51.5 km (32 mi) west of Idaho Falls, Idaho, and occupies 2305 km[2] (890 mi[2]) of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEL (Figure 1). Pad A is located in the north-central portion of the Subsurface Disposal Area (SDA) and is approximately 73.2 x 102.1 m (240 x 335 ft). The SDA is a 35.6-ha (88-acre) area located within the RWMC.

Current land use at the INEL is primarily nuclear research and development and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEL is surrounded by a 1295-km[2] (500-mi[2]) buffer zone used for cattle and sheep grazing.

Of the 11,700 people employed at the INEL, approximately 100 are employed at the RWMC. The nearest offsite populations are in the cities of Atomic City [19.2 km (12 mi) southeast of RWMC], Arco [25.7 km (16 mi)

northwest], Howe [30.6 km (19 mi) north], Mud Lake [58 km (36 mi) northeast], and Terreton [59.5 km (37 mi) northeast].

<Figure>

Figure 1. The Radioactive Waste Management Complex at the INEL.

The INEL property is located on the northeastern edge of the Eastern Snake River Plain (ESRP), a volcanic plateau, that is primarily composed of silicic and basaltic rocks and

relatively minor amounts of sediment. Underlying the RWMC are series of basaltic lava flows with sedimentary interbeds. The basalts immediately beneath the Site are relatively flat and covered by 6.1 to 9.1 m (20 to 30 ft) of alluvium.

The depth to the Snake River Plain Aquifer (SRPA) underlying the INEL varies from 61 m (200 ft) in the northern portion to 274.3 m (900 ft) in the southern portion of the INEL. The depth to the aquifer at the RWMC is 176.8 m (580 ft). Regional groundwater flow is generally to the southwest.

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 23.1 cm/yr (9.1 in./yr), with estimated evapotranspiration of 15.2 to 22.8 cm/yr (6 to 9 in./yr). The only surface water present at the INEL is the Big Lost River, which is approximately 1.5 mi northwest of the RWMC; however, due to the arid nature of the INEL, this river is typically dry and contains no running water. Surface water is present at the RWMC only during periods of heavy rainfall and snowmelt, which generally occur in January through April.

To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC (Figure 2). To further enhance surface water diversion from the pits and trenches, berms have also been constructed immediately around the SDA.

Twenty distinctive vegetative cover types have been identified at the INEL, with big sagebrush the dominant species, covering approximately 80% of ground surface. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Several bird species at the INEL that warrant special concern because of sensitivity to disturbance or their threatened status include the ferruginous hawk (Buteo regalis), bald eagle (Haliaeetus leucocephalus), prairie falcon (Falco mexicanus), peregrine falcon (Falco peregrinus), merlin (Falco columbarius), long-billed curlew (Numenius americanus) and the burrowing owl (Athlene cunicularia). The ringneck snake, whose occurrence is considered to be INEL-wide, is listed by the Idaho Department of Fish and Game as a Category C sensitive species.

The RWMC encompasses 58.3 ha (144 acres) [0.59 km[2] (approximately 0.23 mi[2])] and consists of two main disposal and storage areas: (a)

Transuranic (TRU) Storage Area and (b) the SDA. Within these areas are smaller, specialized disposal and storage areas.

Approximately 10,200 m[3] (13,341 yds[3]) of containerized solid wastes were placed on a 73.2 x 102.1 m (240 x 335 ft) asphalt pad, known as Pad A, at the SDA from September 1972 to August 1978. The asphalt pad is approximately 5.6 to 6.1 cm (2 to 3 in.) thick. The depth from the bottom of the asphalt pad to the underlying basalt ranges from 0.3 to 3.7 m (1 to 12 ft). Pad A presently has a soil cover that averages about 1.2 m (4 ft) thick.

<Figure>

Figure 2. RWMC and associated spreading areas at the INEL.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The RWMC was established in the early 1950s as a disposal site for solid, low-level waste (LLW) generated by INEL operations. Within the RWMC is the SDA where hazardous substances (radioactive and hazardous waste) have been disposed in underground pits, trenches, soil vault rows, and Pad A-an aboveground pad. TRU waste was disposed in the SDA from 1952 to 1970 and was received from the Rocky Flats Plant (RFP) for disposal in the SDA from 1954 through 1970. The RFP is a DOE-owned facility located west of Denver, Colorado, and was used primarily for the production of plutonium components for nuclear weapons. Also located in the RWMC is the Transuranic Storage Area (TSA) where interim storage of TRU waste occurs in containers on asphalt pads. The TSA accepted TRU waste from offsite generators for storage from 1970 through 1988. TRU waste generated at the INEL is still received and stored in the TSA. The location of Pad A within the SDA is shown in Figure 1.

Since 1970, solid TRU waste received at the RWMC has been segregated from non-TRU solid waste and placed into the interim retrievable storage at the TSA. RWMC LLW that is contaminated with TRU isotopes less than or equal to 100 nanocuries per gram (100 nCi/g) but greater than 10 nanocuries per gram (>10 nCi/g) is excluded by DOE's Waste Acceptance Criteria (WAC) from disposal at the RWMC and is placed in interim storage at the RWMC. LLW contaminated with TRU isotopes 10 nCi/g is disposed of in the SDA. All but two shipments of waste disposed of on Pad A are classified as LLW (i.e., <100 nCi/g); the other two shipments contained waste with TRU radionuclide concentrations >100 nCi/g. One shipment consisted of eight drums with a total loading of 583.2 nCi/g, and the second shipment consisted of two drums with a total loading of 108.6 nCi/g. No waste disposal has occurred on Pad A at the SDA since its closure in 1978.

A Consent Order and Compliance Agreement (COCA) was entered into between DOE and the U.S. Environmental Protection Agency (EPA) pursuant to

Resource Conservation and Recovery Act (RCRA) Section 3008(h) in August 1987. The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL, and set up a process for conducting any necessary corrective actions.

On July 14, 1989, the INEL was proposed for listing on the National Priorities List (NPL) [54 Federal Register (FR) 29820]. The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The final rule that listed the INEL on the NPL was published on November 21, 1989, in 54 FR 44184.

As a result of the INEL's listing on the NPL in November 1989, DOE, EPA, and the State of Idaho Department of Health and Welfare (IDHW) entered into the Federal Facility Agreement and Consent Order (FFA/CO) on December 9, 1991.

Pad A was identified for a Remedial Investigation/Feasibility Study (RI/FS) under the FFA/CO. This Record of Decision (ROD) documents the results of the RI/FS and the remedy selected. The entire RWMC will be evaluated in the Waste Area Group (WAG) 7 Comprehensive RI/FS which is scheduled to begin no later than July 1996.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA [Para] 113(k)(2)(B)(i-v) and 117, a series of opportunities for public information and participation in the remedial investigation and decision process for Pad A were provided over the course of 21 months beginning in November of 1991 and continuing through August 1993. For the public, the activities ranged from receiving a fact sheet, INEL Reporter articles and updates, and a proposed plan, to having a telephone briefing, four public scoping meetings, three public meetings, and two open houses to offer verbal or written comments during two separate 30-day public comment periods.

On November 19, 1991, a fact sheet concerning Pad A was conveyed through a "Dear Citizen" letter to a mailing list of 5,600 individuals of the general public and 11,700 INEL employees in advance of the public scoping meetings scheduled in early December. On November 20, the DOE issued a news release to more than 40 news medial contacts concerning the beginning of a 30-day public scoping comment period, which ended January 3, 1992, on the Pad A remedial investigation. Both the letter and release gave notice to the public that Pad A documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Display ads announcing the same information appeared in eight major Idaho newspapers. Large ads appeared in the following newspapers from November 22 to the 27: Post Register (Idaho Falls); Idaho State Journal (Pocatello); South Idaho Press (Burley); Times News (Twin

Falls); Idaho Statesman (Boise); Idaho Press Tribune (Nampa); Lewiston Morning Tribune (Lewiston); and Idahonian (Moscow).

Similar display ads concerning upcoming meetings appeared in each of these newspapers several days preceding each local meeting to encourage citizens to attend and provide verbal or written comments. All three media-the Dear Citizen letter, news release, and newspaper ads-gave public notice of four scoping meetings concerning the beginning of the investigation at Pad A and the beginning of a 30-day public comment period that was to begin December 4, 1991. Additionally, two radio stations in Idaho Falls and newspapers in Idaho Falls and other communities repeated announcements from the news release to the public at large. A total of seven radio advertisements were made by local stations where meetings were scheduled several days before and the day of the meetings.

Personal phone calls concerning the availability of Pad A documents and public meetings were made to individuals, environmental groups, and organizations by INEL Outreach Office staff in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator made calls in Idaho Falls and Moscow.

Scoping meetings on Pad A were held in conjunction with scoping the remedial investigation of the organic contamination in the vadose zone, and an informational discussio

on the Pit 9 proposed plan, all of which were projects from WAG 7 at the RWMC. The meetings were held December 9, 10, 11, and 12, 1991 in Boise, Moscow, Twin Falls, and Idaho Falls respectively. An informal open house was held one hour prior to each of the meetings to allow the public to visit with State and Federal representatives about Pad A.

During the meetings that followed, representatives from DOE and INEL discussed the project, answered both written and verbal questions, and received public comments. Written comment forms were distributed at the meetings. Comments from the scoping meetings were evaluated and considered as part of the RI/FS process.

Regular reports concerning the status of the Pad A project were included in the INEL Reporter and mailed to those who attended the meetings and who were on the mailing list. Reports appeared in the March, May, July, and November 1992; and the January, March, and July 1993 issues of the INEL Reporter. During this time the number of individuals on the mailing list increased to 6,600. Individuals on the mailing list, those who attended the meetings, and all INEL employees received issues of the INEL Reporter.

Opportunities for public involvement in the decision process for Pad A were provided beginning in July 1993. For the public, the activities ranged from receiving the proposed plan, conducting one teleconference call, and attending open houses and public meetings to informally discuss issues and offer verbal and written comments to the agencies during the 30-day public comment period.

On July 19, 1993, DOE-ID issued a news release to more than 40 news media contacts concerning the beginning of a 30-day public comment period on the Pad A proposed plan. The release also gave notice to the public that Pad A documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library in Idaho Falls, the Shoshone-Bannock Library at Fort Hall, the University of Idaho Library in Moscow, the Idaho State Library in Boise; as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow.

Copies of the proposed plan for Pad A were mailed to 6,600 individuals on the INEL Community Relations Plan mailing list on July 28, 1993 urging citizens to comment on the plan and to attend public meetings. Display ads announcing the same information and the location of open houses in Pocatello and Twin Falls, and public meetings in Idaho Falls, Boise, and Moscow appeared in seven major Idaho newspapers. Large ads appeared in the following newspapers from July 15 to 20: Post Register (Idaho Falls), Idaho State Journal (Pocatello), South Idaho Press (Burley), Times News (Twin Falls), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and The Daily News (Moscow).

Similar display ads concerning upcoming meetings appeared in each of these newspapers several days preceding each local open house or meeting to encourage citizens to attend and provide verbal or written comments. Both media, the news release and newspaper ads, gave public notice of public involvement activities and offerings for briefings, and the beginning of a 30-day public comment period that was to begin July 28 and run throug August 26, 1993. Additionally, radio stations in Idaho Falls, Blackfoot, Pocatello, Burley,

and Twin Falls ran advertisements during the three days prior to the open houses in Pocatello and Twin Falls.

The open houses were held in Pocatello and Twin Falls on August 11 and 12, and the public meetings were held in Idaho Falls, Boise, and Moscow on August 17, 18, and 19, 1993. Written comment forms, including a postage-paid business reply form, were made available to those attending the meetings. The forms were used to turn in written comments at the meeting, and by some, to mail in comments later. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep a verbatim transcript of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for Pad A, Operable Unit 7-12, in eight INEL Information Repositories.

On August 10, 1993, a teleconference call between the League of Woman Voters of Moscow and the Environmental Defense Institute, DOE-ID, EPA, and the IDHW concerning the Pad A proposed plan was conducted at the request of Moscow area residents. The call consisted of an overview of the proposed plan, questions and answers, and general discussion of Pad A issues.

Personal phone calls concerning the availability of the proposed plan and the public meetings were made to individuals, environmental groups, and organizations by the INEL Community Relations Plan Coordinator. Outreach Office staff made calls to citizens in northern, southwestern, and southeastern Idaho.

Another series of ads were placed in the same local papers several days before the public meetings to encourage citizens to attend and comment on the plan. Additionally, a special feature article in the July issue of the INEL Reporter was mailed to 6,600 individuals to remind citizens about the meetings and the opportunity to comment on the proposed plan.

A Responsiveness Summary has been prepared as part of the Record of Decision. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

A total of 42 people attended the Pad A public meetings. Overall, 22 provided formal comments; of these 22 people, 10 people provided oral comments and 12 people provided written comments. This resulted in a total number of 109 comments. All comments received on the proposed plan were considered during the development of this ROD. The decision for this action is based on the information in the Administrative Record for this operable unit (OU).

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL is divided into ten WAGs. The WAGs are further divided into OUs. The RWMC has been designated WAG 7 and consist of 14 OUs. Data from shipping records, along with process knowledge, written correspondence, and existing monitoring data, were available to allow Pad A to be evaluated in an expedited manner. Therefore, Pad A was designated as an OU to accelerate a RI/FS. Pad A, OU 7-12, consists of the asphalt pad, the waste pile, and the overlying soil cover.

A complete evaluation of all cumulative risks associated with CERCLA actions at WAG 7 will be conducted as part of the WAG 7 Comprehensive RI/FS (OU 7-14) to ensure all risks have been adequately evaluated. Conducting this remedial action is part of the overall WAG strategy and is expected to be consistent with any planned future actions.

5. SUMMARY OF SITE CHARACTERISTICS

Pad A was constructed in 1972 for disposal of packaged solid mixed waste (hazardous waste contaminated with radioactive material) primarily from the Rocky Flats Plant in Colorado. The waste was packaged in 18,232

55-gal drums, and 2,020 4 x 4 x 7 ft plywood boxes which were placed at Pad A from September 1972 until August 1978. Each container had at least one polyethylene liner, with most containing double liners. Waste was carefully stacked on the pad with the drums reaching a maximum of 11 high, and boxes stacked a maximum of 5 high (Figure 3). At the completion of container placement activities, approximately 40% of the total pad area was occupied by waste materials.

Closure of Pad A was performed by placing plywood and/or polyethylene over the exposed containers. Both types of covering were placed in some areas, and other areas had no covering. The waste pile was then covered with a soil layer 0.9 m (3 ft) to 1.8 m (6 ft) in thickness (Figure 4). After the cover was completed, the area was seeded with crested wheatgrass to minimize soil erosion.

Environmental monitoring has been conducted to detect contaminant migration from Pad A since 1978 and has included the monitoring of surface water, groundwater, soil, and biota. Although these monitoring activities were conducted as part of routine monitoring activities at the RWMC, no conclusive trends for contaminant migration were identified for Pad A.

In addition to the environmental monitoring program, investigations of Pad A wastes were conducted prior to the initiation of FFA/CO activities. This included an investigation between September 26 and October 12, 1979, to determine the condition of the buried drums and plywood boxes. Another investigation in 1989 included determining the extent of radiological contamination on the external surfaces of the uncovered drums. Results of laboratory counts did not indicate that radioactive contamination was present on or near the drums. This investigation also involved surveying for volatile organic compounds (VOCs) and sampling for beryllium and nitrates. The intent of these programs was to determine whether any gross migration of contaminants or large-scale failure of the cover was occurring at Pad A.

The composition of Pad A wastes was identified based on written correspondence and process knowledge from the RFP, the major source of Pad wastes, as well as information from RFP shipping and INEL disposal records contained in the Radioactive Waste

<Figure>

Figure 3. Schematic representation of Pad A waste placement.

<Figure>

Figure 4. Pad A plan view.

Management Information System (RWMIS). The RWMIS was initiated in 1971 and

is considered to be the official INEL record for solid radioactive wastes.

Pad A wastes are primarily composed of nitrate salts, depleted uranium waste, and sewer sludge. Wastes, totaling approximately 10,200 m[3] (13,341 yd[3]), at Pad A consist of:

- Approximately 7,250 m[3] (9,483 yd[3]) of evaporator salts from the RFP contaminated with transuranic radionuclides

- Approximately 2,250 m[3] (2,943 yd[3]) of waste consisting primarily of oxides of uranium, uranium casting wastes, beryllium foundry wastes, and machining wastes from RFP (hereinafter referred to as depleted uranium and beryllium foundry wastes)

- Dry sewage sludge from the RFP contaminated with low levels of TRU radionuclides

- Miscellaneous INEL-generated radioactive wastes such as lab waste, counting sources, and uranium standards.

The evaporator salts are primarily sodium nitrate and potassium nitrate (60% sodium nitrate, 30% potassium nitrate, 10% miscellaneous). The nitrates at Pad A have been reviewed against 40 Code of Federal Regulations (CFR) 261.21(a)(4) and 49 CFR 173.151 and appear to exhibit the properties of an oxidizer. It is recognized that this type of oxidizer can have the characteristic of ignitability. Radioactive contamination includes plutonium, americium, thorium, uranium, and potassium-40.

Miscellaneous wastes at Pad A include other inorganic salts, dirt, concrete, and other materials. Approximately 4,600,000 kg (10,143,000 lbs) of inorganic salts from Rocky Flats are contained in 1,275 plywood boxes and 15,400 drums according to information from the RWMIS. The total inorganic salt waste consists of approximately 60% sodium nitrate ($NaNO_3$), 30% potassium nitrate (KNO_3), and 10% chloride, sulfate, and hydroxide salts. Based on RWMIS information, the volume of salts in the containers noted above comprises 71% of the total waste volume in Pad A.

Using RWMIS data, the depleted uranium waste received from RFP comprises approximately 2,250 m[3], which is 22% of the total waste volume stored in Pad A. The remaining 7% of the total waste volume is made up o the miscellaneous wastes and sludges. The chemical form and mass of the chemical contaminants on Pad A are shown in Table 1. The mass of uranium is based on 72,400 kg (159,642 lb) of total uranium, which is derived from the specific radioactivity of the three uranium isotopes listed in Table 2. This number is then converted to the triuranium octaoxide (U_3O_8) chemical mass. The U_3O_8 chemical form is the stable oxide form from uranium that was incinerated at the RFP before shipment to INEL.

<Figure>

Table 2 displays the specific radioactivity for each radionuclide in

curies on an annual basis from 1972 to 1978. The data used are those supplied by individual shipping records from the RFP that were entered into the RWMIS. The annual data listed for each radionuclide represent total quantities received for each year without decay corrections during that year. The total radioactivity for each radionuclide from 1972 to 1978 is displayed without any decay corrections. The total of nuclide radioactivity in curies from the RWMIS is 3.892E+01.

5.1 Summary of Environmental Monitoring Data

Sampling and monitoring activities of Pad A were conducted prior to the initiation of any FFA/CO investigations. Based on the evaluation of these data, no additional sampling was required to complete the Pad A remedial investigation. Rather, the Pad A investigation in effect consisted of the reconstruction and documentation of existing records and data.

5.1.1 Surface Water

Monitoring of surface water at Pad A began in 1974, when surface water samples were collected from water standing on Pad A. Also commencing in 1974, samples were collected from the Pad A drainage ditch (see Figure 5) and analyzed by gamma spectroscopy. This sampling and analytical program continued through 1975. From 1976 through 1981, surface water samples were collected annually from the Pad A culvert and were analyzed for gross alpha and gross beta in addition to gamma spectroscopy. Sampling of the Pad A culvert continued until 1986. Because monitoring of surface water at Pad A was conducted after periods of rainfall or snowmelt, there was no set frequency for surface water sample collection. Overall the Pad A surface water samples were consistent with or were within the range of the control values taken, and the data do not confirm or refute the leaching of nitrates or radionuclides from Pad A waste.

<Figure>

<Figure>

Figure 5. TSA/SDA surface water sampling locations.

Radionuclides

Between 1974 and June 2, 1982, 46 surface water samples were collected from the Pad A drainage ditch (Figure 5) and were analyzed by gamma spectroscopy. Cs-137 was detected in 19 of the 46 samples; the mean concentration of Cs-137 in these 19 samples was 1.1 x 10[-8] Ci/mL.

Commencing in 1976, the surface water samples were also analyzed for gross alpha and gross beta. Between 1976 and June 1982, 39 water samples were analyzed for gross alpha and gross beta. Gross alpha activity was observed in 4 of the 39 water samples; however, none of the concentrations exceeded the DOE Radiation Concentration Guide (RCG) for gross alpha activity in surface water (3 x 10[-8] Ci/mL). The RCG was the allowable activity of a radionuclide in a specific media in an area where public access is allowed.

Gross beta activity was detected in 34 of 39 samples, but again, none of the samples exceeded the RCG for gross beta activity in place at that time (i.e., 3 x 10[-7] Ci/mL).

Analytical results for surface water samples taken from the Pad A culvert in 1980 and 1982 are provided in Table 3. Table 4 presents the analytical results at Pad from 1983 to 1985. Surface water samples for radionuclides at Pad A were not taken in 1981.

Nonradiological Contaminants

Analysis of surface water from the Pad A culvert for nitrates commenced in 1980 and concluded in 1986. The analytical results for these surface water samples are summarized in Table 5. The nitrate concentrations ranged from 0.08 ppm to 28 ppm.

5.1.2 Soil

Radiological sampling of Pad A soils began in 1984. Analysis included gamma spectroscopy and radiochemistry for Pu-238, -239, U-235, -238, Am-241, and Sr-90. Nitrate sampling commenced in 1979 and concluded in 1984. Samples were normally taken in the spring and fall. Nitrate concentrations collected from Pad A were consistent with nitrate concentrations of control samples outside of the RWMC.

Radionuclides

Routine sampling of the Pad A soil cover for radionuclides began in 1984. Sample locations are presented in Figure 6. Each sample location was 10 x 10-m[2], and samples were collected from each corner of the square and from the center. The composite samples ranged from a depth of 0 to 2 in. The samples were then combined to form one composite sample to represent the entire sample location. Analysis of the samples included gamma spectroscopy and radio chemistry for Pu-238, -239, -240 and U-235, -238, Am-241 and Sr-90. Analytical results of specific radionuclide analyses taken in 1984, 1986, and 1988 are presented in Table 6.

<Figure>

<Figure>

<Figure>

<Figure>

Figure 6. Pad A sampling locations and designated RWMC areas for soil.

<Figure>

<Figure>

Nonradiological Contaminants

Nitrate monitoring of the Pad A soil cover commenced in 1979 with the collection of five samples. Routine nitrate sampling of the Pad A soil cover commenced in 1980 and concluded in 1984. This program consisted of collecting five samples twice a year, normally the spring and fall. The sampling and control locations are shown in Figure 7 and results are presented in Table 7.

5.1.3 Groundwater

Monitoring for nitrates in groundwater has been periodically conducted at the INEL for many years. Some concentrations were observed in 1952 to 1970 to be as high as 20 mg/L in the northeast corner of the INEL south of Terreton, Idaho. The Maximum Contaminant Level (MCL) for nitrate is 45 mg/L. Possible recorded sources of the high nitrate concentrations were chemical and organic fertilizers and sewage disposal.

In 1988, nitrate concentrations in water from United States Geological Survey (USGS) Wells 88 (approximately 500 m south of the RWMC) and 89 (approximately 500 m west of the RWMC) were 7.5 and 8.0 mg/L, respectively (Figure 8). These are very similar to concentrations found at other facilities at the INEL [e.g., Test Reactor Area (TRA), Naval Reactor Facility (NRF)]. At TRA, concentrations ranged from 5.3 to 6.6 mg/L. Nitrates at NRF contained 8.0 mg/L

Data obtained in 1992 from RWMC monitoring wells M1S, M3S, M6S, M7S,

M10S, and M4D (Figure 8) were evaluated. The 1992 nitrate concentrations in groundwater collected from RWMC perimeter wells ranged from a low of 2.1 mg/L in Well M7S to a high of 6.0 mg/L in Well M10S.

5.1.4 Biotic

Transport from radioactive waste to biota at the SDA has been quantified through collection and analysis of vegetation, small mammals, and soil samples from excavation of mammal burrows. The routine biotic sampling program at the RWMC began in 1984 with the collection of vegetation and excavated soils. The routine sampling for radioactivity in small mammals began in 1985, when deer mice were collected for analyses.

Results of sampling and analysis for radioactivity in small mammals were obtained from various locations within the RWMC beginning in 1985. Several species including deer mice and ground squirrels were collected during the reporting periods; however, these species were collected over the RWMC as a whole and were composited. Therefore no data specifically pertaining to Pad A are available.

Vegetation

In 1984, samples of crested wheatgrass and Russian thistle were taken from Pad A. Cs-137 was detected in the Russian thistle sample at a concentration of 0.20 Ci/g which was equal to control sample concentrations. In 1985, 1986, 1988, and 1989, no gamma-emitting

<Figure>

Figure 7. Pad A soil and water nitrate sampling locations.

<Figure>

<Figure>

Figure 8. Well locations.

radionuclides were detected in vegetation collected at Pad A. No data were available for alpha or beta emitting analyses because of inconsistencies in Quality Assurance/Quality Control samples and results. In 1987, Cs-134 and -137 were detected in one sample at concentrations found in other RWMC samples of the same analysis.

5.2 Pad A Soil Overburden Sampling and Drum Retrieval Activitie

1979 Inspection

The TSA/Transuranic Disposal Area (TDA) penetration project was initiated on September 26, 1979, and completed on October 12, 1979, when the excavated area was refilled with soil. The purpose of the penetration was to assess the condition of the oldest waste containers and to obtain soil samples from within the pad to detect migration or leakage of waste. The TDA was later renamed Pad A. The penetration locations are shown on Figure 9. Area B, which contains wooden boxes, and Area A, where 55-gal drums are stored, were selected for penetration and sample retrieval because they contained the oldest waste containers stored on the pad. The entire north end of the pad was established as the work area boundary.

Overburden removal began at the northeast corner of the pad to expose the oldest containers. Excavation continued south along the east boundary until ten rows of drums were uncovered and three rows of boxes were visible. The drums, lids, and lockrings showed varying degrees of corrosion, but appeared to be basically intact. One drum, which was breached during overburden removal, was resealed. The uncovered boxes appeared to be in an advanced state of deterioration caused by moisture accumulation and/or damage caused by excavation. The condition of the boxes and concern over safe handling of the drums precluded retrieval of waste containers.

The condition of the waste containers examined during penetration activities appeared to be questionable since the plywood boxes were in an advanced state of decomposition; however, the inner lining of the boxes appeared to be in good condition. The drums showed visible signs of rusting, especially on the tops and lockrings. Many of the drums showed damage such as dents and scratches, which probably occurred during disposal. Based on a visual inspection, none of the waste containers or their inner linings were breached to the extent that waste had been lost from the drums.

1988 Inspection

The strategy for the Pad A initial penetration investigation in December 1988 was to sample the Pad A cover soil, excavate to the waste, sample the interstitial soil between the drums, and inspect the condition of Pad A drums.

The soil sampling was proposed to determine the type, concentration, and location of metal and volatile organic contamination in the cover soils. The sampling was conducted near two locations on Pad A shown on Figure 10. The halogenated VOC analyses indicate that no VOCs were detected in the soils. The results of the analyses run on the eight inorganic samples collected during the cover soil sampling investigation are summarized in Table 8. The metal and salt compound analyses in Table 8 indicate that uranium was not

<Figure>

Figure 9. 1979 Pad A penetration locations (at points A and B).

<Figure>

Figure 10. 1988 sampling locations for the Pad A initial penetration.

<Figure>

detected in any samples; beryllium was detected in seven of the eight samples at low concentrations of up to 1.34 mg/kg; sodium was detected in all samples and ranged from 1000 to 1709 mg/kg; potassium was detected in all samples and ranged from 2249 to 3508 mg/kg; and nitrate was detected in five of the seven samples with values that ranged from 0.50 to 45.7 mg/kg. The background concentrations for beryllium, sodium, potassium, and nitrate are 1.5 mg/kg, 192 mg/kg, 5,180 mg/kg, and 36.5 mg/kg, respectively. Based on the results and low concentrations, it was concluded that the disturbance of Pad A overburden soils would not present a safety hazard to personnel.

Sampling and screening of the cover soils were conducted on November 1988 to determine the lateral extent of volatile organic contamination as shown in Figure 10. Nineteen samples were collected from designated points within the north and south penetration locations. The results of the screening analyses run on the 19 samples collected during the cover soil sample/screening investigation indicate that no VOCs were detected in the soils.

Efforts to demonstrate drum retrieval of Pad A containers began in October 1989. On December 7, 1989, eight drums were uncovered. All drums showed signs of corrosion; six were corroded through and contained openings ranging from the size of a pin hole to gaps 3 to 4 in. long. Drum surfaces in contact with plywood were also badly corroded. Because operational safety requirements prevented removal of breached drums, subsequent operations centered around two visually intact drums. However, on december 21, 1989, in situ ultrasonic testing and visual examination revealed a small hole in one of the drums. No holes were observed in the other drum which was subsequently removed from the penetration pit on January 8, 1990.

Results of radiological analysis did not indicate that radioactive contamination was present on or near the drums. Continuous air monitor (CAM) filters did not show detectable alpha contamination; beta-gamma airborne levels were less than airborne concentration limits. The VOC concentrations, measured with an organic field detection instrument, ranged from 0 to 10 ppm near the exposed drums. The VOCs in the space between the

drums generally remained lower than 50 ppm but reached a high of 70 ppm.

6. SUMMARY OF SITE RISKS

The risk assessment for Pad A considered both human health and ecological risks. The human health risk assessment evaluated both present and future potential exposures to contaminants. The risk assessments were conducted in accordance with the EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual and Volume II: Environmental Assessment Manual and other EPA guidance. The risk assessment methods an results are summarized in the following sections.

6.1 Human Health Risks

The risk assessment consisted of contaminant identification, exposure assessment, toxicity assessment, and human health risk characterization. The contaminants identified at Pad A were based on existing inventory records and process knowledge. The exposure assessment detailed the exposure pathways that exist at the site for workers, offsite residents, and potential future onsite residents. The toxicity assessment documented the adverse effects that may be caused in an individual as a result of exposure to a site contaminant.

The human health risk assessment evaluated current and future potential carcinogenic and noncarcinogenic risks associated with exposure to contaminants identified in the Pad A waste inventory. The human health evaluation used both the exposure concentrations and the toxicity data to determine a hazard index for potential noncarcinogenic effects and an excess cancer risk level for potential carcinogenic contaminants. In general, when a hazard index exceeds one, there may be a concern for potential noncarcinogenic health effects. The excess cancer risk level is the increase in the probability of contracting cancer. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) acceptable risk range is 1 in 10,000 to 1 in 1,000,000. An excess lifetime cancer risk of 1 in 10,000 (10[-1]) indicates that an individual has up to a one chance in ten thousand of developing cancer over a lifetime of exposure to a site-related contaminant.

Key steps taken in the risk assessment process are summarized in Sections 6.1.1 through 6.1.5.

6.1.1 Identification of Contaminants of Concern

Contaminants evaluated in the baseline risk assessment (BRA) are the following radionuclides and inorganic compounds identified in the waste inventory, based on an evaluation of the RWMIS database:

Radionuclides	Inorganic Compounds
Potassium	Sodium Nitrate
Thorium	Potassium Nitrate

Uranium	Sodium Chloride
Plutonium	Potassium Chloride
Americium	Sodium Sulfate
	Potassium Sulfate
	Sodium Hydroxide
	Potassium Hydroxide
	Triuranium Octaoxide

Total estimated chemical masses and radionuclide activities are given in Tables 1 and 2 respectively.

Environmental monitoring of ground water, surface water, air, and soil has not demonstrated any contaminant releases attributable to Pad A wastes; therefore, fate and transport modeling of Pad A wastes was used in the BR to evaluate potential risks. The modeling estimates contaminant movement through soil, air, and water. These estimates provide contaminant concentrations in a given medium at a specific time and allow evaluations of potential future risks to human and ecological receptors.

6.1.2 Exposure Assessment

Exposed Populations

Only exposure pathways deemed to be complete (i.e., where a plausible route of exposure can be demonstrated from the site to an individual) were quantitatively evaluated in the risk assessment. The populations at risk due to exposure from Pad A wastes were identified by considering both current and future use scenarios.

The human health risk assessment evaluated carcinogenic and noncarcinogenic risks for a period of 1,000 years after the waste was disposed (1972-2971). The 1,000-year period was further divided into three current and future use scenarios:

1. The current industrial scenario is expected to continue until the year 2015. Under this scenario, potential exposures to workers at the RWMC and residents adjacent to the INEL were evaluated.

2. Through the year 2090, it is assumed that DOE will continue to operate and maintain the RWMC to prevent unrestricted public access to the facility. (DOE Order 5820.2A, Radioactive Waste Management, requires control of radioactive waste disposal sites for a minimum of 100 years following closure.) Institutional controls would be implemented to control the facility and may include, but are not limited to, restricting land use; controlling public access; and the posting of signs, fencing, or other barriers. Under this scenario, potential exposures to workers at the RWMC and residents adjacent to the INEL were evaluated.

3. To determine the baseline risk in the absence of institutional controls, it is assumed that the INEL will be available for

unrestricted use beyond the year 2090. The potential risks from residential development adjacent to the INEL, RWMC, and Pad A boundaries were evaluated.

Contaminant transport from the source to receptors was modeled using three different computer codes: (a) GWSCREEN, which models the transport of contaminants from the source to the subsurface; (b) DOSTOMAN, which models the transport of contaminants from the source to the surface; and (c) a simple "Box" model, which models transport of contaminants through the air, once they are brought to the surface.

The GWSCREEN is a combination of three different models. The models address the mass flux of contaminants released from the source, the transport of the contaminants through the unsaturated zone, and transport of the contaminants through the aquifer. In the source, the contaminant is assumed to be uniformly mixed throughout a parallelopiped source region and the mass flux from the source is assumed to be a first-order leach function.

For contaminant transport in the unsaturated zone, GWSCREEN employs a plug-flow model which incorporates retardation due to adsorption and decay of radionuclides but neglects dispersion. In this portion of GWSCREEN, the unsaturated zone is assumed to be homogeneous and the infiltration rate through the unsaturated zone is modeled as a steady-state one-dimensional flow.

The GWSCREEN uses a semianalytical solution to the advection-dispersion equation to model contaminant transport in the aquifer.

The DOSTOMAN code was used to model mechanical transport of contaminated soil through the uptake of waste through flora and burrowing mammals. The DOSTOMAN code mathematically simulates movement of contaminants from a subsurface "source" compartment to overlying "sink" compartments by means of solving a system of differential equations at specific time steps.

The movement of contaminants through air from Pad A to a distant receptor was modeled using a simple "Box" model solution. This method calculates the volume of air passing over Pad A that is swept out per second in order to determine a volumetric rate of contaminants from Pad A.

Several assumptions were used to model contaminant fate and transport. These assumptions, along with the associated uncertainties, are discussed in Section 6.1.5.

The fate and transport modeling indicated that radionuclides (with the exception of potassium-40) would not reach the aquifer within 1,000 years. The modeling showed potassium-40 reaching the aquifer within the 1,000 year timeframe, but it was not shown to pose an unacceptable risk.

The evaluation of current and future use scenarios assumes that industrial workers and residents would be located at the locations shown in

Table 9. For the residential scenarios, it was assumed that a family would occupy the area and engage in agricultural activities such as irrigation of crops, livestock watering, and domestic activities that would utilize water pumped from the Snake River Plain Aquifer (SRPA).

Exposure Pathways

The following exposure pathways were evaluated in the risk assessment for both the current and future risk scenarios: ù Ingestion of surface soil

ù Inhalation of contaminated dust

ù Ingestion of drinking water (groundwater) from the SRPA

ù Ingestion of food crops (residential scenario only)

ù External exposure to radionuclides.

The exposure parameters (such as exposure frequency and duration), used in the risk assessment were obtained from Standard Default Exposure Factors guidance (EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposur Factors, OSWER Directive 9285.6-03, 1991). The exposure parameters used are shown in Table 10.

Exposure Point Concentrations

Contaminant concentrations at points where the potential for human exposure is expected to occur are necessary to evaluate the intake of potentially exposed individuals. Exposure pathways from the source to individuals were evaluated using a groundwater transport computer model, GWSCREEN; a mechanical mixing model, DOSTOMAN; and an air transport model. The results of the computer modeling indicated nitrate concentrations in groundwater are estimated to peak approximately 250 years in the future at the predicted concentrations shown in Table 9. These concentrations, used in conjunction with future receptors being located at Pad A and RWMC boundaries, constitute a reasonable maximum exposure scenario at Pad A. Exposure point concentrations for the media associated with other pathways (e.g., ingestion of surface soil) are provided in Section 5 of the Pad A RI/FS Report.

<Figure>

<Figure>

Because of the overall conservative nature of the assumptions used in the fate and transport modeling, the actual nitrate concentrations in groundwater are expected to be lower than those predicted. In addition, the

hazard indices calculated for infants and children are based on two additional conservative assumptions: (a) peak sodium nitrate and potassium nitrate concentrations occur in groundwater at the same time, and (b) infants and children are exposed to the sum of these peak concentrations. These latter two assumptions are conservative in that the groundwater analysis actually predicted different travel times to the groundwater for sodium nitrate and potassium nitrate (i.e., their predicted peak concentrations are not additive). Given these conservative elements, the hazard index associated with the groundwater ingestion exposure pathway is expected to be lower than 1.

6.1.3 Toxicity Assessment

The toxicity assessment addresses the potential for a contaminant to cause adverse effects in exposed populations and estimates the relationship between extent of exposure and extent of toxic injury (i.e., dose response relationship).

Two types of toxicity values were used in the risk assessment: reference doses, which are used to evaluate noncarcinogenic effects; and slope factors, which are used to evaluate carcinogenic effects. The Integrated Risk Information System database, an EPA online compute database, and the EPA Health Effects Assessment Summary Tables provided toxicity values for chemicals and slope factors for radionuclides for the contaminants at Pad A. Some of the toxicity values were derived based on available toxicity information. The reference doses used in the evaluation of noncarcinogenic effects are shown in Table 11. The inhalation pathway was not included in the risk calculations for noncarcinogenic effects because the inhalation reference doses were not available for the chemicals identified in the waste inventory of Pad A.

Slope factors used to evaluate carcinogenic effects for the radionuclides were obtained from an advance copy of the 1992 edition of the EPA Health Effects Assessment Summary Tables: Annual Update, FY 1992, ORR Publication 9200.6-303 (92-1) and are shown in Table 12. Pathway-specific slope factors were identified for ingestion, inhalation, and external exposure.

The primary contaminants of concern, based on the risk assessment, are the nitrate wastes. The primary concern with nitrate in the environment is related to its conversion by biological systems to nitrite. Nitrite acts in the blood to oxidize hemoglobin to methoglobin, which cannot transfer oxygen to the tissues. This condition is known as methemoglobinemia and is caused by high levels of nitrite or, indirectly, excessive levels of nitrate in humans. Nitrate toxicity can result from ingestion of water and vegetables high in nitrates (EPA 1992a). Infants are more susceptible to nitrate toxicity than adults. This increased susceptibility is attributed to high intake per unit weight, the presence of nitrate-reducing bacteria in the upper gastrointestinal tract, the condition of the mucosa, and the greater ease of oxidation of fetal hemoglobin. Infants (0-3) and small children

(3-6) were evaluated as separate population subgroups when calculating risks from ingestion of nitrates. Other effects associated with ingestion of nitrates can include hypotension, tachycardia, respiratory depression, headache, nausea, vomiting, and diarrhea.

<Figure>

6.1.4 Risk Characterization

Risk characterization is the process of combining the results of the exposure and toxicity assessments. This process provides numerical quantification relative to the existence and magnitude of potential public health concerns related to the potential release of contaminants from the site.

Risk calculations are divided into carcinogenic and noncarcinogenic categories. The calculation of health risks from potential exposure to carcinogenic compounds involves the multiplication of cancer slope factors for each carcinogen and the estimated intake values for that contaminant.

Noncarcinogenic risk is assessed by comparison of the estimated daily intake of a contaminant to its applicable reference dose. A reference dose is a provisional estimate of the daily exposure to the human population that is likely to be without an appreciable risk of deleterious effects during a portion of the lifetime. The estimated daily intake of each contaminant by an individual route of exposure is divided by its reference dose and the resulting quotients are added to provide a hazard index

<Figure>

Based on the results of the risk assessment, no current risk exists to workers or the public from Pad A. The only potential risk identified by the risk characterization of Pad A occurs at the Pad A boundary for residents during a 30-year period beginning in 2228, primarily due to ingestion of nitrate-contaminated groundwater. Noncarcinogenic and carcinogenic risks are summarized in Table 9.

Although not quantitatively evaluated in the risk assessment, prolonged exposure to Pad A contaminants through intrusion into the waste pile would likely pose an unacceptable risk to human health.

6.1.5 Uncertainty

Risk assessments are subject to uncertainty from inventory records, fate and transport estimation, exposure estimation, and toxicological data. Uncertainty was addressed by using health-protective assumptions that systematically overstate the magnitude of health risks. This

process is intended to bound the plausible upper limits of risk and to facilitate an informed risk management decision. Table 13 is a summary of risk assessment assumptions and associated uncertainties.

6.2 Ecological Concerns

The ecological risk assessment qualitatively evaluated the potential ecological effects associated with the presence of Pad A. This ecological evaluation followed the EPA Risk Assessment Guidance for Superfund Volume II. The evaluation focused on the same contaminants and receptor locations as those evaluated in the human health assessment. Objectives of the ecological risk assessment are to qualitatively evaluate the potential risk to ecological receptors from the contaminants in Pad A. The assessment identified sensitive nonhuman species and characterized potential exposure pathways including ingestion of contaminated soil and vegetation by small mammals and contaminant uptake by plants.

The approach used in the ecological risk assessment is consistent with EPA guidance for evaluating risk. The steps included identification of contaminants, assessment of potential exposure pathways, and characterization of threats to exposed biota.

6.2.1 Exposure Assessment

The exposure scenarios assumed that the ecological species would be located at the same receptor locations identified in the human health evaluation, the Pad A boundary, the RWMC boundary, and the INEL boundary. The exposure pathways evaluated included intrusion of the waste after institutional control by plants (sagebrush) and small mammals (e.g., ground squirrels). Exposure routes included ingestion of contaminated soil and vegetation and prey by mammals and uptake of contaminants by plants

6.2.2 Risk Characterization

The risk characterization involved evaluating the potential adverse effects on populations of organisms at Pad A. Impacts on environmental populations were assessed based on the exposure routes presented above. The evaluation covered peak concentrations for post-institutional control exposure periods. The quantitative evaluation that determines a toxic soil concentration compared to estimated concentration in the surface soil indicated that the Pad A contaminants will not pose a threat to the small burrowing animals.

Tolerance limits for plant species were evaluated and were not determined to be at levels that could adversely affect the plant species. These results of the ecological risk assessment indicate that Pad A wastes are not expected to have any significant disruptive effects on animal or plant populations or the local ecosystem. This information will be incorporated into a WAG-wide or INEL site-wide ecological risk assessment to determine the potential cumulative impacts to the environment from all areas.

<Figure>

<Figure>

<Figure>

<Figure>

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<Figure>

6.3 Basis for Response

Threatened releases of, and prolonged direct contact with, hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present a potential threat to public health, welfare, or the environment at the boundary of Pad A.

7. DESCRIPTION OF ALTERNATIVES

7.1 Remedial Action Objectives

The risk assessment indicates that there is no current risk to workers or the public from Pad A. However, fate and transport modeling indicated a potential future risk in approximately 250 years due to exceedances of drinking water standards for nitrate if residents used the groundwater directly adjacent to the Pad A boundary. This fate and transport modeling used conservative assumptions in order not to underestimate risks. Actual nitrate concentrations in groundwater are not expected to exceed drinking water standards at

the WAG 7 boundary and, therefore, Pad A is not expected to pose an unacceptable risk to human health or the environment now or in the future.

The results of investigation and risk assessment indicate that the existing Pad A cover is a protective barrier for the Pad A contents; however, although not quantitatively evaluated, prolonged direct contact with Pad A waste would likely pose an unacceptable risk. Consequently, the focus of the remedial action objectives and the alternative development was on maintaining the effectiveness of the existing cover to prevent direct exposure to the wastes and to minimize the potential for contaminant migration from the pad to surface water or groundwater. The alternatives developed were also designed to address the uncertainty associated with the fate and transport modeling and with future land use assumptions by including environmental monitoring and institutional controls to restrict access.

Remedial action objectives also include the identification of preliminary remediation goals that are established based on both risk and on frequently used standards or ARARs. The nitrates at Pad A have been reviewed against 40 CFR 261.21(a)(4) and 49 CFR 173.151 and appear to exhibit the properties of an oxidizer. It is recognized that this type of oxidizer can have the characteristic of ignitability. The RCRA closure requirements are applicable when (a) the waste is hazardous and (b) the unit received the waste after RCRA requirements became effective. Pad A does contain RCRA hazardous waste but the waste was placed from 1972 through 1978, before RCRA requirements became effective; therefore, RCRA closure requirements are not applicable to the wastes in Pad A. However, certain RCRA closure requirements in 40 CFR Subpart N, specifically [Para]264.310, are considered to be relevant and appropriate. Because the residual contamination in the pad may pose a direct contact threat, but is not expected to pose a groundwater threat, relevant and appropriate requirements include: (a) a cover, which may be permeable, to address the direct contact threat; (b) limited long-term management including site and cover maintenance and groundwater monitoring; and (c) institutional controls (e.g., land-use restrictions or deed notices) to restrict access.

The remedial action objectives would be achieved by implementing the general response actions described below. Alternatives were subsequently developed based on these general response actions.

ù Containment with a cover that:

- Provides long-term minimization or migration of liquids through the pad (e.g., with an infiltration rate of less than 5 cm/yr);

- Functions with minimum maintenance;

- Promotes drainage and minimizes erosion or abrasion of the cover;

- Accommodates settling and subsidence such that the cover integrity is maintained; and

- Has a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

ù Maintenance of the cover integrity and effectiveness including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, and other events and to prevent run-on and run-off from eroding or otherwise damaging the cover.

ù Environmental monitoring of air, groundwater, and surface water/sediments to provide early detection of a potential release to subsurface, groundwater, or surface pathways.

ù Institutional controls such as access and land use restrictions to prevent intrusion into the wastes. The restrictions would prevent activities occurring that allow direct exposure to contaminants in Pad A wastes.

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the Feasibility Study identified alternatives that (a) achieve the stated remedial action objectives, (b) provide overall protection of human health and the environment, (c) meet ARARs, and (d) are cost-effective.

The alternatives evaluated in the FS for Pad A were Alternative 1 - Containment, Alternative 2 - Limited Action, and Alternative 3 - No Action. Descriptions of each alternative are provided in the following sections.

Each of the alternatives evaluated considers leaving the wastes in place and involves utilization of a cover or cap to continue to effectively isolate the wastes. Other alternatives such as excavation, treatment, and disposal were not evaluated because the results of the investigation and the risk assessment indicated that the Pad A wastes would not pose an unacceptable risk if left in place assuming prolonged direct contact with the waste is prevented. Consequently, the impacts/effects for each of the alternatives are similar, as are the regulatory requirements. Therefore, the ARARs for each of the alternatives are the same. Refer to Table 14 for a summary of ARARs and to-be-considered (TBC) criteria for the alternatives.

7.3 Alternative 1 - Containment of Pad A Materials

Two subalternatives were developed and evaluated in the detailed analysis. One subalternative involves construction of a composite earthe material cover to be placed directly over the existing Pad A cover. Several combinations of different earthen material types were evaluated within this alternative using layers of clay, soil, rock and/or sand. A cross-sectional view of several containment options under this subalternative is represented in Figure 11. It is estimated that a composite earthen cover would require 10 to 15 workers approximately 60 weeks to complete construction. Construction and 30 years of monitoring costs are estimated to range from $1.8 million to $2.3 million.

The other subalternative evaluated would involve construction of an earthen/synthetic material cover over the existing waste pile using clay, gravel, and a plastic flexible membrane liner. It is estimated that an earthen/synthetic cover would require 10 to 15 workers 60 weeks to complete construction. Construction and 30 years of monitoring costs are estimated at $2.4 million.

<Figure>

Both of the subalternatives would be capable of being placed directly over the existing Pad A wastes and soil cover. This alternative ensures that the entire volume of Pad A wastes (13,341 yd[3]) that remains in place is effectively isolated with an impermeable cover of composite design. These subalternatives provide continuing isolation of the Pad A wastes from the environment at the surface and protection of human health and the environment. These subalternatives ensure continued protection by preventing contaminant migration to groundwater and reducing the accessibility of waste materials at the surface of the cover.

Certain RCRA closure requirements in 40 CFR 264 Subpart N are considered to be relevant and appropriate with respect to the waste materials remaining on Pad A. Under this alternative, Pad A would be closed and managed in accordance with the substantive relevant and appropriate requirements of 40 CFR [Para]264.310 - Closure and post-closure care.

Institutional controls (i.e., access/land use restrictions) would be continued under this alternative to maintain protection of human health and the environment. The controls would restrict activities occurring onsite that allow direct exposure to contaminants in Pad A.

Because this alternative leaves wastes in place, long-term monitoring (for groundwater, soil, surface water, and air) would be conducted to provide early detection of a potential release to the subsurface, groundwater, or surface pathways. Additionally, infiltration rates will be monitored to ensure the effectiveness of the cover.

<Figure>

Figure 11. Cross-sections of composite earthen material cover options.

7.4 Alternative 2 - Limited Action

Under Alternative 2, actions would focus on recontouring, subsidence correction, and continued maintenance of the existing soil cover. This

alternative is intended to contain the Pad A waste materials, to prevent exposure of these materials through erosion by wind or water, and to limit the infiltration of rainwater through the waste. The overall cost for upgrading the existing soil cover, continued maintenance, and 30 years of monitoring is estimated at $1.7 million.

This alternative ensures that the entire volume of Pad A wastes (13,341 yd[3]) that remains in place is effectively isolated with a protective soil cover. This alternative provides continuing isolation of the Pad A wastes from the environment at the surface and protection of human health and the environment. The placement of additional soil material for contouring and maintenance of this soil cover will provide continuing isolation of the waste, thus minimizing the potential for direct exposure of the waste to the environment via erosion and/or biotic transport. Alternative 2 ensures continued protection by preventing contaminant migration to groundwater and reducing the accessibility of waste materials at the surface of the cover.

Certain RCRA closure requirements in 40 CFR 264 Subpart N are considered to be relevant and appropriate with respect to the waste materials remaining on Pad A. Under this alternative, Pad A would be closed and managed in accordance with the relevant and appropriate requirements of 40 CFR [Para]264.310 - Closure and post-closure care.

Institutional controls (i.e., access/land use restrictions) would be continued under this alternative to aid in protecting human health and the environment. The controls would restrict activities occurring onsite that allow direct exposure to contaminants in Pad A.

Because this alternative also leaves wastes in place, and long-term monitoring (for groundwater, soil, surface water, and air) would be required to provide early detection of a potential release to the subsurface, groundwater, or surface pathways. Additionally, infiltration rates will be monitored to ensure effectiveness of the existing cover.

7.5 Alternative 3 - No Action

Under this alternative, no action other than groundwater, surface water, air, and soil monitoring would be implemented. All wastes currently in place on Pad A are assumed to remain on the pad with no corrective action or maintenance implemented for the existing soil cover. This alternative was a "baseline" case against which the other alternatives were compared and does not include the use of institutional controls to prevent uncontrolled access to the site nor does it address the uncertainties associated with the BRA.

Long-term monitoring (for groundwater, soil, surface water, and air) would be also be conducted for this alternative to provide early detection of a potential release to the subsurface, groundwater, or surface pathways. Monitoring costs for the next 30 years are estimated at $692,000.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVE

CERCLA guidance requires that each remedial alternative be compared according to nine criteria. Thos criteria are subdivided into three categories: (a) threshold criteria that relate directly to statutory findings and must be satisfied by each chosen alternative; (b) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction of toxicity, mobility, and volume, and cost; and (c) modifying criteria that measure the acceptability of the alternatives to State agencies and the community. The following sections summarize the evaluation of the candidate remedial alternatives according to these criteria.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the ROD.

8.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Each of the remedial action alternatives satisfies the criterion of overall protection of human health and the environment. The alternatives provide protection by minimizing the risk of potential contaminant migration to the groundwater and by maintaining the inaccessibility of the Pad A waste materials, thereby preventing direct exposure to the wastes.

8.1.2 Compliance with ARARs

CERCLA, as amended by the SARA, requires that remedial actions for Superfund sites comply with federal and state laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable but are relevant and appropriate, in other words, requirements that pertain to situations sufficiently similar to those encountered at a Superfund site so that their use is well suited to the site. Combined, these are referred to as ARARs. State ARARs are limited to those requirements that are (a) promulgated, (b) uniformly applied, and (c) and are more stringent than federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical, location, and action-specific ARARs or justification for a waiver.

ARARs are identified for each alternative considered at the Pad A unit under the Description of Alternatives (Table 14 in Section 7). All alternatives would be designed to meet the identified ARARs for this unit, with the exception that the No Action alternative does not include institutional controls.

8.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Each alternative is evaluated using each of the balancing criteria. The balance criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. Each criterion is further explained in the following sections. Table 15 includes a summary of the comparative analysis (relative ranking) of the alternatives.

8.2.1 Long-term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternatives 1 and 2 provide long-term effectiveness and permanence because the existing cover and composite earthen material and earthen/synthetic material cover options provide for reliable isolation of the Pad A when combined with institutional controls. A degree of residual risk would remain, however, as the waste material would not be removed from Pad A.

The No Action alternative would likely provide a lower level of long-term effectiveness and permanence because of the lack of cover maintenance and the potential for future uncontrolled erosion and subsidence.

<Figure>

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies, which permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

The Pad A investigations and risk assessment indicated that maintenance of the existing cover would reliably control Pad A wastes in place; therefore, no treatment alternatives were evaluated.

8.2.3 Short-term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection and reduce any adverse impacts on human health and the

environment that may be posed during the construction and implementation period until cleanup goals are achieved.

In general, alternatives requiring the least amount of worker interface (i.e., construction and/or operations) and Pad A waste handling rank the highest in terms of short-term effectiveness.

Alternatives 1 and 2 rank equally under this criterion since they do not require handling of the Pad A wastes. No increase in potential risk t the public would occur because the Pad A waste will not be disturbed under either of these alternatives. Alternative 1 may require more time to complete than Alternative 2 based on the complexity of the design of the containment cover.

8.2.4 Implementability

The implementability criterion has the following three factors requiring evaluation: (a) technical feasibility, (b) administrative feasibility, and (c) the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. The ability to coordinate actions with other agencies is one factor for evaluating administrative feasibility, and the agencies have demonstrated this throughout the project to date. Other administrative activities that would be readily implementable include planning, use of administrative controls, and personnel training. In terms of services and materials, an evaluation of the following availability factors is required: necessary equipment and specialists, prospective technologies, and cover materials.

Each of the alternatives retained for detailed analysis is readily implementable. However, Alternative 1 ranks slightly lower than Alternative 2 and the No Action alternative because of the increased difficulty of installing and maintaining the multi-layered cover systems.

8.2.5 Cost

In evaluating project costs, an estimation of capital costs, operation and maintenance costs, and present worth costs is required. In accordance with the RI/FS guidance, the costs presented are estimates (i.e., -30% to +50%). Actual costs could vary based on the final design and detailed cost itemization. The cost estimates for these alternatives are listed in Table 16.

8.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. For both of these criteria, the factors that are considered include the elements of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the

alternatives that have strong opposition.

8.3.1 State Acceptance

The IDHW concurs with the selected remedial alternative, Limited Action. The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, this ROD, and other project activities such as public meetings. Comments received from IDHW were incorporated into these documents, which have been issued with IDHW concurrence.

<Figure>

8.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the Proposed Plan. Specific comments are responded to in the Responsiveness Summary portion of this document.

Eleven individuals provided written comments on the Pad A Proposed Plan during the public comment period. One written comment was received after the comment period ended. Nine individuals also provided oral comments at the public meetings held in Idaho Falls, Boise, and Moscow. Public opinion on the preferred alternative, in no particular order, included (a) Alternative #1 should have been selected, (b) Limited Action was the best alternative presented, (c) cumulative, INEL-wide risks should have been evaluated, (d) catastrophic future events were not addressed adequately, (e) long-term control of the site cannot be guaranteed, (f) control of public meetings needs to be improved, and (g) treatment and removal of the Pad A wastes from the site should have been evaluated and selected. Additional comments were provided requesting additional technical information, or concerns about the integrity of containers and the current Pad A site. In general, public opinion was split between those in favor of the preferred alternative, those in opposition, and individuals requesting additional, or clarifying information.

9. SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE-ID, EPA, and IDHW have selected Alternative 2 - Limited Action as the most appropriate remedy for Pad A, OU 7-12 at the RWMC. The BRA indicates that there is no current risk to workers or the public from Pad A. The fate and transport modeling indicated a potential future risk in approximately 250 years due to exceedances of drinking water standards for nitrate if residents used the groundwater directly adjacent to the Pad A boundary; however, this fate and transport modeling used conservative assumptions in order not to underestimate risks. Actual nitrate concentrations in groundwater are not expected to exceed drinking water standards at the WAG 7 boundary; therefore, Pad A is not expected to pose an unacceptable risk to human health or the environment in the future. Although not quantitatively evaluated, prolonged direct contact with the Pad A wastes would likely pose

an unacceptable risk. Alternative 2 - Limited Action was therefore selected to address uncertainties associated with the fate and transport modeling and future land use around the RWMC, in order to maintain existing conditions and continue to restrict access to Pad A in order to prevent direct contact with the wastes.

9.1 Limited Action Description

The major components of Alternative 2 - Limited Action include recontouring and slope correction, institutional controls, and maintenance and monitoring of the existing cover at Pad A. The selected alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the nine CERCLA evaluation criteria. DOE-ID, EPA, and IDHW believe the preferred alternative is protective of human health and the environment, complies with applicable federal and state regulations, and is cost-effective.

Maintenance will include subsidence and erosion control of the Pad A cover. Monitoring will continue to be conducted at Pad A to ensure the effectiveness of the existing cover. Groundwater, air, surface water, and soil monitoring will be designed and conducted to provide early detection of a potential release to the subsurface, groundwater, or surface pathways and ensure continued effectiveness of the soil cover.

Institutional controls (i.e., access/land use restrictions, controlling public access, posting signs, and erecting/maintaining barriers or fences) would be continued under this alternative to aid in protecting human health and the environment. The restrictions would reduce the likelihood of activities onsite that allow direct exposure to contaminants in Pad A.

Because this remedy will result in wastes remaining onsite, maintenance and monitoring of Pad A will continue. Independent reviews of the maintenance and monitoring data will be conducted by EPA and IDHW. This evaluation will be conducted within two years of ROD signature, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

9.2 Remediation Goals

The purpose of this response action is to continue to prevent exposure to the wastes disposed at Pad A. This will be accomplished by maintaining the existing cover and continuing to restrict access to Pad A in order to prevent direct contact with the wastes.

Performance standards will be implemented to ensure that the cover continues to provide protection against direct exposure to Pad A wastes. The performance standards identified for Limited Action include (a) maintaining the soil cover to prevent excessive infiltration thereby providing continued protection of groundwater, and (b) ensuring erosion is monitored and controlled to limit soil loss such that the infiltration rates are not affected and the potential for exposing wastes is eliminated. The

inspection and maintenance of the soil cover will be conducted concurrent with the monitoring program. Implementation of the maintenance and monitoring programs will ensure that the Pad A site continues to protect human health and the environment from any unacceptable risks.

For those remedial actions that allow hazardous substances to remain onsite, Section 121(c) of CERCLA requires that a review be conducted of the remedy within five years after initiation of remedial action and at least once every five years thereafter. The purpose of this review is to evaluate the remedy's performance - to ensure that the remedy has achieved, or will achieve, the remedial action objectives set forth in the ROD and that it continues to be protective of human health and the environment.

Monitoring data (groundwater, air, surface water, and soil) will be collected at Pad A and evaluated by the EPA and IDHW within two years of signing the ROD. This monitoring will be implemented to provide a baseline against which future site characterization can be compared, to provide early detection of a potential release to the subsurface, groundwater, or surface pathways, and to ensure continued effectiveness of the soil cover.

9.3 Estimated Costs for the Selected Remedy

A summary of the costs for each of the action alternatives was presented in Table 16. Table 17 provides a detailed breakdown of the estimated costs (i.e., $2.2 million) related to the Limited Action alternative. Costs for maintenance and monitoring of the Pad A site are the Net Present Value (NPV) dollars for 1992, using a 5% discount rate. These costs are calculated using NPV since they extend several years into the future.

10. STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA, as amended by SARA, and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and compliance with ARARs. CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practical and that the implemented action must be cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 9, the selected remedy satisfies the criterion of overall protection of human health and the environment by minimizing the risk of potential contaminant migration to groundwater and by preventing direct contact with the Pad A waste materials. The remedy will ensure that cumulative carcinogenic risk levels are maintained within the NCP risk range

(1 additional cancer in 10,000 to 1 additional cancer in 1,000,000), and the cumulative hazard index is maintained less than 1.

The selected remedy will upgrade the existing cover to improve the cover slope and contours. The cover will be designed to incorporate erosion control measures to reduce the effects from rain and wind. The selected remedy ensures that the Pad A cover receives maintenance which includes subsidence correction and erosion control. Monitoring of Pad A will continue and will include sampling of water, air, and soils at Pad A to ensure the effectiveness of the existing cover and the protection of groundwater. The agencies will continue to review the action, within two years, and at least every five years thereafter, to ensure that human health and the environment are being protected. Additionally, institutional controls (i.e., access/land use restrictions, controlling public access, posting signs, and erecting/maintaining barriers), will be implemented to prevent direct exposure to wastes. No short term risks will be incurred as a result of this remedy.

10.2 Compliance with ARARs

The selected remedy of limited action will be designed to meet all ARARs of federal and state regulations. The ARARs that will be achieved by the selected alternative follow.

<Figure>

10.2.1 Chemical-specific ARARs

No chemical-specific ARARs are identified for the selected remedy.

10.2.2 Action-specific ARARs

Certain substantive IDAPA closure and post-closure requirements [IDAPA [Para]16.01.05008 (40 CFR 264.310)] will be met for closure and post-closure care of Pad A. The relevant and appropriate requirements specify standards for final cover requirements, cover maintenance, and monitoring of Pad A following closure.

The relevant and appropriate substantive requirements of the rules for the Control of Fugitive Dust (IDAPA [Para]16.01.01251 and IDAPA [Para]16.01.01252), which specify that all reasonable precautions be taken to prevent the generation of fugitive dusts, must be complied with.

10.2.3 Location-specific ARARs

No location-specific ARARs are identified for the selected remedy.

10.2.4 To-Be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to consider a number of procedures or guidances that are not legally binding. The following are to be considered guidance documents:

- DOE 5820.2A, "Radioactive Waste Management"
- DOE 5400.5, "Radiation Protection of the Public and the Environment"
- OSWER 9234.2-04FS, October 1989, "RCRA ARARs: Focus on Closure Requirements"
- OSWER 9476.00-1, September 1982, "Evaluating Cover Systems for Solid and Hazardous Waste" (Revised)

DOE Order 5820.2A addresses future control of the site and provides the requirement that DOE maintains active institutional control of low-level radioactive waste disposal sites for 100 years following closure (in this case, closure of the SDA). Institutional controls that would be implemented to continue control of the facility may include, but are not limited to, deed restrictions on future land use, controlling public access, posting signs, and erecting barriers or fences. DOE Order 5400.5 provides radiation protection standards for the general public from activities conducted at DOE sites. The OSWER directives provide additional guidance on the design specifications for constructing and maintaining a cover system.

10.3 Cost Effectiveness

Based on expected performance, the selected remedy has been determined to be cost-effective because it would provide overall effectiveness proportional to its costs when compared against the other alternatives.

10.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable for this site. The NCP prefers a permanent solution whenever possible. Because this site has a large volume of low concentrations of hazardous substances that can be reliably controlled in place, the alternative focuses on maintenance of the existing cover, monitoring, and institutional control of Pad A. The selected remedy provides protection by minimizing the risk of potential contaminant migration to groundwater and by maintaining the inaccessibility of the Pad A waste materials. Based on evaluation of the CERCLA remedial alternative criteria, and in particular the five balancing criteria, limited action will provide the best solution in terms of long- and short-term effectiveness, cost, and implementability.

10.5 Preference for Treatment as a Principal Element

Because the Pad A investigation and risk assessment indicated that the

cover would reliably control Pad A wastes in place, this remedy did not consider treatment as a principal element of the remedy.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

Following the Pad A public meetings, additional soil, and soil moisture monitoring data associated with Pad A became available to the agencies. This information has been evaluated by the agencies and has been determined to have no impact on the remedial alternatives discussed in the Pad A Proposed Plan nor on the remedy selected in the ROD. Because the data were not previously available for public review and comment, the results from the sampling activities are being provided in the interest of completeness of the RI/FS.

In May 1992, 38 soil samples were taken from various locations on the Pad A soil cover. Radionuclides detected in several of the samples included Am-241, detected in nine samples with concentrations ranging from 0.78 to 6.66 pCi/g, Cs-137 detected in five samples with concentrations ranging from 0.06 to 0.1 pCi/g, and Co-60 detected in only one sample at a concentration of 0.14 pCi/g. The measured concentrations are consistent with concentrations detected in past environmental monitoring/sampling activities conducted at Pad A and other areas of the RWMC and were determined to warrant no further consideration.

The Pad A overburden soil inorganic results were screened against INEL background surface soil concentrations established in 1989. Only three inorganic contaminants, beryllium, mercury and manganese, were present in some of the samples above the INEL background levels. Beryllium was detected in one sample at a concentration of 84.6 mg/kg above the background concentration of 2 mg/kg. Mercury was detected in two samples at a concentration of 0.11 mg/kg and 0.75 mg/kg above the background concentration of 0.06 mg/kg. Manganese was detected in five samples at concentrations from 629 to 869 mg/kg. The background concentration for manganese is 636 mg/kg. All other metals were not present above INEL background levels at the 95% confidence limit. Based on the limited number of sample results above the INEL background levels, the measured concentrations were determined to warrant no further consideration.

VOCs were detected positively in only two of the 38 samples. These two sample results indicate a potential single isolated VOC source within Pad A. The amount of VOCs posed by these isolated sample results is considered to be very small and, as such, would have no impact on the previous decisions. Additionally, the planned institutional controls to be implemented by this ROD will adequately prevent any exposure to the VOCs.

In addition to these soil samples, one set of soil moisture samples was obtained in June 1986 from two wells located at the south end of Pad A at a depth of 4.37 m (14 ft 4 in.) and 2.64 m (8 ft 8 in.). The soil moisture samples were analyzed for nitrates and showed concentrations of 13 and 48 mg/kg. As with the overburden sampling, the concentrations suggested by the

samples are adequately bounded by the Pad A BRA and deemed to have no impact on previously reported results.

The cost estimates in the ROD reflect contingency costs associated with each alternative. These contingency costs were not discussed in the Proposed Plan and did not measurably affect the evaluation of alternatives.

APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Overview

Operable Unit (OU) 7-12, Pad A, is the third OU to be addressed within Waste Area Group (WAG) 7, the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). A Proposed Plan was released July 19, 1993, with a public comment period from July 28 to August 26, 1993. The Proposed Plan recommended that limited action, focusing on maintenance and upkeep of the existing soil cover and monitoring to ensure the effectiveness of the existing cover and the protection of groundwater, be taken at Pad A. This Responsiveness Summary recaps and responds to the comments received during the comment period. Generally, the comments reflected a broad range of views, from strong support for the selected alternative to strong opposition to leaving the wastes in place.

Background on Community Involvement

To announce the beginning of the Pad A investigation, public informational meetings were held in December 1992 in Idaho Falls, Twi Falls, Boise, and Moscow. The meetings were to explain the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. These informational meetings were announced via a fact sheet conveyed through a "Dear Citizen" letter mailed on November 19, 1991, to a mailing list of 5,600 individuals in the general public and 11,700 INEL employees. On November 20, 1991, the U.S. Department of Energy, Idaho Operations Office (DOE-ID) issued a news release to more than 40 newspaper, radio, and television media contacts. Display ads announcing the 30-day public comment period on Pad A appeared between November 22 and November 27, 1991 in eight major Idaho newspapers: the Post Register in Idaho Falls, the Idaho State Journal in Pocatello, the South Idaho Press in Burley, the Times News in Twin Falls, the Idaho Statesman in Boise, the Idaho Press Tribune in Nampa, the Lewiston Morning Tribune in Lewiston, and the Idahonian in Moscow. Personal telephone calls were made to key individuals, environmental groups, and organizations from INEL field offices in Pocatello, Twin Falls, and Boise. Calls were also made to community leaders in Idaho Falls and Moscow by the Community Relations Plan Coordinator.

When the investigation was complete, a Notice of Availability for the Pad A Proposed Plan was published between July 15 and July 20, 1993, in the Post Register (Idaho Falls), the Idaho State Journal (Pocatello), the South Idaho Press (Burley), the Times News (Twin Falls), the Idaho Statesman (Boise), the Lewiston Morning Tribune (Lewiston), and The Daily News (Moscow). A second advertisement was placed in the same newspapers several days before each open house or meeting to remind citizens of the opportunity to attend the meeting and provide oral or written comments. Radio stations in Idaho Falls, Blackfoot, Pocatello, Burley, and Twin Falls ran advertisements during the three days before the open houses in Pocatello and Twin Falls.

The Proposed Plan for the remedial action of Pad A was mailed July 19, 1993, to 6,600 individuals on the INEL mailing list. Copies of the Proposed Plan and the entire Administrative Record are available to the public in eight regional INEL information repositories: the INEL Technical Library in Idaho Falls; city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow; the Idaho State Library in Boise; and the Shoshone Bannock Library in Fort Hall. The original documents comprising the Administrative Record are located at the INEL Technical Library; copies from the originals are present in the seven other libraries. These copies were placed in the information repository sections or at the reference desk in each of these libraries.

The public comment period on the Proposed Plan for Pad A was held from July 28 to August 26, 1993. No requests for extensions were made. On August 10, 1993, representatives from DOE-ID, the Environmental Protection Agency (EPA) Region 10, and the State of Idaho Department of Health and Welfare (IDHW) conducted a technical briefing via teleconference with members of the Environmental Defense Institute and the League of Women Voters of Moscow. Open houses were held August 11 and 12, 1993, in Pocatello and Twin Falls, respectively; representatives from DOE-ID and IDHW attended the events to discuss the project and answer questions. Public meetings were held August 17, 18, and 19, in Idaho Falls, Boise, and Moscow, respectively at which over 40 people attended. Representatives from DOE-ID, EPA Region 10, and IDHW were present at the public meetings to discuss the project, answer questions, and receive public comment. Each public meetin was recorded by a court reporter.

This Responsiveness Summary has been prepared as part of the Record of Decision (ROD). All oral comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the ROD. Twelve people submitted written comments on the Pad A proposal and ten others gave oral comments at the public meetings. No oral comments were received at the open houses. In order to respond to each issue raised in the comments, DOE further divided the comments into 106 individual comments. These comments are annotated to indicate which response in the Responsiveness Summary addresses each comment. It should be noted that the Responsiveness Summary groups similar comments together, summarizes them, and provides a single response for each comment group. The

ROD presents the limited action alternative for the Pad A OU at the INEL, selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this OU is based on information in the Administrative Record.

Summary of Comments Received During Public Comment Period

Comments and questions raised during the public comment period on the Pad A Proposed Plan are summarized briefly below. Many of the questions were answered at the public meetings as reflected in the transcripts in the Administrative Record file. An informal open house was held one hour prior to each of the scheduled public meetings to allow the public to discuss the proposed action at Pad A with representatives of IDHW, EPA, and DOE. The public meetings were further divided into an informal question and answer session and a formal public comment session. This meeting format was identified in published announcements and the public was informed at the beginning of each public meeting that the meeting would be divided into two parts-an informal question and answer session, where comments and questions would not be formally recorded by a court reporter and would be immediately responded to by a panel of agency representatives, followed by a formal comment session which would be recorded by a court reporter. The public was requested to provide their formal comments on the Proposed Plan either during the formal comment session of the meeting or in writing prior to the close of the public comment period. This Responsiveness Summary responds to those public comments that were recorded by the court reporter or that were submitted in writing prior to the close of the public comment period.

Comments and questions on a variety of subjects not specific to the Pad A Proposed Plan were recorded including planning and future use, historical issues, procedures and policies, health and safety, availability of information, DOE's responsibilities, and technology development. Responses to those comments are not included in this Responsiveness Summary, however, additional information on these unrelated topics can be obtained from the INEL Public Affairs Office in Idaho Falls; the local INEL offices in Pocatello, Twin Falls, and Boise; or the Environmental Restoration Information Office in Moscow. Comments and questions regarding community participation in general were referred to the INEL Community Relations Coordinator and will be addressed during updates to the Community Relations Plan. Comments and questions on Pad A submitted during the entire comment period are answered below.

History and Design of Pad A

1. Comment: One commenter wanted clarification about when Pad A was first commissioned. (W7-6)

   Response: Pad A was constructed in September 1972. Wastes were placed on Pad A beginning in September 1972.

2. Comment: Several commenters asked about the life expectancy of the

55-gal drums, the polyethylene liners, and the asphalt pad. One commenter wanted to know how long the drums and liners will last. Another commenter remarked that

because the drums have a 20-year life expectancy they must be well past their "safe" expected usefulness. Two commenters wanted to know whether wastes were leaking through the liners or from the drums. Finally, a commenter wanted to know more about the design of the pad itself and whether the pad or something under the pad would prevent the wastes from leaching or seeping into the ground. (W7-5, W10-1, W10-2, W10-3)

Response: The life expectancy of the drums, liners and asphalt pad beneath the wastes is not known. The wastes disposed on Pad A contained no liquids and were in solid form when disposed. However, for purposes of evaluating current and future risk to human health and the environment, the quantity of waste contained in the boxes was assumed to be free to migrate immediately (i.e., the boxes and associated liners were not considered a barrier to movement of the waste) and the quantity of the waste in the drums was assumed to be free to migrate in 100 years (i.e., the drums and associated liners were assumed to totally fail in 100 years). In addition, the asphalt pad was not considered a barrier to movement of the solid wastes.

The most likely transport mechanism at Pad A would be water in the form of precipitation (rain or snow) that permeated the overlying soil cover and moved through the wastes. The amount of water that actually permeates the Pad A cover is relatively limited due to the arid environment at the INEL (e.g., infiltration rates measured in undisturbed areas surrounding the RWMC range from 0.8 to 1.1 cm/yr) as well as the fact that the sloped sides of the existing cover promote surface water runoff, thereby further reducing infiltration.

Pad A was constructed by placing 5.1 to 7.5 cm (2 to 3 in.) of asphalt over approximately 7.5 cm (3 in.) of gravel base. For modeling purposes, this type of pad is assumed to be permeable or to have cracked and could allow contaminants to migrate to the subsurface area beneath the pad. The selected remedy must therefore minimize infiltration through the cover and potentially through the pad. Monitoring and institutional controls are also part of the selected remedy and will serve to ensure the selected remedy will be protective of human health and the environment.

3. Comment: Three commenters noted that DOE's documents and illustrations demonstrated that Pad A was built for monitored retrievable storage. Because the drums and boxes were obviously not meant for long-ter storage, it was difficult to believe that Pad A was engineered as a long-term solution. The wastes were probably originally put on an asphalt pad due to concerns about the contents. One commenter wanted to know how DOE originally planned to sort and clean up the wastes on Pad A. (W7-3, W7-9, T5-1, T10-5)

Response: Based on reviews of historical reports and interviews with personnel involved in the design and construction of Pad A, the pad was designed as a permanent, rather than a temporary, disposal site. Due to basalt outcroppings near the surface of the north-central portion of the SDA (the current location of Pad A) and a desire to maximize radioactive waste disposal within the boundaries of the SDA, a decision was made not to remove the basalt by blasting (and thereby creating another disposal pit) but, rather, level the area and pour an asphalt pad upon which the waste would be placed and then covered with soil.

The maintenance of the existing cover, monitoring of the wastes, and continued use of institutional controls in the selected alternative will ensure long-term protectiveness of human health and the environment.

4. Comment: Two commenters questioned the accuracy and reliability of the characterization of the wastes in Pad A, remarking that DOE used unverified values from the shippers of the waste rather than performing its own characterization. (W5-4, T10-6)

Response: Characterization of the types and concentrations of the wastes on Pad A was based on shipping records from the waste generators (e.g., Rocky Flats Plant) that shipped waste to Pad A as well as the INEL's disposal records. These records were supplemented with process information obtained from the operating facilities that produced the wastes and interviews with personnel from those facilities. Although sampling is often useful in characterizing a site, it was not considered practical or feasible in the case of Pad A because of the heterogeneity of the waste. In addition, characterizing a heterogenous site such as Pad A could result in information that is less reliable than the process knowledge available on the wastes. The characterization of the wastes on Pad A did include the results of the analyses performed on the contents of the drum of salts retrieved in 1989, which indicated that the nitrated salts in the drum closely matched the contamination types and concentrations listed in DOE's records. Thus, historical records, process knowledge, and limited characterization information were used to confirm the information and assumptions used in the Pad A investigation. The agencies believe that the information they have obtained adequately characterizes the wastes on Pad A for purposes of this action.

5. Comment: One commenter wanted to know whether an audit had been done, then suggested that audits must be done to ensure that the present materials on Pad A were properly stored and maintained. (W11-4)

Response: The agencies share the commentor's concern with proper storage and maintenance of Pad A wastes. Audits, as the term is believed to be used here, were performed in 1979 and again in 1989 when the containers were visually inspected to determine their condition In addition to these inspections,

environmental monitoring at Pad A has been conducted since the pad was closed in order to provide an early indication of a gross release of materials from the pad. The selected alternative will provide protectiveness of human health and the environment through maintenance of the cover and monitoring of the wastes to provide early indication of potential releases.

Risk Assessment

6. Comment: Several commenters noted that DOE's studies failed to address the known long-term geologic and hydrogeologic threats at the INEL. They indicated that it was unconscionable and unacceptable for DOE not to analyze the risks to the groundwater or the air in its environmental assessment. For instance, catastrophic events could change the course of the Big Lost River so that it flowed into the complex, potentially releasing wastes to the environment. Flooding from rapid snowmelt and failure of the Mackay Dam were also of concern. Another commenter stated that the risks associated with a failure of Mackay Dam were presented in the Waste Management Operations Environmental Impact Statement. Wastes disposed of at the RWMC, such as those on Pad A, could be released to the environment during a catastrophic event. One commenter disagreed, noting that seismic activity resulting in lava flows at the RWMC was as likely to permanently bury the wastes providing an effective seal against release to the environment. (W5-5, W11-2, T1-9, T1-10, T1-12, T1-14, T1-15, T1-16, T2-11, T4-4)

Response: The possible effects to Pad A from the occurrence of a catastrophic event were not quantitatively evaluated because of the large uncertainties these events the impacts of which may be positive or negative. The evaluation period was set at 1,000 years because uncertainties associated with the modeling approach become unreasonably large beyond this time period.

Impacts from increased infilitration rates due to flooding were addressed in the sensitivity analysis (Appendix H) of the Remedial Investigation report. The analysis indicated that flooding events would have a negligible effect on increasing the average nitrate concentration levels in the aquifer (i.e., by a factor of 2 or 3). Because the wastes on Pad A are above ground level at the RWMC, it is unlikely that increased infilitration rates will strongly affect that transport of the Pad A waste near the surface. The analysis indicated that, although waters could migrate into the subsurface and increase the transport velocity of wastes that have leached into the unsaturated zone, the flooding events would have minimal impact on the outcome of the fate and transport modeling (i.e., the predicted average concentration levels of contaminants would not significantly change the results of the risk assessment).

7. Comment: One commenter wanted to know whether snow is removed from the RWMC. (T1-17

Response: Snow is removed from the roads, parking lots, and other areas which require access.

8. into Pad A. Could the Pad A wastes seep out? (W10-4)
C

Response: This scenario (i.e., burrowing animals) was evaluated in the baseline risk assessment, performed as part of the Pad A Remedial Investigation/Feasibility Study (RI/FS) and was not considered to pose an unacceptable health risk from this exposure mechanism. The wastes at Pad A, which are solid wastes, not liquids, consist primarily of nitrate salts, depleted uranium waste, sewer sludge, inorganic salts, dirt, concrete, and other miscellaneous materials buried in plywood boxes or 55-gal drums. Monitoring has been conducted to detect any contaminant migration from Pad A since its closure in 1978. Contaminants attributable to Pad A have not been detected in the air, soil, or water samples taken on or near Pad A. Potential routes of migration for Pad A contaminants are direct exposure to the wastes due to erosion of the cover and infiltration of precipitation through the wastes causing contaminants to move to groundwater. As discussed in Section 5 of the RI/FS, burrowing animals may be able to reach the Pad A wastes, and the potential exists for them to bring wastes to the surface. The results of the ecological risk assessment indicate that burrowing activity, as well as other transport mechanisms, are not expected to have significant effects on the local ecosystem or on human health. Because institutional controls such as access and land use restrictions are included in the selected alternative, the likelihood of direct human exposure to the contaminants through this transport mechanism is extremely small. Further, because inspections and monitoring of the site, and repair and maintenance of the cover will be conducted as part of the selected alternative, evidence of burrowing animals at the site will be detected and corrective measures will be taken to prevent wastes from migrating due to burrowing activities.

9. Comment: One commenter wanted to know what data DOE possesses that allows a quantitative determination of risk to 2 parts in 10[-13] (see Table 1 on page 7 of the Proposed Plan). The comment went on to note that if DOE has this accuracy, then the number of significant digits in the rest of the carcinogenic risk information is wrong. If DOE cannot quantify risk below 10[-6] or 10[-7], it should present the results to reflect this. (W3-2)

Response: The Pad A baseline risk assessment, performed as part of the RI/FS, calculated carcinogenic risk values based on the fate and transport modeling results. The resulting risk values are derived by multiplying the cancer slope

factors for individual chemicals (provided by EPA) by the estimated daily intake (derived from the modeling). This approach represents the standard EPA derived risk assessment methodology. A quantitative risk estimate of 2 x 10[-13] does not imply that this degree of accuracy is implicit in all cancer risk estimates. Rather, the estimated lifetime excess cancer risk estimate indicates that the expected risk is considerably less than the EPA's risk range of 10[-4] to 10[-6]

10. Comment: One commenter pointed out that the Proposed Plan states that nitrate concentrations in groundwater at the Pad A boundary will reach 112 mg/L. Previous text indicates this will occur in about 2228. The values are qualified by pointing to conservative estimates in modeling. What is the cumulative quantitative effect of the modeling? Associated with this, what is the accuracy and precision of the model? Can it be quantitatively demonstrated that the presented results are unreasonable? If so, why were they presented? If not, then these values should drive the risk assessment, resulting in a risk to infants from exposure to nitrates that is clearly unacceptable. (W3-1)

    Response: Based on the assumptions used in the fate and transport modeling for the baseline risk assessment, MCLs for nitrates in groundwater were calculated to be exceeded at the WAG 7 boundary; however, groundwater concentrations based on actual infiltration rates are expected to be lower. For example, the infiltration rate used in the modeling was 5 cm/yr. Using actual infiltration rates of 0.8 to 1.1 cm/yr, MCLs at the WAG 7 boundary are not expected to be exceeded. The assumptions used in the model were as realistic as possible but were skewed towards the conservative to ensure that potential risks were not underestimated. The uncertainties associated with the assumptions can be found in Section 7.1.4 of the RI/FS. The impact of the conservative modeling results in a tendency to overestimate potential concentrations of contaminants that could reach the aquifer.

11. Comment: Several comments were directed toward the timeframe used by DOE for their analysis. One commenter observed that it was farcical for DOE to limit their analysis to 1,000 years when the contaminants will be dangerous for much longer than that. The commenter went on to remark that the only reason DOE did not analyze risk beyond the 1,000-year window was because their models were not sufficiently accurate to predict the fate of the wastes beyond that time. However, another commenter disagreed with this assessment, reasoning that for wastes such as those on Pad A, 1,000 years was too long a period of time for risk assessment purposes. (W5-3, T1-8, T2-9)

    Response: The evaluation period was set at 1,000 years because uncertainties associated with the modeling approach become unreasonably large beyond this time period. Due to the large uncertainties associated with episodic events (i.e., ice ages, major earthquakes, meteor impacts, and volcanism), these events were

not modeled. Because wastes will remain on-site, the Pad A remedy will

be reevaluated in two years and every five years thereafter to ensure continued protectiveness. In the event that any fundamental assumptions made in the Pad A investigation change (e.g., loss of institutional control due to loss of DOE control or future land use changes) the need for additional action would then be considered.

12. Comment: A written comment noted that information provided at the Idaho Falls public meeting addressed the radiotoxicity of a few, but not all, contaminants in the Pad A wastes and did not address chemical toxicity at all. Another commenter questioned what nuclear debris has a 10-year half-life and if it referred to plutonium. (W5-1, W7-4

    Response: It is true that during the Idaho Falls public meeting, the radiotoxicity of all the contaminants at Pad A was not addressed. However, the BRA contained in the RI/FS evaluated all the contaminants, both radiological and chemical. They were evaluated on exposure mechanisms, concentration levels, relative toxicity, and the carcinogenic risks posed to human health and the environment. Specifically, a detailed discussion of contaminant toxicity is contained in Section 6.1.2 of the RI/FS and Section 6.1.3 of the ROD. The RI/FS is located in the administrative record under file AR3.10.

    Modeling performed in the BRA indicated that radionuclides (with the exception of potassium-40) would not reach the aquifer within 1,000 years. The modeling showed potassium-40 reaching the aquifer within the 1,000 year timeframe but not at sufficient concentrations to pose an unacceptable risk. Inorganic compounds were also evaluated in the risk assessment and only sodium nitrate and potassium nitrate were shown to present any potential risk to the human health and the environment.

    The radionuclide isotopes found at Pad A have half-lives ranging from a few months to several thousand years. A half-life of 10 years does not necessarily refer to plutonium. This information can be found in the Remedial Investigation report (Section 4).

13. Comment: One commenter noted that a post-control period infant is not an industrial receptor (see Table 1 on page 7 of the Proposed Plan). (W3-3)

    Response: The term "post-control period" refers to that timeframe in the future when the INEL may be used for residential or industrial development. The potential for adverse effects to small children or infants is associated with the assumed future residential development. The Proposed Plan incorrectly identified infants as industrial receptors for the post-control period.

14. Comment: Several commenters indicated that it does not do much good to assess the risk from just Pad A as it represents a very small fraction of the wastes at the RWMC; the total composite risk from all the WAGs must be studied. If the INEL is available for unrestricted use (see

Item 3 on Page 6 of the Proposed Plan), it is an unrealistic scenario to only evaluate risk for a single unit. Risk from all the units may be additive. If risk is only addressed unit by unit through the INEL, an actual risk may not be recognized. (W1-2, W3-4, W5-1.1)

Response: The agencies agree with the commenters. The cumulative risks from all of the pits and trenches located at the RWMC (WAG 7) will be evaluated in the TRU Pits and Trenches OU 7-13 RI/FS. Cumulative risks from inactive waste sites throughout the entire RWMC will be evaluated in the Comprehensive WAG 7 RI/FS. All of the risks from all of the WAGs located at the INEL will be evaluated in the Comprehensive WAG 10 (sitewide) RI/FS. This approach is consistent with the NCP. One of the stated purposes of the NCP [[Para] 300.3(b)] is to provide for efficient, coordinated, and effective response to releases of hazardous substances. Section 300.430(a) of the NCP state that complex sites should generally be addressed in OUs when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite completion of the total site cleanup. The agencies recognized that cumulative assessments should be done and have scheduled comprehensive investigations on both the individual WAG and the INEL-wide levels. At the same time, the agencies acknowledged that cumulative risks could not be evaluated until adequate information concerning each individual site is collected. The FFA/CO Action Plan includes the schedules for addressing each of the OUs and WAGs. This approach was presented to the public for review and comment during the comment period on the FFA/CO before it was signed by the three agencies.

15. Comment: One commenter wanted to know whether the time of peak nitrate concentration at the INEL boundary and the RWMC boundary coincide with the peak under Pad A. In addition, the commenter wanted to know what the ambient conditions in the Snake River Plain Aquifer will be, considering the number of potential contaminant contributors. (W3-5)

Response: Peak nitrate concentrations in groundwater beneath Pad A will occur before peak values are reached at either of the other boundaries. Based on conservative fate and transport modeling, ambient groundwater conditions beneath Pad A could potentially be affected by the more soluble inorganic contaminants (e.g., nitrates). The impacts to groundwater conditions from these contaminants are dependent upon many variables (e.g., distance from source, infiltration rates). Ambient conditions are not expected to be affected by Pad A contaminants if the selected remedy is implemented.

16. Comment: One commenter stated that actions at Pad A must comply with the Nuclear Waste Policy Act and Nuclear Regulatory Commission disposal criteria. (T10-3)

Response: The Nuclear Waste Policy Act of 1982, as amended, establishes requirements for selecting and constructing a geologic

repository for disposal of high-level wastes and spent nuclear fuel and for the interim storage of such wastes pending development of the repository. Because Pad A does not contain either high-level waste or spent nuclear fuel, this law does not apply to Pad A wastes, nor is it relevant and appropriate in the circumstances of the Pad A proposed action.

Under the Atomic Energy Act, Congress divided the nuclear industry into two separate entities, each with separate responsibilities. The Nuclear Regulatory Commission (NRC) regulates the commercial nuclear industry (i.e., power generation). The DOE is responsible for researching and planning the country's energy supply and delivery, including nuclear power, developing and manufacturing nuclear weapons, and managing high-level and low-level radioactive waste produced from these activities.

Thus, there are only limited situations when DOE operations fall under the jurisdiction of the NRC. Except for these very limited situations, NRC standards do not legally apply to DOE activities. This is why NR regulations are not listed as ARARs in Pad A. However, NRC standards are reflected in many of the internal DOE orders, which are mandatory requirements for all DOE facilities and activities. DOE Order 5820.2A is included in the Pad A ROD as a to-be-considered (TBC) guidance. This order contains the substantive requirements included in NRC regulations.

In the case of Pad A, remedy selection is based on CERCLA, as amended by SARA, and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and compliance with ARARs. As identified in the ROD, ARARs at Pad A include compliance with the relevant and appropriate substantive requirements of the Idaho Hazardous Waste Management Act. In addition, various EPA guidance documents and two DOE Orders (5820.2A, Radioactive Waste Management and 5400.5, Radiation Protection of the Public and the Environment) are cited as TBC guidance for purposes of implementing the Pad A selected remedy. The agencies agree that these standards will be the criteria at Pad A.

Proposed Plan and Public Involvement

17. Comment: One commenter asked whether public hearings or comment periods were held before Pad A was employed in 1972. Another commenter noted that there was a need for substantive public participation in the planning process; substantive public participation would result in a reevaluation and readjustment of the agencies' priorities. (W7-2, T10-2)

    Response: Based on reviews of historical documents, there is no evidence that indicates public hearings were held prior to "employing" Pad A. During the Cold War, DOE conducted high-technology research and

produced nuclear weapons. This needed to be done quickly while also maintaining national security which, in most instances, precluded public involvement. Growing concern among the public about problems with the environment resulted in the enactment of several programs to ensure that communities are informed about and involved in hazardous waste issues. These include the National Environmental Policy Act of 1969 (NEPA); CERCLA, as amended by the 1986 SARA; and the Resource Conservation and Recovery Act (RCRA) of 1976; all as subsequently amended. The agencies consider public participation to be a critical element of environmental restoration activities as well as other waste management planning activities at the INEL. Several public participation opportunities are available to the public; information about these opportunities is included in the INEL Community Relations Plan or can be obtained from the INEL Community Relations Coordinator at (800) 708-2680 or (208) 526-6864.

18. Comment: One commenter indicated that DOE should provide an explanation of the white tent-like structure on Pad A pictured on the cover of the Proposed Plan. (W8-3)

    Response: The white tent-like structure on Pad A is called a "yurt." It was placed on Pad A in 1989 to provide a controlled environment, and prevent releases of contaminants to the atmosphere, during the dru retrieval effort conducted in 1989. Although the project was safely completed and closed-out, the yurt was never removed.

19. Comment: Two commenters commended DOE on the contents and information provided in the Proposed Plan. One commenter indicated approval of DOE's approach, noting that DOE indicated when the information supplied represented deductions rather than facts. (W2-1, W8-4)

    Response: Comment noted.

20. Comment: Public hearings should involve the decision-makers who set the criteria, methodology, values, and made judgments leading to the alternatives that are being considered. The items on which the study is based have not been presented. Instead, the public is given a glossy, narrow definition of the problem - public relations rather than a review of the actual problem. If the public was given the opportunity to review the larger, inherent problems; more reasonable, efficient, and long-term solutions could be attained. (T7-1)

    Response: The agencies agree that public involvement in the CERCLA process is critical to ensuring successful remediation of INEL waste sites. The public meetings conducted in Moscow, Boise, and Idaho Falls were attended by Mr. Dean Nygard, Federal Facilities Manager for the Idaho Division of Environmental Quality; Ms. Mary Jane Nearman, U.S. Environmental Protection Agency Region 10, RWMC Waste Area Group Manager; and Mr. Greg Hula, U.S. Department of Energy Idaho Operations Office, Pad A Project Manager. These individuals were present at the meetings to provide detailed information concerning this action, answer

questions, and take formal comments. These same individuals reviewed and determined the criteria, methodology, and values that needed to be reflected in the Pad A remedial action, based on legal requirements and agency policies and guidance.

A series of opportunities for public information and participation in the remedial investigation and decision process for Pad A were provided over the course of 21 months beginning November 1991 and continuing through August 1993. For the public, the activities ranged from receiving a fact sheet, INEL Reporter articles and updates, and a Proposed Plan, to having a telephone briefing, four public scoping meetings, three public meetings, and two open houses to offer verbal or written comments during two separate 30-day public comment periods. The proposed plan is intended to be a summary of the detailed RI/FS that was conducted. It references the entire administrative record for members of the public who are interested in reviewing more detailed information on the proposed action.

The Pad A RI/FS process followed the process required under CERCLA, as amended by SARA, and the NCP. All three agencies have been involved in the scoping, implementation, and decision process for this investigation. Further questions regarding specific technical issues or the public participation process can be directed to the INEL Community Relations Coordinator at (800) 708-2680 or (208) 526-6864.

21. Comment: Several commenters remarked on procedural aspects of the public meetings. Some commenters felt that a specific time should b allotted to each individual giving public testimony. However, another commenter noted that the purpose of the meeting was to gain public comment and that it was unfair to

arbitrarily limit time allowed for testimony. One commenter questioned the level of information available at the open houses and indicated his participation in the public meeting was a result of insufficient information at the open house. (W9-1, T1-1, T1-6, T1-18, T1-19, T2-1, T3-1, T4-1)

Response: The public meetings for Pad A provided two opportunities for citizens to become involved: an informal question and answer period, and formal comment period. The informal question and answer period was set up to allow the public to ask questions or to seek clarification on information presented prior to or at the meeting, or in lieu of making formal comment. Generally no time restrictions are placed on either activity to ensure that citizens have sufficient opportunity to have their questions answered and comments and concerns noted; however, at times it may be necessary to limit the time allowed for each formal comment to allow all citizens an opportunity to comment. In addition to providing an opportunity for formal comment at public meetings, the agencies also provided other means by which the public could enter their comments. Oral comments could be entered on a tape recorder provided at both the open houses and the public meetings. The INEL

Community Relations telephone was equipped with recording equipment for oral comments. Finally, written comments could be submitted either on the individual's own stationery or on the self-addressed, postage-paid comment forms provided in the Proposed Plan and made available at all activities.

A series of opportunities for public information and participation in the remedial investigation and decision process for Pad A were provided over the course of 21 months beginning November 1991 and continuing through August 1993. For the public, the activities ranged from receiving a fact sheet, INEL Reporter articles and updates, and a Proposed Plan, to having a telephone briefing, four public scoping meetings, three public meetings, and two open houses to offer verbal or written comments during two separate 30-day public comment periods.

22. Comment: One commenter asked to see other citizens' comments. (W2-4)

Response: All oral comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for OU 7-12. The comments are annotated to indicate which response in the Responsiveness Summary addressed each comment. It should be noted that the Responsiveness Summary groups similar comments together, summarizes them, and provides a single response for each comment group. The Administrative Record also includes transcripts of the public meetings - including the agencies' presentation, the question and answer period, and formal comment and testimony.

The Administrative Record is available to the public in eight regional INEL information repositories: the INEL Technical Library in Idaho Falls; city librarie

in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow; the Idaho State Library in Boise; and the Shoshone Bannock Library in Fort Hall. The original documents comprising the Administrative Record are located at the INEL Technical Library; copies from the originals are present in the seven other libraries. These copies were placed in the information repository sections or at the reference desk in each of these libraries.

General Comments on the Proposed Alternatives

23. Comment: One commenter mentioned the importance of preventing releases to the air that could occur through mistakes in handling. The commenter remarked that workers should not be put at risk through contact with the waste. (T8-3)

Response: The selected alternative on Pad A consists of recontouring, slope correction, and maintenance and monitoring of the existing Pad A cover. Under the selected remedy, no wastes would be handled, exhumed, repackaged, transported, or disturbed in any manner. The low-level

wastes at Pad A will remain buried and undisturbed. Thus, the possibility of a release to the ambient air, soil, or groundwater via worker mishandling is virtually nonexistent. In addition, monitoring and inspections will continue to ensure early detection of any potential releases.

24. Comment: Several commenters noted that the cost estimates for implementation of the alternatives were outrageous and asked DOE to reexamine the estimates. One commenter thought the estimate of $45,000/year for monitoring seemed a bit inflated, given the only potential risk is from a single contaminant, nitrate. Because nitrates are relatively inexpensive to monitor in groundwater and because monitoring techniques and instruments are continually improved, the commenter believed that monitoring costs will actually decrease. However, the commenter acknowledged that much will depend on the sampling strategy/decision. (W8-2)

Another commenter questioned why a range was given for the estimate for Alternative 1A while relatively precise costs were given for Alternatives 1B and 2. The commenter wanted more information about the precision of the estimates. Finally, the commenter noted that the information in the Proposed Plan appeared to be skewed to influence readers to accept Alternative 2, rather than being objectively presented with a logical conclusion. (W3-6, W4-2, T10-7)

Response: As required by the NCP, cost estimates provided in the Proposed Plan are rough estimates (i.e., -30% to +50%) given for comparison purposes only. Cost estimates for sampling and monitoring activities will be provided in greater detail in the Remedial Design phase which follows the ROD. Costs may appear high because overhead rates with the management and operations contractors and general and administrative rates are all factored into the ultimate cost estimate.

The cost estimates for the technical portion of the alternatives evaluated are consistent with the costs associated with similar activities conducted at other landfills across the country, as discussed in Appendix C of the Feasibility Study, which formed the basis for the cost estimates associated with the alternatives evaluated in the FS; however, the cost estimates also include administrative costs associated with the project, which tend to be higher within the government, and the DOE system specifically, than in the private sector. The cost estimates contained in the ROD are based on sampling the groundwater, air, soil and surface water for a range of contaminants known to be present in Pad A, not exclusively nitrates.

Several combinations of different earthen material types were evaluated within the first subalternative ("Alternative 1A") resulting in a range of costs. Every effort was made to objectively present each alternative so that a rational comparison could be made, including cost comparisons. Table 16 in the ROD presents a cost comparison of the considered alternative for Pad A.

25. Comment: Several commenters questioned whether DOE considered all possible alternatives for remediation of Pad A. One commenter questioned whether alternatives proposed for or implemented at other waste areas at the site were considered for Pad A. One commenter remarked that DOE opted for the proposed alternatives - to maintain and monitor the existing dirt cover - because it did not know what else to do. The commenter went on to question the wisdom of dumping more dirt on what is already a mess. (W7-8)

Several comments were received regarding the feasibility of treating Pad A wastes to eliminate the radioactive constituents or to reprocess or recycle the wastes for positive uses. One commenter wondered whether DOE considered processing and elimination of radioactive materials, while another wanted to know whether DOE was investing in research to determine whether radionuclides could be recycled or reused. One commenter noted that DOE should find a positive use for the radionuclides currently being thrown away and in the interim find safe, long-term storage solutions for its radioactively contaminated wastes. Another commenter wanted to know how much of DOE's budget is being used for research to find positive uses for its wastes, such as the wastes on Pad A. (W11-1, T5-2, T6-1, T8-9)

Response: The results of the remedial investigation and BRA indicate that the existing cover is a protective barrier for the Pad A contents and that leaving the Pad A wastes in place does not pose an unacceptable risk to human health and the environment. In accordance with CERCLA and the FFA/CO, if an area does not pose an unacceptable risk, cleanup alternatives that involve excavation, treatment, and disposal elsewhere are not typically evaluated. Nevertheless, the preferred alternative (long-term maintenance of the soil cover, groundwater

monitoring, and institutional controls such as restricted access) was selected to prevent direct contact with the wastes. Maintenance of the cover is being done to address the uncertainties associated with th risk modeling and to ensure that Pad A will be a protective unit.

Aside from the Pad A context, DOE continues to research ways to minimize, reuse, or stabilize/treat its wastes. DOE has budgeted just under $1 billion for technology development within the DOE complex.

26. Comment: One commenter asked how the pad will be monitored for its structural integrity if it is buried. (W11-3)

Response: The risk assessment, which indicated an acceptable long-term risk to human health and the environment, assumed that the containers and the asphalt pad failed and would not act as barriers to contaminant migration (i.e., it was assumed the Pad A wastes are not in containers and that the waste is placed directly on native soil.). Therefore, there is no need to monitor or audit the condition of the asphalt to

ensure its continued structural integrity; however, monitoring for contaminant releases will be conducted as part of the selected remedy.

27. Comment: One commenter requested a formal WAG-wide Environmental Impact Statement (EIS) be completed before any wastes are declared to be permanently disposed of at the INEL. (W5-2)

Response: The analyses and processes required by CERCLA and the NCP for remedy selection involve essentially the same scope, level of detail, and subject matter that are appropriate under NEPA. DOE has issued a policy which requires integration of NEPA values into the CERCLA decision processes where practicable. Also, through the CERCLA public comment process, DOE carries out NEPA public involvement goals and responds to all public comments received in the responsiveness summaries that are prepared. Consistent with DOE's policy, relevant NEPA values for a particular CERCLA action are identified and may be discussed in the CERCLA documentation that is prepared; alternatively, supplemental information may be prepared to ensure these values are considered. This approach is needed to achieve the CERCLA statutory mandate for expeditious and prompt cleanups and to allow flexibility in formulating the response to be taken at different OUs. DOE reviewed the Pad A proposed action and concluded that the action qualified for a categorical exclusion (CX) consistent with DOE's published NEPA procedures. Therefore, an EA or EIS is not considered to be necessary for Pad A. NEPA's objective of considering the environmental impacts associated with the selected alternative for Pad A was met primarily through the CERCLA BRA process, which includes an ecological risk assessment component. This risk assessment concluded that the selected alternative does not pose an unacceptable risk to the environment. The NEPA objective of assessing cumulative environmental impacts of all WAG 7 remedial activities will be met through a WAG-wide risk assessment that will be conducted as part of a WAG-wide RI/FS, as well as through the INEL Environmental Restoration and Waste Management (ER&WM) EIS, which is currently being prepared. A draft of that EIS is expected to be issued for public comment in FY-94.

28. Comment: One commenter noted that, while the next 30 years will bring new technologies, there was no need to implement interim measures such as adopting Alternative 2. (W4-1.1

Response: Despite the likelihood that new technologies will be discussed and/or implemented in the next 30 years, CERCLA still mandates that actions be taken to assure the protection of human health and the environment from releases of hazardous substances. Further, periodic reviews of monitoring data, site and land use conditions will be conducted to verify the assumptions of the BRA. In the event of changing conditions or if fundamental assumptions are no longer accurate, the need for additional action, including application of treatment alternatives, would then be reevaluated.

29. Comment: Two commenters questioned DOE's preference for a soil cover rather than a synthetic cover.

One commenter indicated that none of the proposed alternatives will prevent water from entering the Pad A cover. The Pad A wastes must be contained; water must be prevented from infiltrating the wastes. The commenter indicated that the proposed covers should be designed with 100- or 125-mil welded plastics over a 6 in. clay layer over a layer of clean sand (no rocks). (T8-1)

Another commenter indicated that only Alternative 1, with a synthetic cover, should be considered based on the negligible cost difference between the alternatives and the benefits from implementing that alternative. (W4-1)

Response: The agencies' decision to choose Alternative 2, Limited Action, was not based solely on a comparison of the pad's cover (i.e., soil/clay v. synthetic). The three alternatives considered in the Pad A ROD were evaluated based on a comparison of the nine CERCLA decision criteria. Thus, the Pad A feasibility study evaluated the following criteria to determine the best course of action at this site: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; implementability; cost; and state acceptance. A summary of this evaluation is included in the Proposed Plan (pp. 9-12) and the Section 8 of the ROD. Based on this comparative analysis, the agencies chose

Alternative 2 because they determined this alternative provided the best balance of trade-offs. Alternative 2 would provide the best overall protection and compliance with ARARs, ensure risks are reduced, provide adequate protection for both long- and short-term effectiveness, can be easily implemented, and is cost effective.

30. Comment: One commenter recommended that DOE successfully complete one remediation activity before beginning the next. lessons learned at Pit 9 could then be used to remediate Pad A wastes. (T8-2)

Response: Lessons learned at Pit 9 are not necessarily applicable to Pad A because the results of each site's evaluation demonstrated a need for different remedial actions. In Pad A, the BRA indicated no unacceptable risks were present assuming prolonged direct contact to the Pad A waste is prevented, and thus Alternative 2, Limited Action, was chosen. Also, Pit 9 was an interim action due to the large volume of oils, solvents and relatively large amounts of radioactive contaminants. In contrast, Pad A is a permanent disposal action and does not contain these types of wastes. Thus, lessons learned at Pit 9 would not necessarily be used to remediate Pad A waste because the results of the RI/FS and BRA indicated remediation (i.e., removal, treatment, and disposal) was not necessary to adequately protect human health and the environment.

31. Comment: Two commenters indicated that potential environmental problems should be dealth with now, rather than shifting the burden to future generations or to other communities. One of the commenters expressed concern that if the Pad A wastes were not dealth with now, they may never be dealth with. (T1-7, T10-4)

Response: The RI/FS and BRA evaluated both current and future potential risks from Pad A waste to determine potential environmental problems to both current and future generations. This analysis indicates that conditions at Pad A are not expected to result in environmental problems to current or future generations. The INEL, including Pad A, is being evaluated under an FFA/CO entered into between DOE-ID, EPA, and the State of Idaho in order to ensure compliance with CERCLA, RCRA and the Idaho Hazardous Waste Management Act (HWMA). These statutes require that cleanup actions be taken if there is a release or threat of a release of a contaminant to the environmental which exceeds regulatory or risk-based cleanup standards. The remedial investigation for Pad A indicated that there is currently no unacceptable risk to human health and the environment. Therefore, the question remained, could contaminants migrate from Pad A and present an unacceptable risk to human health and the environment at some time in the future? The Pad A risk assessment was conducted to answer this question. The risk assessment using available data, including generator records, indicated the risk to human health and the environment would be within

the acceptable risk range as defined by CERCLA assuming prolonged direct contact to the waste is prevented. It is important to note that the computer model used conservative assumptions to be on the safe side (e.g., the model assumed that the Pad A waste materials were not containerized and were disposed of directly onto the soil as opposed to on an asphalt pad.)

The results of the remedial investigation and BRA indicate that the existing cover is a protective barrier for the Pad A contents and that leaving the Pad A wastes in place does not pose an unacceptable risk to human health and the environment assuming institutional controls are maintained to prevent prolonged direct contact with the waste. In accordance with CERCLA and the FFA/CO, if an area does not pose an unacceptable risk, cleanup alternatives that involve excavation, treatment, and disposal elsewhere are not typically evaluated. Nevertheless, the selected alternative (long-term maintenance of the soil cover, groundwater monitoring, and institutional controls such as restricted access) was selected to prevent direct contact with the wastes. Maintenance of the cover is being done to address the uncertainties associated with the risk modeling and to ensure that Pad A will be a protective unit

32. Comment: DOE is expending resources to remediate Pad A while it continues to bury equally environmentally hazardous wastes at the RWMC.

(T10-1)

Response: DOE is not continuing to bury mixed wastes (i.e., wastes that are radioactive as well as defined as hazardous pursuant to RCRA and HWMA) at the RWMC and has not disposed of these types of wastes since approximately 1984. Rather, these wastes are currently being stored at the Transuranic Storage Area (TSA) at the RWMC in accordance with RCRA and HWMA. DOE is currently preparing documentation to obtain a Part B Permit (i.e., final permit) which will allow storage of these wastes at the TSA. The wastes currently being stored at the TSA will be retrieved and eventually transferred to the RWMC waste storage facility for eventual treatment and/or on- or off-site disposal. The only wastes that are currently buried at the Subsurface Disposal Area (SDA) are low level wastes (i.e., radioactive wastes with a transuranic activity of less than 10 nCi/g) in the SDA at the RWMC and disposal is conducted in accordance with low level waste acceptance criteria (WAC).

33. Comment: One commenter mentioned that nonradioactive contaminants are as much a concern as the radioactive contaminants since they are toxic and pose a permanent risk to human health and the environment. (W11-2)

Response: The agencies agree. Risks from nonradioactive hazardous contaminants (e.g., chlorides and nitrate salts) were evaluated in the BRA and it was determined that they posed no threat to human health or the environment. As identified in the ROD, the selected remedy at Pad A will be designed to

comply with the relevant and appropriate substantive requirements of the Idaho HWMA; various EPA guidance documents; and DOE Order 5820.2A, Radioactive Waste Management. The remedy at Pad A will meet all DOE Order requirements and the relevant and appropriate RCRA/HWMA requirements governing the closure of landfills that contain low-level radioactive waste and nonradioactive hazardous waste.

34. Comments: Several commenters had other general comments on the proposed alternatives.

Because the INEL was never meant to be a permanent repository for radioactive waste, a permanent home for the wastes should be found and the Pad A wastes removed and disposed of properly. (W1-1)

Another commenter noted that, because the RWMC requires active management, it was unsuitable for permanent disposal of wastes. (T1-16)

If elimination cannot be accomplished, then containment is necessary. The materials on Pad A are too dangerous to risk contamination of groundwater or the air. Deadly wastes must be contained as long as they pose a hazard to human health and the environment. (W11-2, T1-5)

Response: The INEL, including Pad A, is being evaluated under a FFA/CO

entered into between DOE-ID, EPA, and the State of Idaho in order t ensure compliance with CERCLA, RCRA and the HWMA. CERCLA and RCRA/HWMA only require that cleanup actions be taken if there is a release or threat of a release of a contaminant to the environment which exceeds regulatory or risk-based cleanup standards. The remedial investigation for Pad A indicated that contaminants from Pad A do not currently pose unacceptable risks assuming prolonged direct contact to the waste is prevented. Therefore, the question remained, could contaminants migrate from Pad A and present an unacceptable risk to human health and the environment at some time in the future? The Pad A risk assessment was conducted to answer this question. The risk assessment based on available information, including generator records and using a computer model, indicated the risk to human health and the environment would be within the acceptable risk range. It is important to note that the computer model used conservative assumptions in order to be on the safe side (e.g., the model assumed that the Pad A waste materials were not containerized and were disposed of directly onto the soil as opposed to on an asphalt pad, and greater than normal rainwater infiltration rates were assumed).

The results of the remedial investigation and BRA indicate that the existing cover is a protective barrier for the Pad A contents and that leaving the Pad A wastes in place does not pose an unacceptable risk to human health and the environment so

long as institutional controls are maintained. In accordance with CERCLA and the FFA/CO, if an area does not pose an unacceptable risk, cleanup alternatives that involve excavation, treatment, and disposal elsewhere are not typically evaluated. Nevertheless, the selected alternative (long-term maintenance of the soil cover, groundwater monitoring, and institutional controls such as restricted access) was selected to prevent direct contact with the wastes. Maintenance of the cover is being done to address the uncertainties associated with the risk modeling and to ensure that Pad A will be a protective unit.

Agree
(Commenter Agreed with Selected Alternative)

35. Comment: Several commenters indicated their agreement with the Preferred Alternative selected by DOE. The Preferred Alternative was recognized as presenting the least risk to workers and the public and being the most cost-efficient alternative for the established objectives. One commenter noted that the logic, process, and justifications for the Preferred Alternative were presented well and made good sense. The commenter went on to indicate that he was glad to see the State of Idaho was willing to leave low-risk wastes at the RWMC. Another commenter noted that, as long as there is no real threat to the environment, DOE should not be wasting resources (i.e., tax dollars) on precipitous cleanup. (W6-1, W8-1, W12-1, T2-10, T4-6)

Response: DOE, EPA, and IDHW agree that limited action is the best

alternative based upon the risk assessment, which shows that no unacceptable risk exists assuming prolonged direct contact with the Pad A waste is prevented. Monitoring, with independent verification of the data by EPA and IDHW, will ensure that the selected remedy will be protective of human health and the environment

Disagree
(Commenters Disagreed with Selected Alternative)

36. Comment: Some commenters stated that the Selected Alternative (containment in place with monitoring) was not protective enough and that something else was necessary (i.e., excavation and disposal elsewhere). Specific comments are as follows:

Several commenters indicated that DOE's proposal not to remove the waste on Pad A was both unacceptable and irresponsible. Another commenter noted that all of the alternatives were unacceptable. (W1-1, T1-20, T8-1, T8-4, T10-4)

Another commenter wanted to see not only Pad A but the rest of the INEL cleaned up, questioning when and how something will be done with the wastes

that have been generated and stored at the INEL and noting that any haste on DOE's part will be lauded and a pleasant contrast to the usual diversion and delay. (W7-1).

Response: The INEL, including Pad A, is being evaluated under a FFA/CO entered into between DOE-ID, EPA, and the State of Idaho in order to ensure compliance with CERCLA, RCRA and the HWMA. CERCLA and RCRA/HWMA only require that cleanup actions be taken if there is a release or threat of a release of a contaminant to the environment which exceeds regulatory or risk-based cleanup standards. The remedial investigation for Pad A indicated that contaminants from Pad A do not currently pose unacceptable risks assuming prolonged direct contact with the waste is prevented. Therefore, the question remained, could contaminants migrate from Pad A and present an unacceptable risk to human health and the environment at some time in the future? The Pad A risk assessment was conducted to answer this question. The risk assessment used available data, including generator records, indicated the risk to human health and the environment would be within the acceptable risk range assuming prolonged direct contact to the waste is prevented. It is important to note that the computer model used conservative assumptions in order to be on the safe side (e.g., the model assumed that the Pad A waste materials were not containerized and were disposed of directly onto the soil as opposed to on an asphalt pad, and greater than normal rainwater infiltration rates were assumed).

The results of the remedial investigation and BRA indicate that the existing cover is a protective barrier for the Pad A contents and that leaving the Pad A wastes in place does not pose an unacceptable risk to

human health and the environment assuming institutional controls are maintained. In accordance with CERCLA and the FFA/CO, if an area does not pose an unacceptable risk, cleanup alternatives that involve excavation, treatment, and disposal elsewhere are not typically evaluated. Nevertheless, the selected alternative (long-term maintenance of the soil cover, groundwater monitoring, and institutional controls such as restricted access) was selected to prevent direct contact with the wastes. Maintenance of the cover is being done to address the uncertainties associated with the ris modeling and to ensure that Pad A will be a protective unit.

Comments Deemed Beyond the Scope of the Pad A ROD

Comments and questions on a variety of subjects not specific to Pad A were received during the public comment period. Those subjects included alternate storage sites (i.e., WIPP), energy production costs, prior accidents at EBR-I, buffer zones around the INEL, Swedish bentonite canisters, etc., and are not responded to in this Responsiveness Summary. Additional information on these unrelated subjects can be obtained from the INEL Public Affairs Office in Idaho Falls or at the local INEL offices in Pocatello, Twin Falls, and Boise.

REFERENCES

Halford et al., 1993, Remedial Investigation/Feasibility Study for Pad A, Operable Unit 7-12, Waste Area Group 7, Radioactive Waste Management Complex, Idaho National Engineering Laboratory, July 1993.

Environmental Protection Agency, 1990, National Oil and Hazardous Substances Contingency Plan (NCP), at 40 CFR, [Para] 300 et seq. EPA, Office of Emergency and Remedial Response, Washington, DC.

Environmental Protection Agency, 1991, Federal Facility Agreement and Consent Order 1088-06-29-120 in the matter of the U.S. Department of Energy Idaho National Engineering Laboratory, Idaho Falls, Idaho. December 1991.

U.S. Department of Energy, 1993, Proposed Plan for Pad A at the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, July 1993.

APPENDIX B

PUBLIC COMMENT/RESPONSE LIST INDEX

Description of Comment/Response List Index

This index was created to enable commenters and other interested persons to locate the agencies responses to public comments. The Comment/Response List Index is sorted two ways; by the commenter's last name

and by the comment code assigned to each comment received during the public comment period. All oral comments, as given at the public meetings, and all written comments, as submitted, were assigned comment codes. These codes were assigned to assist the agencies and the public identify and track specific comments.

Twelve people submitted written comments (comment codes W1 - W12) and ten others gave oral comments at the public meetings (comment codes T1 - T10). These comments were further divided into 106 individual comments and assigned comment codes. Copies of oral and written comments annotated with their respective comment codes are located in the administrative record.

To locate a response to a specific individual's comments, look up th last name of the individual, identify the specific comment you are looking for, then, turn to the page indicated in the Responsiveness Summary.

If, after reviewing the annotated comments, a reader wishes to locate a response to a specific comment, he/she can use the comment code to locate a response as well. The reader should identify the comment code, and page number of the response then turn to that page of the Responsiveness Summary.

Some of the comments involved multiple issues and those comments were further divided and answered in more than one place in the Responsiveness Summary. This occurred in only seven of the 109 comments.

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APPENDIX C

ADMINISTRATIVE RECORD INDEX

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE RWMC PAD A RI/FS FOR
OPERABLE UNIT 7-12
03/02/94

FILE NUMBER

AR1.1 BACKGROUND

Document #: 5306
Title: Subtitle D: How will it affect Landfills?
Author: Glebs, R.T.
Recipient: N/A
Date: 08/01/88

Document #: 5307
Title: Water-Rock Interaction - Proceedings of the 7th International
Symposium on Water-Rock Interaction
Author: Pittman, J.R.
Recipient: N/A
Date: 07/01/92

Document #: 5308
Title: Erosion Modeling Results and Erosion Control Design Recommendations Pad A Operable Unit 7-12
Author: Dorigan, L.
Recipient: EPA
Date: 12/01/92

Document #: DOE/ID-10183[**]
Title: Annual Progress Report: FY-1987
Author: Laney, P.T.
Recipient: N/A
Date: 04/01/88

Document #: DOE/ID-22073
Title: Hydrogeology and Geochemistry of the Unsaturated Zone, RWMC, INEL
Author: Rightmire, C.T.
Recipient: N/A
Date: 11/01/87

Document #: EGG-GEO-1006
Title: A Modeling Study of Water Flow in the Vadose Zone Beneath the RWMC
Author: Baca, R.G.
Recipient: N/A
Date: 011/01/92

FILE NUMBER

AR1.1 BACKGROUND (continued)

Document #: WM-F1-81-015
Title: INEL Stored Transuranic Waste Characterization: Nonradiological Hazards Identification
Author: Clements, T.L.
Recipient: N/A
Date: 09/01/81

Document #: EGG-2386
Title: Environmental Surveillance For The INEL RWMC and Other Areas
Author: Reyes, B.D.
Recipient: N/A
Date: 08/01/85

Document #: DOE/ID-12118
Title: Climatography of the INEL, 2nd Edition

Author: Clawson, K.L.
Recipient: N/A
Date: 12/01/89

Document #: DOE/ID-22080
Title: Stratigraphy of the Unsaturated Zone at the RWMC at the INEL
Author: Anderson, S.R.
Recipient: N/A
Date: 05/01/89

AR3.2 SAMPLING AND ANALYSIS DATA

Document #: RLN-04-93
Title: Review of Sampling Data Affecting the Pad A Risk Assessment
Author: Norland, R.L.
Recipient: Macdonald, D.W.
Date: 01/12/92

Document #: ERD-BWP-70
Title: Results of Pad A Overburden Sampling
Author: Rice, R.S.
Recipient: N/A
Date: 07/01/9

FILE NUMBER

AR3.10 SCOOPE OF WORK

Document #: ERD1-060-91
Title: Transmittal of Draft Scope of Work for the Waste Area Group 7 Pad A
RI/FS at the INEL
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 04/30/91

Document #: ERD1-088-91
Title: Transmittal of Draft Final Scope of Work for the Waste Area Group 7
Pad A RI/FS at the INEL
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 06/04/91

Document #: 5327
Title: Final Scope of Work (SOW) Remedial Investigation/Feasibility Study

(RI/FS) at Pad A of the Radioactive Waste Management Complex
(RWMC)
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 08/21/91

Document #: ERD-051-92
Title: Revisions to Pad A Scope of Work
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 04/08/92

Document #: 5320
Title: Revision to Pad A Scope of Work
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 04/30/91

Document #: 5326
Title: Revisions to INEL Pad A Scope of Work
Author: Pierre, W.
Recipient: Lyle, J.L.
Date: 05/11/92

FILE NUMBER

AR3.10 SCOPE OF WORK (continued)

Document #: EGG-WM-9792 Rev. 4
Title: Draft Final Scope of Work Pad A Remedial Investigation/Feasibility Study
Author: Halford, V. E. & Matthern, G. E.
Recipient: N/A
Date: 04/01/91

AR3.12 REMEDIAL INVESTIGATION FEASIBILITY STUDY

Document #: ERD-060-92
Title: Transmittal of the RWMC Pad A Draft RI/FS
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 06/03/92

Document #: EGG-WM-9967, Vol. 01
Title: Remedial Investigation/Feasibility Study (RI/FS) For Pad A
Author: Halford, V. E.

Recipient: N/A
Date: 07/01/93

Document #: EGG-WM-9967, Vol. 02
Title: Remedial Investigation/Feasibility Study (RI/FS) For Pad A
Author: Halford, V. E.
Recipient: N/A
Date: 07/01/93

Document #: AM/ERWM-ERD-008-93
Title: Transmittal Letter, Final Remedial Investigation/Feasibility Study (RI/FS)
For Pad A Operable Unit in Waste Area Group 7 (WAG 7)
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 02/11/93

AR3.13 COST ANALYSIS

Document #: 5335
Title: Cost Estimate Breakdown for Pad A Post Closure Operations - Annual
Environmental Monitoring
Author: Dames & Moore
Recipient: Halford, V.E.
Date: 05/03/93

PAD A RI/FS FOR OPERABLE UNIT 7-12 03/02/94

FILE NUMBER

AR4.3 PROPOSED PLAN

Document #: ERWM-ERD-033-93
Title: Draft Proposed Plan (PP) for the Pad A Operable Unit (OU) 7-12 in
Waste Area Group (WAG) 7
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 05/21/93

Document #: 5342
Title: Proposed Plan for Pad A at the Radioactive Waste Management
Complex (RWMC) Idaho National Engineering Laboratory (INEL)
Author: INEL Community Relations
Recipient: N/A
Date: 07/01/93

AR5.1 RECORD OF DECISION

Document #: ER-093-93
Title: Transmittal of the Draft Record of Decision for the Pad A Remedial Investigation/Feasibility Study at the RWMC
Author: Lyle, J.L.
Recipient: Pierre, W.; Nygard, D.
Date: 10/04/93

Document #: OPE-ER-073-93
Title: Transmittal of the Draft Final Record of Decision for the Pad A Remedial Investigation/Feasibility Study at the RWMC
Author: Lyle, J.L.
Recipient: Pierre, W.; Nygard, D.
Date: 12/23/93

Document #: 5632
Title: Record of Decision for the Pad A Remedial Investigation/Feasibility Study at the RWMC
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 02/17/94

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS

Document #: ERD1-070-91[*]
Title: Pre-signature Implementation of the CERCLA Interagenc Agreement Action Plan
Author: EPA, Findley, C.E.
Recipient: DOE, Solecki, J. E.
Date: 05/17/91

Document #: 3205[*]
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 2919[*]
Title: INEL Action Plan For Implementation of the Federal Facility Agreement and Consent Order

Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 1088-06-29-120[*]
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 12/04/91

Document #: 3298[*]
Title: Response to Comments on the Idaho National Engineering Laboratory
Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

Document #: DOE/ID-10340(92)[*]
Title: Track 1 Sites: Guidance for Assessing Low Probability Hazard Sites at
the INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 07/01/92

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

Document #: DOE/ID-10389 Rev. 6[*]
Title: Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at
the INEL
Author: INEL, EPA, IDH
Recipient: N/A
Date: 01/01/94

AR6.3 PROJECT MANAGEMENT MEETING MINUTES

Document #: 5305
Title: Minutes From Teleconference Held With IDHW and EPA Regarding
Pad A
Author: INEL Community Relations
Recipient: N/A
Date: 11/17/92

AR6.4 REQUEST FOR EXTENSION

Document #: 5328
Title: Draft RI/FS For Pad A at the Radioactive Waste Management Complex (OU 7-12)
Author: Nygard, D.
Recipient: Lyle, J.L., Pierre, W.
Date: 07/17/92

Document #: 5329
Title: INEL Operable Unit 7-12 Pad A Draft RI/FS
Author: Pierre, W.
Recipient: Lyle, J.L.
Date: 07/17/92

Document #: AM/ERWM-ERD-093-92
Title: Extension of Document Finalization Period For the Pad A Remedial Investigation Feasibility Study (RI/FS) Area Group 7 (WAG 7)
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 09/25/92

FILE NUMBER

AR6.4 REQUEST FOR EXTENSION (continued)

Document #: AM/ERWM-ERD-098-92
Title: Request for Extension for Preparation of a Revised Draft Final RI/FS for the Pad A Operable Unit at WAG 7
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 11/16/92

Document #: 5330
Title: Extension Approval for Preparation of the Revised Draft Final RI/FS fo the Pad A Operable Unit at WAG 7
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 11/20/92

Document #: AM/ERWM-ERD-003-93
Title: Notification of Fifteen (15) Day Extension to the Pad A RI/FS for the Pad A Remedial Investigation Feasibility Study (RI/FS)

Working
Schedule
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 01/20/93

AR9.1 NOTICES ISSUED

Document #: AM/SES-ESD-92-256[*]
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Andrus, C,D,
Date: 07/07/92

Document #: AM/SES-ESD-92-257[*]
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

Document #: AM/SES-ESD-92-258[*]
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Edmo, K.
Date: 07/07/92

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

Document #: AM/SES-ESD-93-007[*]
Title: Invitation to Natural Trustee Representatives to Discuss Natural
Resources and Environmental Restoration at the INEL
Author: Hinman, M.B.
Recipient: Addressee List
Date: 01/25/93

Document #: AM/SES-ESD-93-097[*]
Title: Agenda for Meeting of Potential Natural Resource Trustees' on
March 17, 1993
Author: Twitchell, R.L.
Recipient: Addressee Lis
Date: 03/02/93

Document #: AM/SES-ESD-93-159[*]
Title: INEL Natural Resource Trustee Meeting "Group Memory" March 17,

1993
Author: Hinman, M.B.
Recipient: Addressee List
Date: 03/30/93

Document #: AM/SES-ESD-93-162[*]
Title: Department of Energy Idaho Field Office (DOE-ID) Proposal for
Consultation and Coordination between Natural Resource Trustees
Author: Hinman, M.B.
Recipient: Addressee List
Date: 04/02/93

Document #: AM/SES-ESD-93-276[*]
Title: Department of Energy Idaho Field Office (DOE-ID) Action Item Report to
Potential Natural Resource Trustees
Author: Hinman, M.B.
Recipient: Addressee List
Date: 06/16/93

Document #: 5337[*]
Title: Natural Resource Trustee Representation Designation
Author: Andrus, C.D., Governor
Recipient: Pitrolo, A.A.
Date: 08/11/92

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

Document #: 5338[*]
Title: Response to Natural Resource Notification
Author: Polityka, C.S.
Recipient: Pitrolo, A.A.
Date: 08/28/92

AR10.1 COMMENTS AND RESPONSES

Document #: 5313
Title: Draft Scope of Work for Pad A Remedial Action at the INEL Radioactive
Waste Management Complex
Author: Pierre, W.
Recipient: Lyle, J.L.
Date: 05/08/91

Document #: 5332

Title: Draft Scope of Work for Pad A Remedial Investigation Feasibility Study
at the INEL Radioactive Waste Management Complex
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 05/16/91

Document #: 2775
Title: Draft Final Scope of Work Remedial Investigation/Feasibility Stud at Pad
A of the Radioactive Waste Management Complex (RWMC)
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 06/17/91

Document #: 5314
Title: Review of Draft Remedial Investigation/Baseline Risk Assessment Report
for Pad A OU 7-12, Revision 1, August 1991
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 10/03/91

Document #: 3231
Title: Draft RWMC Pad A Remedial Investigation Report
Author: Pierre, W.
Recipient: Lyle, J.L.
Date: 10/03/91

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

Document #: ERD1-030-92
Title: Pad A RI/BRA Comment Resolutions
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 02/27/92

Document #: 6045
Title: INEL RWMC - Comments on Draft RI/FS for Pad A OU 7-12 WAG 7
RWMC INEL, April 1992
Author: Nearman, M.J.
Recipient: Macdonald, D.
Date: 08/10/92

Document #: 5319
Title: Technical Review Comments for Draft Remedial

Investigation/Feasibility
Study for Pad A at the RWMC (OU 7-12)
Author: Nygard, D
Recipient: Lyle, J.L.
Date: 08/10/92

Document #: AM/ERWM-RPO-235-92
Title: Draft Final Remedial Investigation Feasibility Study (RI/FS) for the Pad A
Operable Unit in Waste Area Group 7 (WAG 7)
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 10/14/92

Document #: AM/ERWM-ERD1-280-92
Title: Modified Draft Final Remedial Investigation Feasibility Study (RI/FS) for
the Pad A Operable Unit in Waste Area Group Seven (WAG 7)
Author: Lyle, J.L.
Recipient: Pierre, W., Nygard, D.
Date: 12/16/92

Document #: 5310
Title: INEL WAG 7 RWMC Pad A - Comments on the Modified Final Remedial
Investigation/Feasibility Study
Author: Nearman, M.J.
Recipient: Macdonald, D.
Date: 01/12/93

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

Document #: 6114
Title: Technical Review Comments on the Modified Draft Final Remedial
Investigation Feasibility Study
Author: Nygard, D.
Recipient: Macdonald, D.
Date: 01/19/93

Document #: 5362
Title: INEL WAG 7 - Pad A Draft Proposed Plan, Revision 3, May 1993
(Review Comments)
Author: Nearman, M.J.

Recipient: Macdonald, D.
Date: 06/06/93

Document #: 5363
Title: INEL WAG 7 - Pad A Draft Proposed Plan, Revision 4 (Review
Comments
Author: Nearman, M.J.
Recipient: Macdonald, D.
Date: 06/28/93

Document #: 5615
Title: Review Comments from EPA on the INEL WAG 7 Pad A Draft Record
of Decision Revision 1, dated September 1993
Author: Nearman, M.J.
Recipient: Macdonald, D.
Date: 11/17/93

Document #: 5616
Title: Review Comments From IDHW For The Preliminary Working Draft
Record of Decision For Pad A at the Radioactive Waste Management
Complex at the Subsurface Disposal Area
Author: Koch, D.
Recipient: Hula, G.
Date: 11/19/93

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

Document #: 5608
Title: Resolution to comments on the Draft Record of Decision for Pad A sent
to EPA
Author: DOE-ID
Recipient: EPA
Date: 11/22/93

Document #: 5607
Title: Resolution to comments on the Draft Record of Decision for Pad A sent
to IDHW
Author: DOE-ID
Recipient: IDHW
Date: 11/22/93

Document #: OPE-ER-023-94
Title: Responses to comments on the Draft Final Record of Decision for Pad A at Waste Area Group 7 (WAG 7)
Author: Green, L.
Recipient: Pierre, W.; Nygard, D.
Date: 11/22/93

AR10.3 PUBLIC NOTICES

Document #: 532
Title: Public Notice of Scoping Meeting
Author: INEL Community Relations
Recipient: N/A
Date: 11/01/91

Document #: 5502
Title: Public Meeting on the Proposed Plan for Pad A at the Boise Public Library
Author: INEL Community Relations
Recipient: N/A
Date: 08/16/93

FILE NUMBER

AR10.3 PUBLIC NOTICES

Document #: 5503
Title: Public Meeting on the Proposed Plan for Pad A at the Idaho Falls Westbank Inn
Author: INEL Community Relations
Recipient: N/A
Date: 08/16/93

Document #: 5504
Title: Public Meeting on the Proposed Plan for Pad A at the Moscow University Inn
Author: INEL Community Relations
Recipient: N/A
Date: 08/16/93

AR10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 5568
Title: Transcripts - Task 10.04 - Community Relations Meeting Assistance:

Pad A Public Meetings in Idaho Falls, Boise, and Moscow
Author: Hemphill, C.J.
Recipient: Hula, G.
Date: 10/01/93

Document #: 5631
Title: Cross Reference Document For Oral/Written Comments on Proposed
Plan and the Pad A Record of Decision
Author: Brown, D.L.
Recipient: Hula, G.
Date: 04/03/94

AR10.5 DOCUMENTATION OF OTHER PUBLIC MEETINGS

Document #: 5333
Title: Summary of Public Scoping Comments Concerning Proposed
Remediation of Pad A
Author: ASI
Recipient: N/A
Date: 12/04/91

FILE NUMBER

AR10.6 FACT SHEET

Document #: 3391
Title: Public Scoping Meetings Planned for Pad A
Author: INEL Community Relations
Recipient: N/A
Date: 11/20/91

AR11.1 EPA GUIDANCE

Document #: 5163 Revision 3[*]
Title: Administrative Record List of Guidance Documents
Author: EPA
Recipient: N/A
Date: 08/12/92

NOTE: Documents listed as bibliographic sources in the Pad A Remedial Investigation/Feasibility Study Report, might not be listed separately in this index, but nonetheless may have been used in the decision process for Pad A.

<Footnote>
[*] Document filed in INEL Federal Facility Agreement and Consent Order

(FFA/CO)
Administrative Record Binder

[**] Document filed in INEL Pit 9 Administrative Record Binder
</footnote>

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD) - Explanation of Significant Differences (ESD):

ROD Date: 05/17/1994
Operable Unit: 22
ROD ID: EPA/ESD/R10-94/088

Text: Full-text ROD document follows on next page.

Text:

<IMG SRC 1094088>

Power Burst Facility Corrosive Waste Sump and
Evaporation Pond Record of Decision

at the Idaho National Engineering Laboratory
Idaho Falls, Idaho

Explanation of Significant Difference for the Power Burst Facility
Corrosive Waste Sump and Evaporation Pond Record of Decision
at the Idaho National Engineering Laboratory

I. Introduction

This document presents an Explanation of Significant Difference (ESD) from the Record of Decision (ROD) for the Power Burst Facility Corrosive Waste Sump and Evaporation Pond Interim Action, which was signed by the United States Department of Energy, the United States Environmental Protection Agency, and the Idaho Department of Health and Welfare on September 30, 1992. This ROD was signed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the December 1991 Federal Facility Agreement and Consent Order (FFA/CO) entered into by the United States Departmem of Energy, United States Environmental Protection Agency and the Idaho Department of Health and Welfare.

Site Name and Location:

Power Burst Facility Corrosive Waste Sump and Evaporation Pond
Waste Area Group 5, Operable Unit 13
Idaho National Engineering Laboratory

The lead agency for this action is the United States Department of Energy Idaho Operations Office (DOE-ID). The United States Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare (IDHW) both concur with, and approve the need for, this significant change to the selected remedy. The three agencies participated jointly in the decision and preparation of this document.

This ESD, prepared in accordance with Section 117(c) of CERCLA and 40 CFR 300.435(c)(2)(i), is necessary to address needed modifications to the selected remedy identified in the Power Burst Facility (PBF) Corrosive Waste Sump and Evaporation Pond ROD; and is being implemented for the following reasons:

The amount of sediments requiring excavation has increased from the 100 cubic yards estimated in the ROD to 170 cubic yards identified in the Remedial Design/Implementing Remedial Action Work Plan, due to further site characterization which more clearly defined the areas requiring cleanup.

An inadequate number of partially filled certified low-level waste containers having sufficient void space and

remaining weight capacity are available to accommodate the expected volume of sediments.

Containment of the sludge and sediments will be utilized instead of stabilization, because the treatability study confirmed that the ungrouted sediments meet the Radioactive Waste Management Complex (RWMC) waste acceptance criteria and grouting does not significantly increase the long-term effectiveness of the remedy.

Excessive implementation times and increased costs would occur if the selected remedy detailed in the September 1992 Record of Decision were to be fully implemented with no significant decrease in risk.

This and other relevant documents will become part of the Administrative Record file pursuant to Section 300.825(a)(2) of the National Oil and Hazardous Substances Pollution Connngency Plan (NCP). Copies of this ESD and the Administrative Record are available to the public in the following regional INEL Information Repositories:

DOE Reading Room INEL Technical Libsary 1176 Science Center Drive Idaho Falls, Idaho	INEL Pocatello Office 1651 A1 Ricken Drive Pocatello, Idaho	INEL Twin Falls Office 233 Second Street North Suite B Twin Falls, Idaho
INEL Boise Office 816 West Bannock Suite 360 Boise, Idaho	University of Idaho Library U of I campus Moscow, Idaho	Shoshone-Bannock Library HRDC Building Bannock & Pima Streets Fort Hall, Idaho

II. Site History, Contamination Problems, and Selected Remedy

The Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls, in southeastern Idaho and encompasses approximately 890 square miles of semi-arid high desert, partially overlying the Snake River Plain Aquifer. The Power Burst Facility is situated in the southeast portion of the INEL (see Figure 1). The area of focus is the corrosive waste sump and adjacent evaporation pond.

The PBF Corrosive Waste Sump is a concrete structure that was used during the neutralization of reactor secondary coolant water prior to discharge to the PBF evaporation pond. The sump measures 11 feet on each side and extends to a depth of 21 feet. The walls are 12 inch thick reinforced concrete and the base measures 15 inches thick. Discharge to the evaporation pond is through a single walled pipeline.

The evaporadon pond is a lined, bermed surface impoundment, spanning 140 feet on each side. The pond was constructed in 1978 by berming native soils to 4 1/2 feet and lining the interior with Hypalon. The liner was then

covered with approximately 6 inches of sand for protection. This sand has become contaminated due to the discharge of secondary cooling water containing chromium and cesium-137.

In the FFA/CO, DOE was tasked with assessing the risk presented by the pond and sump. Following an EPA-approved risk assessment methodology for an interim action,it was found that the pond represents an unacceptable risk to a hypothetical occupational worker through the inhalation pathway due to the presence of chromium-contaminated dust. The decision to remediate the evaporation pond and sump was presented to the public in a proposed plan. The preferred alternative was the removal of areas of high chromium contamination based on the cesium/chromium correlation (high cesium concentrations were identified in the same areas as the high chromium concentrations in the sediments) that was previously identified. A grout material would be manufactured from sediments and injected into void spaces in existing certified low level waste containers scheduled for disposal in the RWMC.

<IMG SRC 1094088A>

Following review of public comments, the preferred alternative listed in the proposed plan was deemed by the agencies to be the most practicable. The selected remedy was presented by the DOE in a ROD and approved by the EPA, with IDHW concurrence. Following signing of the ROD, design of the remedial action commenced. The Remedial Design/lmplementing Remedial Action Work Plan is filed in the Administrative Record in the binder for Operable Unit 5-13.

III. Description of Significant Differences and Basis

The areas to be cleaned up, the cleanup levels, and the disposal of the contaminated sediments within the RWMC will be completed as provided in the ROD. However, that component of the remedy that deals with preparing the sediments for disposal in the low-level waste containers will be modified for the reasons outlined in section I of this ESD and further discussed below.

Sediment samples collected from the pond in December 1992 for a treatability study to be used in the grout design provided the following significant information:

The previously identified correlation between the concentrations of cesium-137 and chromium was found to be invalid.

Testing of the unstabilized pond sediment samples was done using the Toxicity Characteristic Leaching Procedure (TCLP). This confirmed that the sediments will meet the RWMC waste acceptance criteria without stabilization prior to disposal.

Because the correlation between cesium and chromium was not demonstrated during the analysis of the treatability study samples, the plan to identify "hotspots" for cleanup using a hand-held radiation detector would not be effective. Sampling of the entire pond on a 20-foot square grid was substituted for the originally planned survey. Results from this sampling effort indicated that approximately 170 cubic yards of sediments would be generated by the cleanup, rather than the 100 cubic yards estimated in the proposed plan and ROD. The treatability study results show that grouting 170 cubic yards of sediments would create a total volume of approximately 240 cubic yards of grout.

Concurrent with the treatability study, the remediation contractor initiated efforts to identify and coordinate delivery of waste containers destined for the RWMC which had sufficient void space for the projected volume of grouted sediments. This resulted in the identification of three additional issues:

Due to implementation of waste minimization at the INEL, most waste containers have only minimal amounts of void space available for grouting.

Most waste containers with significant void space are close to their weight limit, and cannot accept significant amounts of the dense grout material. Delaying the project pending availability of sufficient containers with both the weight capacity and enough void space to accept 240 cubic yards of grouted sediments would significantly extend the project completion date.

More detailed contaminant characterization of waste container contents would be needed to document worker safety and health protection. This could result in additional worker exposure, additional costs, and schedule delays.

In view of all the issues identified above, the three agencies agreed that a modificatdon to the selected remedy was needed. Empty waste containers will be used for disposal of the sediments if sufficient partially filled containers requiring only minimal further characterization of the contents are not available. Containers will be filled directly with the contaminated sediments, sealed and placed in the RWMC. Without grouting the sediments, the remedy remains protective of human health and the environment because: 1) it reduces the potential for exposure via the inhalation and direct radiation pathways, as identified in the ROD; 2) the treatability study confirmed that the ungrouted sediments meet the RMWC waste acceptance criteria, and; 3) institutional and administrative controls for a low-level waste disposal facility are presently in place at the RWMC.

The modified remedy will have an impact on the cost of the project as well, due to the substantial increase in the estimated quantity of contaminated sediments. The need to procure new boxes for disposal of the sediments will also increase cost. Current estimates indicate that the project can be completed without exceeding the estimated cost included in the ROD by more than 50%. However, because the current estimated cost is

close to 150% of the estimate in the ROD and there are several areas of uncertainty with subcontractor costs, it is possible that the total cost of the project may exceed 150% of the ROD estimate.

IV. Affirmation of the Statutory Determination

The revised remedy continues to utilize permanent solutions and treatment technologies to the extent practicable for the site. However, the three agencies consider certain aspects of the original remedy to be no longer practicable when evaluated in accordance with the criteria established by the NCP [40 CFR 300.430 (e) (9)].

Mixing the sediments with grout would have dispersed the contaminants in an inert matrix and allowed the sediments to flow into void spaces within the waste containers. However, as discussed in Section 8.2.1 of the ROD, the permanence of grout mixtures has not been established. Consequently, grouting to stabilize the sediments is no longer practicable because it does not significantly increase the long-term effectiveness of the remedy.

Mixing the sediments with grout increases the volume of contaminated material. Waste minimization principles were not a major factor in the initial remedy selection process because the grout mixture would have been injected into existing container void spaces and there would not be a net increase in the volume of materials disposed at the RWMC. Due to the limited availability of partially filled containers, the grouted sediments would have to be placed in new boxes, thus increasing the volume of material disposed at the RWMC.

Due to the increase in worker exposure, short-term effecdveness wil1 be reduced if existing partially filled boxes are opened for further charaaerization of the contents.

The implementability of the original remedy has been reduced because of the limited availability of partially filled containers with sufficient void space and/or remaining weight capacity. In addition, the use of grout is no longer required to provide a medium which can be injected into existing container void space.

Cost is the last of the balancing criteria, and is also a factor in determining practicability. Grouting would cost more than was originally expected, due to the increased volume of contaminated sediments, as well as the need to complete a more detailed evaluation of waste container contents.

Considering the new information that has been developed, DOE, EPA, and IDHW all believe that the remedy remains protective of human health and the environment, complies with Federal and State requirements that have been identified as relevant and appropriate to this interim remedial action, and is cost effective.

V. Public Participation Activities

This ESD has been published and a notice placed in the Post Register (Idaho Falls), Idaho State Joumal (Pocatello), Times News (Twin Falls), Southern Idaho Press (Burley), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and Daily News (Moscow). This ESD and the contents of the Administrative Record are available for public review. ln addition to the Administrative Record on file for the Record of Decision, the Administrative Record for this action includes a copy of this ESD, Remedial Design/Implementing Remedial Action Work Plan (RD/RAWP) and supporting information (refer to binder for Operable Unit 5-13).

Implementation of this action will begin approximately 30 days after issuance of this ESD. Although modified from the original ROD, the remedy, as modified by this ESD, does not represent a fundamental change in scope or purpose of this action. Thus, a formal comment period will not be conducted.

Consistent with NCP Section 300.435(c)(2)(i), this ESD has been placed into the previously listed INEL Information Repositories, after the publication of a notice in the following papers:

Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Southern Idaho Press (Burley), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and Daily News (Moscow)

The public is encouraged to review this ESD and other relevant documentation in the Administrative Record and provide comments to any of the agencies involved. Additional information may be requested within 14 days of the notice of issuance for this ESD by contacting:

Reuel Smith
INEL Community Relations Plan Office
P.O. Box 2047
Idaho Falls, Idaho 83403-2047
(208) 526-6864

Signature sheet for the foregoing Explanation of Significant Difference for Operable Unit 5-13 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the Power Burst Facilicy Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

_____ _____

John M. Wilcynski
Acting Manager
Department of Energy Idaho Operations Office

Date

Signature sheet for the foregoing Explanation of Significant Difference for Operable Unit S-13 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the Power Burst Facility Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

_____ _____

Gerald A. Emison
Deputy Regional Administrator, Region 10
Environmental Protection Agency

Date

Signature sheet for the foregoing Explanation of Sigificant Difference for Operable Unit 5-13 interim action at the Idaho National Engineering Laboratory between the United States Deparment of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the Power Burst Facility Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

_____ _____

Jerry E. Harris
Director
Idaho Department of Health and Welfare

Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

May 6, 1994

Reply to
Attn of: HW-124

Mr. Jerry Lyle, Director
Environmental Restoration Division
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

Re: The Explanation of Significant Difference for the Power Burst Facility Corrosive Waste Sump and Evaporation Pond Interim Action (Operable Unit 5-13)

Dear Mr. Lyle:

We have reviewed the referenced document and have briefed Region 10 management up through the Deputy Regional Administrator on the modified remedy that DOE will implement at this site.

The decisions presented are consistent with the EPA guidance for an Explanation of Significant Difference. The rationale for, and scope of the changes are clearly presented in the document. We agree that the modified remedy is consistent with the scope and purpose of the remedy selected in the Record of Decision for this operable unit. The remedial action should be completed as soon as possible, consistent with the Federal Facility Agreement and Consent Order for the INEL, and the ROD for this OU.

If there are any further issues that you or your staff wish to discuss regarding this action, please contact me at (206) 553-7261, or Howard Blood, EPA WAG 5 Manager at (206) 553-1172.

Sincerely,

Wayne Pierre
INEL FFA/CO Project Manager

cc: Lisa Green, DOE-ID
Talley Jenkins, DOE-ID
David Frederick, IDHW-IF
Shawn Rosenberger, IDHW-IF
Dean Nygard, IDHW

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/27/1994
Operable Unit: 19
ROD ID: EPA/ROD/R10-94/084

Media: Groundwater, soil

Contaminant: Chromium, mercury, cesium-137, cobalt-60, barium, copper, nickel, silver, zinc, ethyl benzene, TCE, PCE, xylenes

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The 2,305 square kilometer Idaho National Engineering Laboratory (INEL), a government facility managed by the U.S. Department of Energy, is located 32 miles west of Idaho Falls, Idaho. Current land use at the INEL is primarily nuclear research and development and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEL is surrounded by a buffer zone used for cattle and sheep grazing. The INEL property is located on the northeastern edge of the Eastern Snake River Plain, a volcanic plateau, that is primarily composed of silicic and basaltic rocks and relatively minor amounts of sediment. The depth to the Snake River Plain Aquifer underlying the facility varies from 61m (200 ft) in the northern portion to 274.3m (900 ft) in the southern portion of the INEL. Regional groundwater flow is generally to the southwest. 100 out of 11,700 people from INEL are employed at the Radioactive Waste Management Complex (RWMC).

Contamination at the site includes two areas: Pad A and the Naval Reactors Facility (NRF). Pad A is located in the north-central portion of the Subsurface Disposal Area (SDA), an 88-acre disposal area located within the RWMC. Surface water is present at the RWMC only during periods of heavy rainfall or snowmelt, which generally occur in January through April. To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. The NRF is located on the west-central side of the Idaho National Engineering Laboratory, outside the perimeter OU 8-07. Also located on NRF are an industrial waste ditch (IWD) and landfill units.

The Naval Reactors Facility was established in 1949 as a testing site for the naval nuclear propulsion program. The Submarine Thermal Reactor Prototype (SIW) became operational in 1953. At that time, the first section of the Industrial Waste Ditch was constructed to accommodate the disposal of nonradioactive, nonsewage liquid discharges. Three landfill units received solid waste similar to that of municipal landfills (construction, petroleum, cafeteria, and small quantities of paint products) from the prototype and support facility operations.

The landfill areas were used intermittently from the time construction started at NRF. In general, construction debris and waste material was burned, then covered with soil. The volume of construction debris decreased after the construction of A1W and ECF in 1958, and after the construction of S5G in 1965. Use of the last NRF landfill ceased by 1971.

In November 1989, the INEL was listed on the National Priorities List (NPL). The DOE, EPA, and State of Idaho Department of Health and Welfare (IDHW) entered into the Federal Facility Agreement and Consent Order (FFA/CO) on December 9, 1991. The entire NRF area will be evaluated in the Waste Area Group (WAG) 8 Comprehensive RI/FS, which is scheduled to begin in 1995.

The RI/FS performed on the IWD evaluated potential risks for both human health and environmental effects. It was found that although there may be some health risk associated with the IWD in the future, the risk is not significant when compared to the background risk, and considering the conservative nature of the estimate.

For the Landfill sites the agencies agreed that the Presumptive Remedy for CERCLA Municipal Landfill Sites was applicable. The

assessment of the associated risk presents a large amount of uncertainty due to the volume and heterogeneity of landfill contents make characterization extremely difficult, constituent concentrations in the landfill contents are assumed.

Remedy: The alternative selected for landfill sites 8-05-01, 8-05-51, and 8-06-53 is the Presumptive Remedy for CERCLA Municipal Landfill Sites. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. The objective of the presumptive remedies process is to use the EPA's past experience to streamline site investigation and the remedy selection process, thereby improving consistency, reducing cost, and increasing the speed within thick hazardous waste sites are remediated. The specific actions are to survey and mark the areas, restrict land use, monitor soil gases, and install and maintain a two-foot thick native soil cover over the landfill contents by means of administrative controls. Ground water monitoring will be performed to evaluate these and other areas at NRF.

Text: Full-text ROD document follows on next page.

Text:

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Naval Reactors Facility Industrial Waste Ditch and Landfill Are
Operable Units 8-07, 8-O6, and 8-05
Idaho National Engineering Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This document presents the remedial actions selected for the Naval React Industrial Waste Ditch (operable Unit 8-07) and Landfill Areas (operable at the Idaho National Engineering Laboratory. The remedy was selected i the Comprehensive Environmental Response, Compensation, and Liability Ac by the Superfund Amendments and Reauthorization Act, and to the extent p National Oil and Hazardous Substances Pollution Contingency Plan. This based on the information in the Administrative Record for the Naval Reac Industrial Waste Ditch and Landfill Areas.

The U.S. Environmental Protection Agency (EPA) approves of this remedy, Idaho concurs with the selected remedial actions.

ASSESSMENT OF THE SITE

The Naval Reactors Facility Industrial Waste Ditch and Landfill sites 8-8-06-48, 8-06-49, and 8-06-50 do not present an unacceptable risk to human environment, and therefore, require no further action. Hazardous substance landfill areas 8-05-1,8-05-51, and 8-06-53 may present a potential threat t welfare, or to the environment if not addressed by implementing the respons in this Record of Decision.

DESCRIPTION OF THE SELECTED REMEDY

The Naval Reactors Facility has been designated as Waste Area Group (WAG WAGs at the INEL which are under investigation pursuant to the Federal Faci and Consent order (FFA/CO) between the Idaho Department of Health and Welfa the EPA, and the U.S. Department of Energy (DOE). The Industrial Waste Dit designated as operable Unit 8-07, and the Landfill Areas are designated as 05 and 8-06. No action is recommended for the Industrial Waste Ditch or La 59, 8-06-35, 8-06-36, 8-06-48, 8-06-49, and 8-06-50. The recommended remed landfill sites 8-05-1, 8-05-51 and 8-06-53 is in accordance with the Presum CERCLA Municipal Landfill Sites. This consists of containment of landfill gas monitoring to reduce the risks associated with potential exposure to th wastes. Ground water monitoring will be performed to provide information o these areas may have had on ground water and to support the NRF Comprehensi of Decision.

The major components of the selected remedy include:

Installation of a native soil cover, followed by planting with nat erosion;

Periodic inspection and maintenance to ensure the integrity of the

Soil gas monitoring to provide early detection of any release from the subsurface, ground water, or surface pathways;

Ground water monitoring to evaluate these and other areas at NRF;

Maintaining institutional controls, including signs, postings, and

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, comp Federal and State applicable or relevant and appropriate requirements, and This remedy utilizes permanent solutions and presumptive remedies to the ma practicable; however, because the wastes can be reliably controlled in plac principle sources of contamination was not found to be cost effective. The does not satisfy the statutory preference for treatment as a principal elem

Because the remedy will result in hazardous substances remaining in some of areas onsite, a review will be conducted within five years after commenceme actions, and every five years thereafter, to ensure that the remedy continu adequate protection of human health and the environment.

SIGNATURE SHEET

Signature sheet for the foregoing Industrial Waste Ditch and Landfill Areas Facility at the Idaho National Engineering Laboratory Record of Decision be Department of Energy and the Environmental Protection Agency with concurren Idaho Department of Health and Welfare.

_____ _____

CHUCK CLARKE Date
Regional Administrator, Region 10
U.S. Environmental Protection Agency

SIGNATURE SHEET

Signature sheet for the foregoing Industrial Waste Ditch and Landfill Area Facility at the Idaho National Engineering Laboratory Record ot Decision be Department ot Energy and the Environmental Protection Agency with concurren

Idaho Department of Health and Welfare.

_____
_____

THERON M. BRADLEY
Manager
U.S. Department of Energy Naval Reactors Idaho Branch

SIGNATURE SHEET

Signature sheet for the foregoing Industrial Waste Ditch and Landfill Areas Facility at the Idaho National Engineering Laboratory Record of Decision be Department of Energy and the Environmental Protection Agency with concur Idaho Department ot Health and Welfare.

_____ _____

JERRY L. HARRIS Date
Director
Idaho Department of Health and Welfare

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ACRONYMS

A1W	Large Ship Reactor Prototype
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
BGS	Below Ground Surface
BESWL	Below Elevation of the Static Water Level
BLM	Bureau of Land Management
BTEX	Benzene, toluene, ethylbenzene, and total xylene
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liabil
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COCA	Consent Order and Compliance Agreement
CRP	Community Relations Plan
CSM	Conceptual Site Model
DOE	Department of Energy
DOE-ID	Department of Energy, Idaho Field Office
EPA	Environmental Protection Agency

FFA/CO	Federal Facility Agreement/Consent Order
FS	Feasibility Study
HQ	Hazard Quotient
ICR	Increased Cancer Risk
IDHW	Idaho Department of Health and Welfare
IWO	Exterior Industrial Waste Ditch
INEL	Idaho National Engineering Laboratory
km	kilometer
MDL	Method Detection Limit
mi	miles
NCP	National Contingency Plan
NPL	National Priorities List
NRF	Naval Reactors Facility
OU	Operable Unit
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethylene
ppb	parts per billion
PPE	Personal protective equipment
ppm	parts per million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Desision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SRPA	Snake River Plain Aquifer
SOP	Standard Operating Procedure
SOW	Statement of Work
S1W	Submarine Thermal Reactor Prototype
SVOCs	Semi-Volatile Organic Compounds
TAN	Test Area North
TCA	1,1,1-trichloroethane
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
TSD	Treatment, Storage, and Disposal facility
USGS	United States Geological Survey
UTL	upper tolerance limit
VOCs	Volatile Organic Compounds
WAG	Waste Area Group

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1.0 DECISION SUMMARY

Site Name, Location, and Description

The Idaho National Engineering Laboratory (INEL) is a government facilit U.S. Department of Energy located 51.5 kilometers (km) [32 miles (mi)] w Idaho, and occupies 2305 km2 (890 miý) of the northeastern portion of th River Plain. The Naval Reactors Facility is located on the west-central National Engineering Laboratory (Figure 1). This Record of Decision app portion of the Industrial Waste Ditch outside the NRF perimeter (Operabl hereinafter referred to the Industrial Waste Ditch). This segment exten the northeast from the northwest corner of the fence. The interior port addressed as Operable Unit 8-09. The Landfill Units (Operable Units 8-0 nine separate locations situated on the west and northeast sides of the maximum area of the combined landfill units is 0.16 kmý (0.06 miý).

Current land use at the INEL is primarily dedicated to nuclear research waste management. Surrounding areas are managed by the Bureau of Land M for multipurpose use. The developed area within the INEL is surrounded miý) buffer zone used for cattle and sheep pasture.

Of the 11,700 people employed at the INEL, approximately 830 are employe Reactors Facility. The nearest offsite populations are in Atomic City, and Terreton.

<IMG SRC 1094084>

Figure 1 The Idaho National Engineering Laboratory showing the location Reactors Facility.

The INEL is located on the northeastern portion of the Eastern Snake Riv volcanic plateau that is primarily composed of silicic and basaltic rock amounts of sediment. Underlying the INEL are a series of basaltic flows interbeds. The basalts immediately beneath the Naval Reactors Facility are covered by 6.1 to 9.1 meters (20 to 30 feet) of alluvium and loess.

The depth to the Snake River Plain Aquifer (SRPA) at the INEL varies fro feet) in the northern portion to 274.3 meters (900 feet) in the southern the aquifer at the Naval Reactors Facility is approximately 112.78 meter ground water flow is generally to the southwest.

The Idaho National Engineering Laboratory has semidesert characteristics and cold winters. Normal annual precipitation is 23.1 centimeters (9.1 surface water present at the INEL is the Big Lost River, which is approx south of the Naval Reactors Facility. However, this river is typically climate. The only naturally occurring surface water at the Naval Reacto heavy rainfall or snow melt, usually during the period from January to A

Twenty distinctive vegetative cover types have been identified at the IN being the dominant species, covering approximately 80% of the ground sur of habitats on the INEL support numerous species of reptiles, birds, and bird species warrant special concern because of senstivity to disturbanc

status. These species include the ferruginous hawk (Buteo regalia), bal leucocephalus), prairie falcon (Falco mexicanus), merlin (Falco columbar curlew (Numenius americanus), and the burrowing owl (Athlene cunicularia snake, whose occurrence is considered to be INEL-wide, is listed by the Fish and Game as a Category C sensitive species.

The areas of the Industrial Waste Ditch and landfill areas included with Decision have been evaluated for compliance with the Wetlands Protection legislation, and Historical and Cultural Preservation, and were found to and/or relevant and appropriate statutes.

The Naval Reactors Facility includes approximately 80 developed acres. nonhazardous industrial waste water from water treatment operations and has been discharged to the IWD since 1953. The ditch was originally an it has been modified to carry water away from the facility. The volume has varied greatly, depending on operational requirements. Due to recen operations, water is rarely present beyond 1.2 miles beyond the ouffall. and Landfill units are discussed in Sections 5 through 11 of this Record will be discussed first, or will be labeled as subsection 'a'.

The landfill areas are primarily located west and northeast of the Naval Operable Units 8-05 and 8-06 include nine separate areas which have been potential waste disposal sites. The wastes in these landfill areas are municipal landfills; cafeteria wastes, construction debris, petroleum pr small amounts of paints and solvents. Different landfill units were use 1951 through 1971. NRF discontinued use of the last landfill unit in 19 IWD and Landfill units are discussed in Sections 5 through 11 of this Re landfills will be discussed second, or will be labeled as subsection 'b'

Assessment of the Industrial Waste Ditch

The no action decision is applicable to the Industrial Waste Ditch becau unacceptable risk to human or ecological receptors in the present or fut scenarios.

Assessment of Landfill Units

Landfill sites 8-05-59, 8-06-35, 8-06-36, 8-06-48, 8-06-49, and 8-06-50 existing data, and risk calculations were performed for those constituen gas analyses, surface soil samples, or based on historic information. T determined to contain primarily construction debris, did not present any human or environmental receptors, and are recommended for no action. La 8-05-51, and 8-06-53 have contents similar to those found in municipal l by the three parties, intrusive sampling of the actual contents of the l performed. Containment with a native soil cover is the recommended alte areas, based on the Presumptive Remedy for Comprehensive Environmental R Compensation, and Liability Act (CERCLA) Municipal Landfill Sites, to pr there will not be a release of contaminants to the environment in the fu will be conducted to verify that the actions taken remain protective of environment.

Description of the Selected Remedy

The altenative selected for landfill sites 8-05-1, 8-05-51, and 8-06-53 Remedy for CERCLA Municipal Landfill Sites. Presumptive remedies are pr technologies for common categories of sites, based on historical pattern selection and EPA's scientific and engineering evaluation of performance implementation. The objective of the presumptive remedies process is to experience to streamline site investigation and the remedy selection pro improving consistency, reducing cost, and increasing the speed within wh waste sites are remediated. The specific actions are to survey and mark land use, monitor soil gases, and install and maintain a two foot thick the landfill contents by means of administrative controls. Ground water perfommed to evaluate these and other areas at NRF.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Naval Reactors Facility was established in 1949 as a testing site fo propulsion program. The Submarine Thermal Reactor Prototype (S1W) becam in 1953. At that time, the first section of the Industrial Waste Ditch accommodate the disposal of nonradioactive, nonsewage liquid discharges. landfill units received solid waste similar to that of municipal landfil cafeteria, and small quantities of paint products) from the prototype an operations.

The Large Ship Reactor Prototype (A1W) and the Expended Core Facility (E operational in 1958, and the S5G Prototype became operational in 1965. Reactors Facility expanded, the Industrial Waste Ditch was modified to a increased volume of waste water. The primary discharge constituents wer

cooling water, acidic and basic solutions from the water treatment facil with occasional oily residues, storm water runoff, and small amounts of

The landfill areas were used intermittently from the time construction s general, construction debris and waste material was burned, then covered volume of construction debris decreased after the construction of A1W an after the construction of S5G in 1965. Use of the last NRF landfill cea

In 198O, the Naval Reactors Facility ceased the discharge of all Resourc Recovery Act (RCRA) wastes to the Industrial Waste Ditch except the acid exchange regenerant solutions, which were self-neutralizing. In 1985, a constructed to neutralize these solutions prior to discharge. A Consent Compliance Agreement (COCA) was established between the Department of En U.S. Environmental Protection Agency pursuant to the Resource Conservati Act Section 3008(h) in August 1987. The COCA required an initial assess of all solid waste and/or hazardous waste disposal units at the INEL, an for conducting any necessary conective actions. In November 1989, the I the National Priorities List (NPL) by the EPA under CERCLA as amended by Amendments and Reauthorization Act of 1986 (SARA). The DOE, EPA, and St Department of Health and Welfare (IDHW) entered into the Federal Facilit Consent order (FFA/CO) on December 9, 1991.

Most of the discharge to the IWD has been directly proportional to plant

particularly the amount of cooling water utilized. The reduction in wor Reactors Facility over the past five years has resulted in a correspondi volume of water discharged to the IWD. When three prototype plants were was present to the 4 kilometer (2.5 mile) mark in the ditch channel. As inactivation of the S1W prototype in 198O, and the permanent shut down o prototype in 1994, water is only present in the first 1.6 kilometer (one S5G prototype inactivation scheduled to start in 1995 will further reduc discharged to the IWD.

The IWD was identified for a Remedial Investigation/Feasibility Study (R FFA/CO. The landfill Units were investigated in accordance with Track 2 for Assessing Low Probability Hazard Sites at the INEL. The entire NRF evaluated in the Waste Area Group (WAG) 8 Comprehensive RI/FS, which is begin in 1995.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA 113(k)(2)(B)(i-v), information on the invest decision-making processes involved in the evaluation of the NRF Industri Landfill Areas was provided to the public from January through April 199 mailings, articles in the INEL Reporter, and public meetings. Opportuni these plans were provided during the public comment period from April 12 1994. A Fact Sheet and Proposed Plan were distributed to 7500 citizens calls were made, and announcements were made in the media and INEL publi infomation and scoping meetings and two open houses were also conducted. written comments were accepted.

Display ads describing upcoming meetings were published in the following Idaho Falls Post Register, Pocatello Idaho State Journal; Burley South I

Times News; Boise Idaho Statesman; Nampa Idaho Press Journal; Lewiston M and Moscow Idahonian between March 15 - 23, 1994 to encourage citizens t public meetings and provide oral or written comments. During the week o press release addressing the Naval Reactors Facility public meetings and on the investigations was released to approximately 40 media centers for the public. Articles were also published in the INEL Reporter, The INEL Environmental Restoration at the INEL, and the INEL News.

Newspaper and radio advertisements were presented the week of April 10, public of the information sessions at Pocatello and Twin Falls. Adverti two local newspapers, and radio advertisements were broadcast by six loc times a day for three days in Pocatello, Burley and Twin Falls. Two rad broadcast from Burley on April 13, 1994 and Jerome on April 14, 1994 pro on the public meetings, and the locations of the INEL regional office. release, radio, and newspaper ads) gave public notice of two scoping mee notification of the beginning of the 30 day public comment period from A 1994.

Personal phone calls concerning the availability of Naval Reactors Facil public meetings were made to individuals, environmental groups, and orga Outreach office staff in Pocatello, Twin Falls, and Boise. The Communit Coordinator made calls in Idaho Falls and Moscow.

Information sessions were held at the Pine Ridge Mall in Pocatello on Ap the INEL regional office in Twin Falls on April 14, 1994 prior to the pu 13, 1994, representatives from the DOE, EPA, and IDHW conducted a techni teleconference calls with members of the League of Women Voters and the Defense Institute in Moscow, Idaho.

All media presentations gave public notice that Naval Reactors Facility available before the beginning of the comment period in the Administrati the INEL Information Repositories located in the INEL Technical Library as in the city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, a announced the same information.

Open houses were held in Pocatello on April 12, 1994, and Twin Falls on Public meetings were held in Idaho Falls on April 19, 1994, Boise on Apr Moscow on April 21, 1994. A total of 83 people attended these meetings. forms were available at all meetings. The reverse side of the meeting a form for the public to evaluate the effectiveness of the meetings. A co present at each meeting to keep a verbatim transcript of discussions and The meeting transcripts were placed in the Administrative Record section Reactors Facility Industrial Waste Ditch (operable Unit 8-7), and Landfi Units 8-O5 and 8-06) in eight INEL Information Repositories.

A Responsiveness Summary has been prepared as part of this Record of Dec formal oral comments made at the public meetings, and all written commen verbatim in the Administrative Record. Those comments are annotated to response in the Responsiveness Summary addresses each comment.

A total of nine written comments and six oral comments were received dur period. All comments received on the Proposed Plan were considered duri

of the Record of Decision. The decision for this action is based on the Administrative Record for these Operable Units.

4. SCOPE AND ROLE OF OPERABLE UNITS AND RESPONSE ACTIONS

Under the FFA/CO, the INEL is divided into ten WAGs. The WAGs are further divided into Operable Units (OUs). The Naval Reactors Facility is designated as WAG 8, and consists of nine OUs. Monitoring data, process knowledge, written correspondence, and interviews with current and previous employees were used to evaluate the IWD and Landfill Units. The Remedial Investigation/Feasibility Study on the Industrial Waste Ditch and the Track 2 Investigations of the Landfill

<IMG SRC 1094084A>

Areas evaluated the potential for contamination and migration from the soil, water, and air affected by these areas. A complete evaluation of all cumulative risks associated with the CERCLA actions at WAG 8 will be conducted as part of the NRF Comprehensive RI/FS to ensure that all risks have been adequately evaluated. This Record of Decision is part of the overall WAG strategy, and is expected to be consistent with any planned future actions.

5. SUMMARY OF SITE CHARACTERISTICS

Industrial Waste Ditch

The exterior portion of the NRF IWD (Operable Unit 8-07) extends about 5.15 kilometers (3.2 miles) to the northeast from the northwest corner of the fenced perimeter of the Naval Reactors Facility. The Industrial Waste Ditch was first used to dispose nonsewage industrial waste water in 1953. The primary component of the

Figure 2 Photograph of NRF with the Northeast from the Northwest Corner

throughout the lifetime of the IWD has been cooling water from circulati and ion exchange regenerant solutions. The ditch channel was modified a direct the original waste stream and additional discharge from the newly plant toward the dry streambed at the northwest corner of the facility. was expanded to the point 2.66 kilometers (1.65 miles) downstream from t accommodate additional effluent as the S5G prototype became operational. ditch was dredged occasionally to improve drainage, but remained within The dredged sediments were placed along the ditch banks parallel to the

Table 5-1 identifies various categories of chemicals used at the NRF dur operations, and provides an estimate of the source volume which may have to the IWD. It is uncertain if all the listed compounds entered the dit information is based on procurement records, process knowledge, and plan records.

Table 5-1 Categories of Discharges and Typical Annual Discha

Categories of Discharges to the Industrial Waste Ditch	Estimated Annual Volume (Gallons/Year)	Examples of Wa Disc
Run-off (rain and	33,000,0001	Residual oils, met

snow melt)		
Prototype and Auxiliary operations	70,000,000ý	Waste oil, water t chemical reagents, chemicals, chlorin compounds
Cooling Systems	500,000	Water treatment ch
Ion Exchange Regeneration	4,000,0003	Acidic and basic solu
Laboratory operations	1,000	Laboratory chemica including dilute m reagents, chlorina preservatives, aci
Photographic Operations	1,000	Photographic solut preservatives
Total	107,503,000	gal/year

1 Volume may range as high as 40,000,000 gallons

2 Volume may range as high as 79,000,000 gallons

3 Volume may range as high as 4,750,000 gallons

In 1980, NRF ceased the discharge of all RCRA wastes to the IWD except a ion exchange regenerant solutions, which were self-neutralizing. This c practice was part of a site improvement project, and was accomplished by hazardous chemicals with non-hazardous chemicals, collecting and properl remaining waste streams, and implementing waste control procedures. Dis

and basic ion exchange regenerant solutions continued from June 1980 thr In April 1985, a neutralization facility consisting of two 15,000 gallon installed. Acidic and basic solutions were mixed, neutralized, and disc The optimal pH control level at the facility is between 6.0 and 9.0 pH u the IWD has received only rain/snow run-off, facility discharge containi hazardous industrial waste water, neutralization tank discharges contain and bases neutralized to a pH between 6.0 and 9.0, and infrequent discha chemical solutions.

The total volume of the sediment in the IWD containing inorganic waste w 7,542 cubic meters (270,744 ft3). This corresponds to a length of 1,768 width of 4.74 meters (15.56 feet), and a depth of 0.9 meters (3 feet). surface area was calculated to be 8,380 mý (90,248 ftý).

<IMG SRC 1094084B>

Figure 3 Schematic of Operable Units Described and NRF Wells

Landfill Units

The Landfill Units (Operable Units 8-05 and 8-06) include nine separate west and northeast sides of the facility. The maximum area of the combi 0.16 kmý (1.64 x 106 ftý). The landfill units are believed to have simi wastes, migration paths, and risk factors. The wastes consisted of offi debris, cafeteria garbage, waste oils, chromate compounds, and small qua

Table 5-2 Summary of Landfill Units (8-05 and 8-06)

Area	Primary Uses/Wastes	Dates of Operation	Dimensions
8-05-1	Similar to municipal landfill; construction debris and refuse such as petroleum products, small quantities of paints and solvents, cafeteria wastes	1951-1960	107 x 137 meters (35 450'), depth of refuse 1.2-7.6 meters (4-25
8-05-51	Similar to municipal landfill; construction debris and refuse such as petroleum products, small quantities of paints and solvents, cafeteria wastes, material staging area and construction debris disposal	1957-1963	137 meters x 30.5 to 53.4 meters x 3.05-4. meters deep (450' x 100- 175' x 10-15')
8-05-59	Possible landfill/burn pit	1951-1953	22.9 x 30.5 meters (75 100'), depth estimated 6.1 meters (20')
8-06-35	Construction debris disposal	1960-1971	91.4 x 121.9 meters (300' x 400') cont silty soil, concrete, wood, scrap metal
8-06-36	Construction debris disposal	1960-1971	Triangular; base about 91.4 meters (300') an attitude of 152.4 mete (500)
8-06-48	Material staging area and construction debris disposal	1956-1964	198.1 (650') long x 22 to 53.3 meters wide (7 to 175')
8-06-49	Construction staging	1961-1963	106.7 meters (350') lo

	area		x 7.6 to 45.7 meters (25' and to 150')
8-06-50	Construction material staging and parking (50' to 150')	1956-1959	137.1 meters (450') lo x 15.2 to 45.7 meters pr disposal
8-06-53	Similar to municipal landfill; construction debris and refuse such as petroleum products, small quantities of paints and solvents, cafeteria wastes	1956-1970	274.3 x 365.8 x 2 to 3 meters deep (900' x 1200' x 7' to 10')

Areas recommended for the selected remedy appear in bold type.

miscellaneous chemicals from the Naval Reactors Facility. Chemicals whi have been disposed of in the landfills include low concentrations of sil nitrate in solution, which were used in laboratory analyses. A review o interviews with former employees indicate that the waste was placed in u pits, burned, and the areas subsequently backfilled. Use of the last la in 1971.

The objectives of the investigations were to determine the boundaries of depth of the cover, and the potential for ground water contamination and organic vapor release. Intrusive sampling to determine the landfill con performed due to the heterogenous nature of the landfill contents. Tabl information about the landfill units.

Records of what materials were deposited in the NRF landfills were not k records were kept of the materials shipped from NRF to the INEL Central after use of the last NRF landfill was discontinued in 1971. Since the processes used at NRF remained constant, the types and quantities of was not believed to have changed significantly over time. Therefore, these used to estimate the volumes and concentrations of wastes disposed of pr NRF landfills. In addition, historic photographs were reviewed, and emp a records search were conducted.

Table 5-3 NRF Waste Generation After 1971 and Prior Inferred Generatio Units Volume Calculation

Waste Type	Form	Average Annual Volume after 1971 (Cubic meters/year)	In Annu to m
Office trash	Solid	4,655.8	
Construction debris	Solid	1,571.2	

Municipal waste	Solid	1,090	
Waste oil	Liquid	23.8	
Paint, thinner, solvents	Liquid	0.14	
Acidic, basic, or metal-based solutions used in plant operations or analytical chemistry procedures	Liquid	2.2	1.3
Chromate solutions	Liquid	2.5	
Chemicals used for water treatment	Solid	0.6	
Totals		7,346.2	

Based on the number of major construction evolutions which were in progress time period the NRF landfills were in use, a considerable amount of the construction debris. After 1965, the quantity of construction debris di decreased due to the reduced number of construction projects. In additi of plant-related waste was generated and sent to the Naval Reactors Faci 1965, since only two prototype plants were operating. This volume of wa conservatively estimated from later records by applying a reduction fact provides information about waste generated after 1971, and an estimate o generated prior to that time. Table 5-4 estimates the volume of waste d landfill unit. For the landfills, the three waste types of concern are chemicals. Soil gas samples were collected and analyzed for volatile or screen for waste oils and solvents.

Table 5-4 Estimated Total Volume of Waste Disposal to NRF Landfill Units (m3)

Year	8-05-1	8-05-51	8-06-53	Total
1956	2,540		2,382	4,922
1957	2,310	230	2,382	4,922
1958	2,310	230	2,382	4,922
1959	2,310	230	2,382	4,922
1960	2,310	230	2,382	4,922
1961		230	2,382	4,922
1962		230	2,382	4,922
1963		230	3,555	7,346 3,56

1964			3,555	7,346
1965			3,555	7,346
1966			3,555	7,346
1967			3,555	7,346
1968			3,555	7,346
1969			3,555	7,346
1970			3,555	7,346
Total	11,780	1,610	45,114*	93,222
Capacity	55,O64	1,612	22,585	79,261

*Assumes this volume was reduced by 50 percent as a result of inc

Radioactivity Controls

At NRF, systems which contain radioactive liquids (e.g. reactor coolant, laboratory liquid discharge) with beta, gamma, and alpha emitting radion

physically isolated from those systems wnich discharge to the IWD. Wast radioactivity is contained in separate, monitored systems which are isol carrying other site effluents. Waste water containing radioactivity is remove the radioactivity, and reused rather than discharged to the envir systems include collection tanks, particulate filters, activated carbon bed ion exchange columns to remove radioactivity from the water. Strict procedures have been used from the start of operations at NRF to control radioactive materials.

The effectiveness of this program is demonstrated by the results of sedi vegetation samples collected through routine environmental monitoring fr results indicate that radionuclides are not a contaminant of concern for provides a summary of the routine soil, sediment, vegetation, and water radiological analysis in 1991.

Table 5-5 Summary ot Routine Radiological Monitoring at the NRF IW

	Soil (pCi/gm)			Sedimentý (pCi/gm)		Vegetation (pCi/gm)		Water (10-8 uCi	
	MEAN	MAX	SL	MEAN	MAX	MEAN	MAX	MEAN	MAX
Cobalt-60	<0.1	0.22	4	<0.38	1.18	<0.36	<0.52	<5.5	<5.
Cesium-137	025	0.49	1.3	0.36	0.60	<0.18	<O.26	5	5

pCi/gm Picocurie (1O-12 curie) per gram
SL Risk based screening level

1 < in front of a maximum value signifies LESS THAN the minimum activity (MDA). A mean value preceded by < contains at least MDA.

2 Sediment samples are collected from the A1W and S5G cooling t sewage lagoons; i.e., material which has been deposited by wa

3 Water samples are analyzed for all gamma rays with energies b MeV. This energy range includes Cobalt-6O, Cesium-137, and a other radionuclides of both natural and man-made origin. The shown for Cobalt-60 are less than the minimum detectable conc analysis, assuming all gamma rays detected had come from that

4 While no specific screening level for Cobalt-60 has been esta 137 screening level may be used for comparison, since Cobalt- shorter halflife and comparable dose conversion factors for b external exposure.

5 Cesium-137 is included in the equivalent Cobalt-60 concentrat

Since 1953, routine radiological monitoring of process water, cooling wa and buildings and grounds has been performed at NRF. Currently, water s

collected weekly from the IWD and other discharge locations, and analyze radioactivity using gamma spectrometry. All samples collected for non-r are screened for radioactivity using a gamma detector prior to leaving N radiological surveys are performed along the IWD, and sediment, soil, an samples are collected and analyzed for gross gamma radioactivity on an a five locations in the interior and exterior IWD. Cobalt-60 and Cesium-1 predominant radionuclides identfied during this analysis. These two rad to assess the presence of radioactivity during environmental monitoring are easily detectable and are present with other NRF isotopes.

5.1 Summary of Environmental Monitoring Data

5.1.a IWD Remedial Investigation Soil Samples

Sediment samples from the IWD channel were first collected for character were analyzed for chromium and silver concentrations based on process kn Detailed characterization sampling was initiated in 1986. Core samples November 1986 indicated that chromium, copper, lead, mercury, nickel, si present in the channel sediments. The only volatile organic compound pr samples was methylene chloride, which is a common laboratory contaminant eighteen soil samples were collected to determine background levels. Co dredge pile samples were collected in 1987, and analyzed for metals and constituents (chemicals which have been shown to have toxic, carcinogeni teratogenic effects on humans). Only chromium and mercury were found to concentrations above background levels.

Soil samples collected for the Remedial Investigation in 1992 were categ
types; sediment samples from the ditch channel, dredge pile samples, and
samples from the beneath the ditch channel and on either side at set int
samples were analyzed for metals, volatile organic compounds (VOCs), sem
compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, total p
hydrocarbons (TPH), and benzene, toluene, ethylbenzene, and totat xylene
vast majority of VOC and SVOC analyses results reported concentrations b
Detection Unit (MDL); however, there were a few indications of organic s
acetone, detected in some samples. All of the volatile organic values r
were interpreted as resulting from laboratory background, since many of
are frequently used in the laboratory or are common laboratory contamina
identified contaminants were considered during risk assessment calculati

Compounds only identified in the dredge piles include one observation ea
trichlorobenzene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a
benzo(g,h,i)perylene, and two observations each of chrysene and benzo(b)
These SVOCs are sometimes associated with coal tar and are possibly air
remnants burning heavy fuel oil (#5 & #6) at the NRF boilerhouse, which
heating for the site. These compounds were detected in only a few locat
considered to be contaminants of concern or representative of the site.
the compound pentachlorophenol were made in the dredge piles, with the c
averaging 0.256 ppm. This compound is commonly used as a wood preservat
have leached from the treated wood used in the cooling towers (part of t
water system).

The majority of volatile organic compounds were reported at concentratio
of the chemical analyses. Volatile samples reporting concentrations abo
identified as resulting from laboratory or field contamination, except f
ethylbenzene, and total xylene (BTEX) values reported in one ditch sedim
compounds are commonly associated with gasoline and other refined petrol
and their presence is viewed as an isolated occurrence from a localized
further analysis of the volatile data was conducted, and no calculations
compounds were made in the risk assessment.

The majority of the semi-volatile organic compounds were reported at con
the MDLs. Some of the semi-volatile compounds were detected in the qual
samples and the trip blanks. Because these compounds were detected in t
samples, they were not included in the risk assessment. Most of the sem
compounds that were detected in the IWD sediments and dredge piles are r
constituent in coal tar, and were only found in one or two samples, and
representative of site conditions.

Pesticide, herbicide, and polychlorinated biphenyls (PCB) analyses were
samples from eight ditch sediment locations. All results were reported
except for one sample which showed lindane at 0.0006 milligrams per lite
was not included in the risk assessment because this one sample was not
representative of the site.

Total petroleum hydrocarbon (TPH) analyses were conducted on selected sa
the petroleum products found in the IWD are releases from pumps, compres
turbines during normal operations. Seven sediment samples reported TPH
3,600 ppm. TPH values in background samples ranged from <10 to 27 ppm w

16 ppm. There was not a consistent decrease in TPH concentration with d discharge point. The lack of elevated BTEX concentrations indicates the are the result of longer chain hydrocarbons (e.g., motor oil, diesel, et small quantities of these constituents. This data is for general evalua since TPH does not have a health-based standard for use in a risk assess

The inorganic sample results for the IWD indicated that the constituents barium, chromium, copper, mercury, nickel, silver, and zinc. Table 5-6 results of sampling inorganics in the IWD.

Subsurface soil samples were also collected from cross-sectional borings collected from these borings had slightly elevated metals concentrations elevated metals concentrations in subsurface soils appears to be restric two, but no more than ten feet laterally from the IWD, and primarily wit the elevation of the static water level (BSWL). Occasional elevated con observed at depths of between five and 3O feet below ground surface (BGS

Three areas of the IWD displayed peak constituent concentrations which w higher than surrounding areas. These "hot spot" areas of the IWD are lo (discharge point) in the first 500 feet, downstream between 3,000 and 3, downstream between 5,500 and 6,500 feet. This appears to be the result of accumulation of metals in the sediments plus the deposition of metal remobilized by upstream dredging activities.

Table 5-6 Contaminant Concentrations in

Constituent	95% UCL of Background (Normal)	95% UCL of Sediment (Log Normal)	95% UCL of Dredge Pile (Log Normal)	Average of 95% of UCL Sediment + Dredge Pile	Hot S Sed	Hot Spot from 3000' to 6500' Average Dre Dredge	5500' to Comb1
	Mean Distribution	Mean Distribution	Mean Distribution)				
Barium	263.61	271.07	234.44	252.76	282.1	246.33	325.77
Total Chromium	30.79	102.16	109.99	106.08	91.3	58.47	136.28
Hexavalent Chromiumý	1	1	1	1	1		
Copper	27.02	37.96	25.32	31.64	64.4	30.05	29.53
Mercury	0.11	1.84	0.39	1.12	1.2	1.38	
Nickel	36.66	26.21	29.58	27.9	28.5	30.32	27.36
Silver	0.77	1.13	1.00	1.07	1.2	1.17	
Zinc	162.68	156.46	176.06	166.26	130.4		

112.48 176.69 156.42

_____

1The combined averages for the hot spots ars ths averages of all sam equal the average sediment value + the average dredge pile value/2 shown on this t

ýThe method detection limit is used for hexavalent chromium in soil time requirement. See Section 4.5 of the Final RI/FS Report for the IWD for

3The wrong laboratory analysis number was submitted with the data gr The 95% UCL of mean sediment values is used for risk calculation purposes.

4Mercury analysis results from these samples were rejected by the da was used for risk calculations.

The dredge piles did not have areas identified as "hot spots". The tota dredge piles was estimated to be 2,972.6 cubic meters (104.976 cubic fee area of the dredge piles was calculated to be 7.583.7 m3 (81,633 ft3).

5.1.b Landfill Units

Geophysical and soil gas surveys were conducted to determine the overall waste disposal areas, and if they exist, the boundaries of specific tren Magnetometer surveys were conducted in 8-05-1, 8-05-51, and 8-06-53. So were analyzed for benzene, ethylbenzene, toluene, xylenes, and 1,1,1-tri Portable gas detection instruments were also used to monitor for methane gases, hydrogen sulfide, and total volatile organic compounds. Surface collected and analyzed for inorganic constituents. A soil gas/vapor sur was conducted over the estimated locations of the trenches as delineated magnetometer survey.

Based on process knowledge, photographs, employee interviews, visual ins existing analytical data, 8-06-35, 8-06-36, 8-06-48, 8-06-49, and 8-06-5 pose no unacceptable risk.

Surface Soil Gas Emissions Survey

A surface soil gas emissions survey recorded values at 10 foot intervals locations within zero and six inches of the ground surface. No readings the ambient air upwind concentrations, except where vapors were released vegetation.

Soil gas surveys detected volatile organic compounds (primarily ethylben which may be associated with solvents at 8-05-1, 8-05-51, and 8-06-53, a the boundaries of the landfills. Benzene was not detected in any of the and toluene was detected in four samples.

Although there were some positive detections of meta- and para-xylene at

resuts were, in general, only slightly elevated above associated blank s considerably lower than the concentrations detected at 8-05-51). This a time discharge of 50,000 gallons of waste oil. There is a large amount assoasted with the location of the disposal pit, the presence of a build suspected site location, the short duration of the disposal period, and since the occurrence of the disposal. Modeling was conducted to determi effect to ground water of a one time release of 50,000 gallons of waste hazardous constituents. The results of this modeling showed that concen representative compounds would not exceed MCLs. These results are consi conservative because eyewitness reports indicate that the contents of th days following the oil discharge (which should have significantly reduce

Soil Samples Analyzed for Inorganic Constituents

Thirty-two surface soil samples were collected from 8-06-53, and were an content. Cadmium, mercury, selenium, and silver were not detected in an samples. Arsenic, barium, chromium, and lead were detected in all sampl

samples from NRF-51 had concentrations of barium and mercury which excee background Idaho National Engineering Laboratory threshold level.

Magnetometer Surveys

Six small linear anomalies in 8-05-51 were interpreted as possible debri broad, moderate-sized anomaly zone corresponded with a visible trench ap feet deep. A section of the trench was scraped to very shallow bedrock. moderate anomaly was also associated with a shallow depression. The mag over 8-06-53 was successful in identifying possible debris-filled trench with various orientations were interpreted as representing the extent of activity at 8-06-53.

5-2 Ground Water Samples

The NRF water supply has been monitored for physical parameters (conduct radioactivity, chromium, sodium, and chloride from 1980 to the present b Geological Survey (USGS). The quality of water in all samples was withi regulatory limits; there were no out-of-specification values noted. NRF domestic water system in accordance with Title 1 Chapter 8, Idaho Regula Drinking Water Systems, from 1987 through the present. Other data has b subcontractor personnel. NRF has published the results of analysis of s the annual Naval Reactors Facility Environmental Monitoring Report. Por and 1991 reports which summarize the results of sampling for those param concern are provided as Table 5-7. Figure 5-3 shows the location of NRF and 7. Approximate locations and distances of wells downgradient from N well 97, 1.0 mile south; well 98, 2.7 miles southwest; well 99, 2.2 mile miles west; and INEL-1, 2.5 miles west southwest. Approximate locations wells upgradient from NRF are: USGS well 12, 2.5 miles north; well 15, well 17, 3 miles northeast.

Predicted Ground Water Values

GWSCREEN is a semi-analytical model used for assessment of the ground wa

from the surface to an underlying aquifer. NRF used this program to ass contaminant release from the sediments associated with the IWD and from the landfill. The limiting soil concentration is the soil concentration and transport, maximum allowable concentrations in ground water are not Maximum allowable concentrations are based on chemical toxicity, and max contaminant levels (MCLs) as listed in Title 40 Code of Federal Regulati associated amendments. The concentration in ground water is proportiona concentration (excluding solubility limited releases). Table 5-8 provid predicted ground water concentration in each Operable Unit and ground wa of each constituent of concern.

Table 5-7 Comparison of Results of Water(a)

Parameters	Units	Standard/ Guideline	Upgradient(k) (USGS Wells 12, 15, 1 1990	1991	Downgradient (k) Wells 6, (USGS 97, 98, 99, 102, INEL- 1991 only	1990	1991
Ammonia plus Organic N (as N)	mg/l	(c)	<0.3	<0.20	<0.3	<0.28	
Bromide	mg/l	(c)	<0.02	0.05<plus	0.05<plusmn>0.04	0.11<plusmn>0.11	0.11<plusmn> 0.11
Chloride	mg/l	250(b)	18<plusmn>13	16<p	41<plusmn>7.2	110<plusmn>120	43<plusmn>38
Chromium	mg/l	0.05(e)	0.006<plusmn>0.003	<0.00	0.010<plusmn>0.002	0.021<plusmn>0.014	0.008<plusmn>0.003
Fluoride	mg/l	4.0(e)	<0.2	0.2<plus	0.2<plusmn>0.1	<0.2	<0.2
Iron	mg/l	0.3(b)	<0.082	<0.11	0.33<plusmn>0.24	<0.274	0.29<plusmn>0.49
Lead	mg/l	0.05(e)	<0.001	<0.00	<0.003	<0.002	
Mercury	mg/l	0.002(e)	<0.0001	<0.0001			
Nickel	mg/l	(c)	<0.001	<0.001	<0.002	<0.002	0.011<plusmn>0.007
Nitrite (as N)	mg/l	(d)	<0.01	<0.01	<0.01	<0.01	<0.01

Nitrate plus Nitrate (as N)	mg/l	10(e,f)	1.0<plusmn>0.7	0.93<pl	
Nitrogen, Ammonia dissolved	mg/l	(g)	(j)	<0.01	
Organic Carbon Total	mg/l	(c)	<0.2	0.3<plusmn>0.01	
Orthophosphate (as P)	mg/l	(c)	<0.01	<0.01	<0.02
pH	pH Units	6.5-8.5(b)	7.9<plusmn>0.2	8.0<plusmn>0.2	
Silver	mg/l	0.5(e)	<0.001	<0.001	<0.001
Sodium	mg/l	20(d)	10<plusmn>4	9. <plusmn>4.1	
Specific Conductance	æmho/cm	(c)	425<plusmn>130	412<plusmn>	
Sulfate	mg/l	250(b)	25<plusmn>7	23<plusmn	

(a) Values preceded by < contain at least one less than minimum detecti the analysis results.
(b) Secondary maximum contaminant levels per Title 1, Chapter 8, Idaho Public Drinking Water Systems are provided for comparison.
(c) No standard or guideline available.
(d) No maximum per Title 1, Chapter 8, Idaho Regulations for Public Dri Systems. 20 mg/l is suggested as optimum.
(e) Maximum contaminant levels per Title 1, Chapter 8, Idaho Regulation Drinking Water Systems.
(f) The limit Is for Nitrate (As N) only. Since nitrite values are nea quantities represent Nitrate (As N).
(g) The following parameter values are anomalously high for USGS Well 1 sample: Chromium - 21 æg/l; Iron - 4600 æ9/l; Manganese - 100 æ9/l

æg/l; Organic Carbon, Total - 1.5 æg/l; Turbidity - 22 NTU. Thes included in the values for the upgradient wells.
(h) Anomalously high value of 1400 æg/l reported for NRF Well 4 in th This value is not included in the values for the onsite wells.
(i) Ammonia plus organic nitrogen (as N) was not performed for NRF we
(k) Not measured.
(k) Upgradient and downgradient wells are off the map provided by Fig

Table 5-8 GWSCREEN - Predicted Peak Ground Water Concentrations and Li for IWD and Landfill Unit Constituents

Contaminant IWD1 8-05-1

	Pradicted Peak Ground Water Concentration (mg/L)	Limiting Soil Concentration (mg/m3)	Predicted Peak Ground Water Concentration (mg/L)	Limi Predicted Peak Conc Ground Water Concentration (mg/m3)
Barium	43.6	NA	NA	2.8 X 107
Chromium+3	3.5	1.3 X 104	5.87 X 10-ý	NA 10-ý
Copper	5.6	NA	NA	NA NA
Mercury	0.2	1.8 X 10-4	3.57 X 10-6	2.2 X X 10-6
Nickel	4.1	NA	NA	NA
Silver	0.01	2.7 X 10-6	3.6 X 10-4	NA
Zinc	144	NA	NA NA	NA

NA The Constituent was not identified in the waste disposa

1 Limiting soil concentration was not calculated for the the RI/FS was available for risk calculations

2 Limiting soil concentration from GWSCREEN Version 1.5

3 Limiting soil concentration from GWSCREEN Version 2.02

5.3 Shallow Perched Water Table

Shallow perched water was only evaluated in the IWD RI/FS. During the s two deep monitoring wells and 15 shallow piezometer wells were drilled i IWD. Six of these wells encountered shallow perched water, and the rest

Samples were collected from the shallow perched water table and analyzed constituents listed in Appendix VIII of Title 40 Code of Federal Regulat Data on background water quality are not available for the shallow perch all volatile and semi-volatile organic analytes were reported at concent Primary and Secondary drinking water standards, or were interpreted as r laboratory background influences. Observed concentrations of metals in water zone were below Federal Primary and Secondary drinking water stand represent background levels. These data suggest that any impacts from t

6. SUMMARY OF SITE RISKS

The Remedial Investigation/Feasibility Study performed on the IWD evalua

risks for both human health and environmental effects in accordance with Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Ma Environmental Assessment Manual, and other EPA guidance. The risks asso Landfill Units were evaluated under the Track II Guidance. The Agencies Presumptive Remedy for CERCLA Municipal Landfill Sites was applicable to 8-05-1, 8-05-51, and 8-06-53 because they are suspected to contain waste found in municipal landfills. This assumption allows corrective action characterization of the landfill contents, and therefore, applies availa action, rather than additional investigation. Because the landfill cont characterized, assessment of the associated risk presents a large amount

The Presumptive Remedy relates primarily to containment of the landfill collection and/or treatment of landfill leachate. Although some of the associated with the Landfill Units (8-05-1, -51, and 8-06-53) were evalu (see the Summary Reports for operable Units 8-05 and 8-06) because the c units were not sampled, there is a large amount of uncertainty inherent these areas. An ecological risk assessment was not conducted for the La However, the protectiveness of the presumptive remedy chosen for these s potential risk to ecological receptors, and a detailed ecological risk a conducted in the Naval Reactors Facility Comprehensive Remedial Investig Feasibility Study.

6.1 Human Health Risks

Evaluation of human health risk included contaminant identification, exp toxicity assessment, and health risk characterization. The potential co identified based on existing inventory records, process knowledge, and i exposure assessments detailed the current and future exposure pathways t sites for workers and residents. The toxicity assessments documented th that may be caused in an individual as a result of exposure to a site co

The human health risk assessment evaluated current and future potential noncarcinogenic risks associated with exposure to the identrfied contami assessment used the exposure concentrations and the toxicity data to det indices for potential noncarcinogenic effects and excess cancer risk lev carcinogenic contaminants. The chronic hazard index for each constituen exposure route was quantified as the constituent intake through the expo by the corresponding constituent and route-specific reference dose (RfD) index less than or equal to 1.0 indicates with a high degree of confiden health effects will be experienced by any member of the general populati greater than 1.0 require further considerations and risk management deci

The excess cancer risk is the increase in the probability of contracting exposure to hazardous constituents. The carcinogenic risk multiplies ea by the route-specific slope factor. The National Oil and Hazardous Subs Contingency Plan (NCP) acceptable risk range is 1 in 10,000 to 1 in 1,00 lifetime cancer risk of 1 in 1O,OOO indicates that an individual has up of developing cancer over a lifetime of exposure to a site-related conta

6.1.1 Contaminants of Potential Concern

6.1.1.a Industrial Waste Ditch

The results of previous investigations and the Remedial Investigation fo Ditch indicated that the constituents of concern were barium, chromium, nickel, silver, and zinc. Table 6-1 summarizes the analyses results for results for mercury and chromium had the greatest deviation from the mea values, and elevated levels of silver, zinc, copper, and barium were als

Table 6-1 Summary of IWD Metals Analysis Results in Parts per Mi (ppm)

Constituent	IWD Sediment Mean	IWD Sediment 95% UCL	Dredge Piles Mean	Dredge Piles 95% UCL	NR Bac M
Barium	231.34	271.07	210.32	234.44	2
Total Chromium	69.76	102.16	51.33	109.99	
Copper	31.16	37.96	21.24	25.32	
Lead	9.99	11.21	10.98	11.94	
Mercury	0.74	1.841	0.20	0.39	
Nickel	21.24	26.21	27.91	29.58	
Silver	0.91	1.13	0.83	1.00	
Zinc	120.84	156.46	133.79	176.06	1

Mean The arithmetic average of the analysis results
UCL Upper Confidence Level of the mean value

6.1.1.b Landfill Units

The initial scoping of the landfill units reviewed waste generation proc disposal records from the time of the landfill operations, sampling evol during subsequent construction evaluations, and subsequent records of wa the Central Facilities Landfill. Sampling for the Track 2 evaluation fo of potential concern identified through this data collection and evaluat presented in Table 6-2. Because the volume and heterogeneity of landfil characterization extremely difficult, constituent concentrations in the assumed, although magnetometer readings were used to better define the b landfill areas. Surface contents and offgases were directly sampled.

Tetrachloroethylene and 1,1,1-trichloroethane were detected in 8-05-1 an not included in the table because they were also present in control samp was detected at 8-05-1, and m,p-xylenes and o-xylenes were detected in m samples from 8-05-1 and 8-05-51. However, because no RfDs are available they are not included in the risk assessment.

Barium and mercury exceeded the background upper tolerance limit in soil sa 05-51 and chromium exceeded the background upper tolerance limit in one sample from 8-06-53. Chromium, mercury, and siiver were identified as c concern in buried waste in all units, based on historical records of was

Table 6-2 Summary of Chemicals of Potential Concern in Landf Units

Chemical	Surface Soils (mg/kg)	Soil Gas (ug/L)	Predict Concentra
8-05-1			
Ethylbenzene	NS	0.2 - 1.0	NA
m,p-Xylenes	NS	0.3 - 5.2	NA
o-Xylene	NS	0.3 - 4.8	NA
8-05-51			
Barium	94.8 - 265	NS	NA
Mercury	0.15 - 0.65	NS	NA
m,p-Xylenes	NS	0.3 - 0.5	NA
o-Xylene	NS	0.3 - 0.5	NA
8-06-53			
1,1,1-Trichloroethane	NS	1.25	NA
Tetrachloroethylene	NS	1.39	NA
Chromium	21.1 - 72.3	NS	11.8*
Mercury	NA	NS	0.52*
Silver	NA	NS	4.6*

NA - Not Applicable
NS - Not Sampled
* - Assumed

6.1.2 Exposure Assessment

The potential populations at risk were identified for current and future Occupational exposures were determined for current and future population exposure was considered for future scenarios. The IWD evaluation includ agriculture, scenario, and the Landfill Units included a recreational sc assumptions of the frequency and duration of exposures were based on bot default values and site-specific information. The Risk Assessment Guida (RAGS) provided many of the default values for inhalation and ingestion

water consumption. Site-specific information, such as climate and geolo

to determine exposure pathways, and values. The exposure pathways evalu
and the Landfill Units were soil ingestion, dust inhalation, and ground
IWD assessment also considered dermal exposure to surface soil and surfa
ingestion of homegrown fruits and vegetables.

6.1.2.a IWD

The constituent concentrations used in the IWD risk assessment were prov

6.1.2.b Exposure Concentrations for Limiting Soil Concentrations for Lan

Because non-intrusive sampling was utilized for the Landfill Units, the
required to perform risk assessments had a high degree of uncertainty.
potential hazards associated with the area were thoroughly understood, r
concentrations for these areas were calculated (Table 6-3). The risk ba
is that level of a constituent at which it becomes a cause for concem (s
equations for determining these risk-based soil concentrations are stand
for exposure and risk assessment with modifications to calculate a conce
medium at a specific risk level or target level.

6.1.3 Toxicity Assessment

The toxicity assessment data was obtained from the Integrated Risk Infor
(IRIS), the Heath Effects Assessment Summary Tables (HEAST), and other E
Contaminants of concern were evaluated for both carcinogenic effects and
effects. The intake of each contaminant for each receptor along each ex
calculated.

The RfD is the toxicity value used to evaluate noncarcinogenic effects t
exposure to chemicals, and is based on the concept that there is a thres
reached before adverse effects occur. For carcinogenic contaminants, th
slope factor (SF) is the toxicity value used to evaluate potential human
These toxicity values have been derived based on the concept that for an
carcinogenic chemical, there is some risk of a carcinogenic response. T
risk assessment for the purpose of estimating an upper bound lifetime pr
individual developing cancer from the exposure to a specfic level of a c

6.1.4 Risk Characterization

6.1.4 a. Industrial Waste Ditch

The levels of risk associated with background levels of contaminants in
water were calculated to provide a comparison for future scenarios. The
samples were used for both dredge pile and sediment values. Ground wate
collected from the four NRF domestic water wells by the USGS from 1989 t
used to calculate concentrations in ground water.

Table 6-3 Risk Based Soil Concentrations for Landfill Units

Pathway/Unit/Constituent Occupational

RfD Slope Carcinogen Noncarcinogen

Soil Ingestion 5.7/SF RfD*2E6

8-05-1

Cr3 1.00E + 00 2.00E + 06

Cr6 5.00E-03 1.00E + 04

Hg 3.00E-04 6.00E + 02

Ag 5.00E-03 1.00E + 04

Ethylbenzene 2.90E-01 5.80E + 05

8-05-51

Ba 7.00E-02 1.40E + 05

Hg 3.00E-04 6.00E + 02

8-06-53

Cr3 1.00E + 00 2.00E + 06

05

Cr6 5.00E-03 1.00E + 04

Hg 3.00E-04 6.00E + 02

Ag 5.00E-03 1.00E + 04

1,1,1-Trichbroethane 5.20E-02 1.04E + 05

Tetrachloroethylene 1.1OE + 02 2.20E + 08

Inhalation of Fugitive Dust 1.4E-05*PEF/SF RfD*5.1*PEF

8-05-1 Particulate Emission Factor = 7.60E + 08

Cr6 4.10E + 01 2.6OE + O2

Hg 8.60E-05 3.33E + 05

8-05-51 Particulate Emission Factor = 4.75E + 08

Ba 1.00E-04 2.42E + 05

Hg 8.60E-05 2.08E + 05

8-06-53 Particulate Emission Factor = 2.11E + 08

Cr6 4.10E + 01 7.20E + 01

Hg 8.60E-05 9.25E + 04

Inhalation of Volatiles 1.4E-05*VF/SF RfD*5.1*VF

8-05-51 Volatization Factor for Ethylbenzene Occupational 3.77E + 03 Resident

Ethylbenzene 2.90E-01 6.20E + 03

8-06-53 Volatization Factor for 1,1,1-Trichloroethane Volatization Fact

Occupational 1.20E + 03 Residential 1.32E + 03 Occupational 2.90

1,1,1-Trichloroethane 3.00E-01 1.84E + 03

Tetrachloroethylene 2.00E-03 2.03E-03

A Baseline Risk Assessment was performed to determine if any unacceptabl were associated with the Industrial Waste Ditch. Risk is characterized four scenarios (current and future occupational, future residential, and receptors), and Table 6-4 summarizes the results of the IWD Baseline Ris (BRA). The risk assessment calculated risk for exposure to receptors fr whole, using 95% upper confidence level of the mean soil concentration, of the IWD which may have elevated metals concentrations in comparison t values ("hot spots") to ensure these calculations were truly protective three hot spot areas are identified as outfall to 500', 3000' to 3300', many cases, the risks are probably overestimated due to the conservative assumptions. An example is assuming that residents are exposed to airbo 350 days a year.

The risk of cancer in all scenarios, including background, exceeded the 10-6 due to the consideration of inhalation of hexavalent chromium in gr of the lack of sampling data for hexavalent chromium in ground water, th hexavalent chromium was considered equal to the total chromium value.

In conclusion, although there may be some health risk associated with th the risk is not significant when compared to the background risk, and co conservative nature of the estimate.

Table 6-4 Summary of Baseline Risk Assessment for the IWD

	Current Occupational Hazard	Risk	Future Occupational Hazard	Risk	Future Hazard
Background	0.0557	165E-06	NA	NA	0.74
95% UCL	0.057	165E-06	0.0696	1.66E-06	1.37
Outfall to 500'	NA	NA	NA	NA	1.32
3000' to 3300'	NA	NA	NA	NA	1.99
5500' to 6500'	NA	NA	NA	NA	1.94

6.1.4.b Landfill Units

The evaluations performed in the Track 2 investigations of the Landfill there may be an unacceptable risk to future receptors from Landfill Unit O6-53 based on the results of soil gas surveys, surface soil samples, an Landfill sites 8-06-35 8-06-36, 8-06-48, 8-06-49, and 8-06-50 were evalu data and historical information, and it was determined that these areas material and equipment staging areas, and there was no unacceptable risk

6.1.5 Uncertainties and Limitations

Uncertainties are associated with all estimates of cancer and noncancer These uncertainties result from incomplete knowledge of many physical an processes, such as carcinogenesis. Where specific information is not av necessary to make assumptions and/or use predictive models to compensate information. The assumptions, models, and calculations are chosen so th

and hazard estimates are protective of human health. However, these ass result in a conservative estimate of risk.

6.1.5.a Industrial Waste Ditch

Residential scenarios assumed that receptors consume homegrown products day for 30 years and methylmercury would be present in future scenarios. because it does not account for the consumption of commercially prepared difficulty in converting inorganic mercury to methylmercury. The risk a assumes that the receptor inhales hexavalent chromium during showering, unlikely, and the toxicity data for the inhalation of hexavalent chromiu particulates from industrial processes, rather than a residential exposu

6.1.5.b Landfill Units

The uncertainty associated with the identification of organic chemicals this site is considered high. However, since it was assumed that the pr landfills (EPA, 1993) was going to be used at this site and this would r restrict access, and preventing contact with landfill contents, the sour additional chemicals of concern was not investigated. Assumptions inclu reduction in waste volume during incineration, and that metals contamina distributed throughout the landfill mass. Other uncertainties associate 59 were the location of the disposal pit, the presence of a building ove suspected site location, the short duration of the disposal period, and since the occurrence of the disposal.

6.2 Environmental Risk Assessment

6.2.1 Exposure Assessment

6.2.1.a IWD Qualitative Ecological Risk Assessment

The ecological risk assessment qualitatively evaluated the potential eco associated with the presence of the Industrial Waste Ditch. This invest in accordance with the EPA Risk Assessment Guidance for Superfund Volume ecological risk assessment identified sensitive nonhuman species, and ev same exposure pathways and contaminants as the human health assessment.

There is no evidence of sensitive plants in the IWD vicinity. The close sensitive plants to the IWD involves a tree-like Oxytheca (Oxytheca dend population of interest is located approximately six miles south of the I INEL Central Facilities Area (CFA). From the perspective of the ecologi endpoint, the risk posed to sensitive plants by the IWD appears to be ne

The only metals in the soil significantly above background are chromium sensitive species, such as raptors, to receive significant exposure, met from the soil to plants, the plants ingested by the small mammals, then consumed by the raptors. The uptake level of chromium and mercury is 15 percent, respectively. When the plant is eaten by the small mammal, it between 5 - 20 percent of the metals content from the plant to the anima between metal concentrations in plants and algae at the IWD with those o the control site at Mud Lake indicate that the IWD does not represent a risk through this segment of the food web than background areas.

The IWD poses no significant risk to sensitive plants at the INEL, since of these plants to the ditch is known. The risk posed to sensitive anim small, but is less well defined, since the animals are mobile. Comparis concentrations in IWD plants and in plants from a control area indicate responsible for a significantly greater risk through this segment of the web segments, as well as other exposure pathways, have not been quantifi available data.

6.2.1.b Lanfill Units

An ecological risk assessment was not performed as part of this evaluati risk will be assessed in the Naval Reactors Facility Comprehensive Remed and Feasibility Study.

7.0 DESCRIPTION OF NO ACTION DECISIONS

On the basis of the results of the human health and ecological risk asse for the RI/FS, it was concluded that there are no unacceptable risks ass Therefore, the DOE has determined that no remedial action is necessary f

In addition, the DOE has determined that no further action is needed for 35, -36, -48, -49, and -50. On the basis of the Track 2 evaluations, it significant sources of contamination exist at these sites. Consequently these sites pose no unacceptable risks to receptors, and therefore, no r necessary.

The EPA approves of these no action decisions, and the IDHW concurs. Bo the IDHW have been involved in the development and review of the RI/FS a reports, the Proposed Plan, this ROD, and other project activities such

The remainder of this ROD discusses landfill units 8-05-1, -51, and 8-06 may pose unacceptable risks to receptors, and thus require remedial acti

8.0 DESCRIPTION OF ALTERNATIVES

8.1 Remedial Action Objectives

The purpose of remedial action objectives (RAOs) is to set measureable g of human health and the environment. RAOs were not developed for the IW unacceptable risks to human health or the environment were found. RAOs

for the three Landfill Units (OUs 8-05-1, 8-05-51, and 8-06-53) at which taken.

The primary remedial action objective is to contain the landfill content associated with potential contact of the contents with ground water. Th were not sampled or characterized. Consequently, it was difficult to ac risk to future receptors. Development of the RAOs was guided by, and co Presumptive Remedy for CERCLA Municipal Landfill Sites. The Presumptive that containment be accomplished by installing a cover to reduce permeab land use restrictions to preserve the cover.

8.2 Summary of Alternatives for Landfill Units

The presumptive remedy for landfills (EPA, 1993) which requires monitori access, and prevention of contact with landfill contents will be used to receptors. General Response Actionss (GRAs) have been assembled into a action alternatives designed to represent a range of options. The remed developed include:

Alternative 1: No Action

Alternative 2: Containment with Native Soil Cover

Alternative 3: Containment with Single Barrier Cover

The following descriptions of the remedial action alternatives explain t
assembly of GRAs into specific alternatives.

8.3 Alternative 1: No Action

Alternative 1 is required for consideration by NCP 300.430 (e)(6) as a b
Under this alternative, the landfill contents, would be left in place.
would be performed for the no action alternative under the Federal Facil
Consent Order (FFA/CO).

8.4 Alternative 2: Containment with Native Soil Cover

This alternative involves the containment of landfill contents by coveri
cover. There are four components of this alternative: obtaining a deed
each landfill area; monitoring; and performing operations and maintenanc
cover. (1) A deed restriction would be obtained for each area, includi
beyond each landfill boundary to protect the integrity of the cover. Th
and use of the property. The area would be surveyed and signs would be
of the presence of the landfill and potentially contaminated soils. (2)
be capped using conventional construction equipment to ensure a native s
thick covers the entire landfill area to prevent contact with the conten
potential for infiltration. The 24 inch thick cover is the minimum land
soil cover would be graded, and natural vegetation planted to stabilize
promote evapotranspiration, and decrease erosion of the soil cover. (3)
would be performed to assess the effectiveness of the cover, and ground

would be performed to assess these areas and other areas at NRF. (4) P
and maintenance would be performed to ensure the integrity ot the landfi

8.5 Alternative 3: Containment with Single Barrier Cover

Alternative 3 includes the same components as Alternative 2 except that
consist of a single-barrier cover composed of a 12 inch layer of compact
inch clay layer, and at least a 24 inch protective layer of vegetation a
Conventional construction equipment would be used to cap the landfill.
would be planted to stabilize the soil surface, promote evapotranspirati
erosion of the soil cover.

9.0 SUMMARY OF COMPARATATIVE ANALYSIS OF ALTERNATIVES

Each remedial alternative must be compared according to nine evaluation
as a basis for conducting the analysis of alternatives, and for subseque
appropriate remedial action. The evaluation criteria are divided into t
threshold criteria that relate directly to statutory findings and must b
alternative; (2) primary balancing criteria that include long and short
implementability, reduction of toxicity, mobility, and volume, and cost;
criteria that measure the acceptability of the alternatives to State age
community. The following sections summarize the evaluation of each reme
according to these criteria.

9.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold cr protection of human health and the environmental, and compliance with AR criteria must be met by the remedial alternatives to be considered as po

9.1.1 Overall Protection of Human Health

The remedial alternatives for the Landfill Units were assessed to determ protect human health and the environment. Protection is determined by a the risks associated with each exposure pathway are eliminated, reduced, through treatment, engineering controls, or institutional controls.

Alternative 1, the No Action Alternative, would not satisfy the criterio human health and the environment. Alternative 2, Containment with Nativ Alternative 3, Containment with Single Barrier Cover, satisfy the criter both alternatives protect human health by potentially reducing the level migration to the ground water and the release of contaminants to the atm amount of reduction under Alternatives 2 and 3 is unclear because the po contaminants may be affected by factors other than moisture infiltration landfill.

9.1.2 Compliance with ARARs

The selected remedial action must comply with identified substantive app under Federal and State laws. Remedial actions must also comply with la that are not directly applicable, but do pertain to situations sufficien encountered at the site, so that use of the requirements is well suited Determining compliance with ARARs requires evaluation of the remedial al compliance with chemical, location, and action-specific ARARs.

The ARARs for Alternatives 2 and 3 are identified in Tables 11-1 and 11- meet the identified ARARs through engineering controls and operating pro Action alternative for the landfills is for comparative purposes only, a ARARs.

9.2 Balancing Criteria

Each alternative that satisfies the threshold criteria is evaluated agai criteria. The balancing criteria include: (1) long-term effectiveness reduction of toxicity, mobility, or volume through treatment; (3) short- implementability; and (5) cost.

9.2.1 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of the alternatives protection of human health and the environment.

Alternatives 2 and 3 prevent direct contact with contaminated soils, and migration of contaminants from soils and landfill contents to the ground alternatives do not, however, provide permanent treatment. The covers p alternatives would be equally effective in the long-term with proper mai

and land use restrictions. The No Action Alternative provides the lowest effectiveness and permanence because it does not provide recovery or mea the migration of contaminants to the ground water.

9.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial treatment technologies that permanently reduce toxicity, mobility, or vo substances.

Alternatives 2 and 3 reduce the mobility of contaminants by restricting water through the landfills. The alternatives do not, however, reduce e volume of contaminated soils, or treat any of the contaminants. The No provides no reduction in toxicity, mobility, or volume of the contaminan

9.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the effects of each alternative durin implementation phase until remedial action objectives are met. The alte

with respect to their effects on human health and the environment during the alternative.

Both Alternative 2 and Alternative 3 will require a significant level of install a cover over the landfill units. Alternative 2 would require le Alternative 3 and therefore, provides greater short-term effectiveness. Alternative ranks the highest under this criterion because it requires n activities, and does not result in additional hazards to human health or

9.2.4 Implementability

The following three factors must be evaluated under the implementability technical feasibility; (2) administrative feasibility; and (3) the avail materials.

Alternatives 2 and 3 are both highly implementable because they use esta and materials. Alternative 2 is considered more implementable because t construction activity and soils may be available locally.

9.2.5 Cost

Evaluation of project costs requires an estimation of the net present va and operation and maintenance costs. The costs presented are estimates. could vary based on the final design and detailed cost itemization. Tab cost estimates for each Altemative.

Table 9-1 Cost Estimate for Alternatives for Landfill Units

Alternative	Sample Collection and O & M ($)	Deed Restrictions1 $	Monitoring Well Installation1 ($)	Exc Ca

Alternative 1	NA	NA	NA	
Alternative 2	21,400 2	12,000	800,000	379,000 3
Alternative 3	21,400 ý	12,000	800,000	6,3 379,000 3

NA Not Applicable

1 These are one time only costs to conduct the work in 1994 and have to be amortized.

ý These costs are costs associated for 1994 only, time value of are used to determine 30 year cost.

3 This is the life cycle cost for 30 years of operation and 5% d

4 The total cost is an upper-limit cost estimate. The actual co be less than these values, and will be determined during the R Design/Remedial Action (RD/RA) phase.

9.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alte modifying criteria are state and community acceptance. For both of thes that are considered include the elements of the alternatives that are su of the alternatives that are not supported, and the elements of the alte strong opposition.

9.3.1 State Acceptance

The IDHW concurs wffh the selected remedial alternative for the Landfill Section 10.0. The IDHW has been involved in the development and review report, the Proposed Plan, this ROD, and other project activities such a Comments received from IDHW were incorporated into these documents, whic issued with IDHW concurrence.

9.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed presented in the Proposed Plan. Specific comments are addressed in the Summary (Appendix A) of this document.

10.0 SELECTED REMEDY

The results of the investigations of OU 8-05-1, 8-05-51, and 8-06-53 sho not fully characterized, and that some future unacceptable risk may exis of potential contaminants from the landfills to the Snake River Plain Aq intruction into the landfill contents. The selected remedy for these Op the installation of a native soil cover designed to incorporate erosion reduce the effects from rain and wind. The selected remedy provides for

landfill covers, including subsidence correction and erosion control. M landfills will include sampling of soil gas to assess the effectiveness sampling the ground water to evaluate these areas and other areas at NRF concentrations. The Agencies will continue to review this action within every five years thereafter. Institutional controls (access/land use re public access, posting signs, and erecting and maintaining barriers) wil prevent direct exposure to the landfill contents. Short-term risks will minimized during implementation of the selected remedy.

The selected remedy provides a barrier against direct contact, restricti land use, and early detection of potential contaminant migration.

The remediation goals for the landfill areas were developed in accordanc CERCLA Landfill Guidance (EPA 1991). These goals include preventing dir landfill contents, and meeting all ARARs.

11. STATUTORY DETERMINATION

Remedy selection is based on CERCLA, as amended by SARA, and the regulat contained in the NCP. All remedies must meet the threshold criteria est protection of human health and the environment, and compliance with ARAR requires that the remedy use permanent solutions and alternative treatme the maximum extent practicable, and that the implemented action must be Finally, the statute includes a preference for remedies that employ trea and significantly reduce the volume, toxicity, or mobility of hazardous principal element. The following sections discuss how the selected reme statutory requirements.

11.1 Protection of Human Health and the Environment

As described in Section 10, the selected remedy satisfies the criterion human health and the environment by minimizing the risk of potential con to ground water and by preventing direct contact with the landfill waste remedy will ensure that cumulative risks are maintained within the NCP r

11.2 Compliance with ARARs

The selected remedy of containment with a native soil cover with vegetat to meet all ARARs of Federal and State regulations. The ARARs that will selected alternative are described in Sections 10.2.1 and 10.2.2.

11.2.1 Chemical-Specific

No chemical-specific ARARs are identified for the selected remedy.

The future concentrations of inorganic contaminants in the groundwater a below the risk-based concentrations as determined by the GWSCREEN modeli However, due to the uncertainty regarding the source term (regarding bot inorganic constituents), long-term monitoring of the ground water and la provide early indications if migration of contaminants occurs. The soil not exceed any known soil contamination standards.

11.2.2 Action-Specific

The selected remedy triggers the applicable or relevant and appropriate requirements listed in Table 11-1. Although 40 CFR 258 is also appropri Units, the more rigorous requirements for Hazardous Waste Management Uni in this instance due to the uncertainty in the types of wastes disposed.

11.2.3 Location-Specific

The selected remedy will trigger ARARs under the Archeological Resources Archeological and Historic Preservation Act, and Preservation of America These acts are applicable to the remedy since the cultural resources mus

additional native soil from another site is needed for the installation Table 11-3 provides a description of the pertinent ARARs.

Table 11-1 Federal and State Action-Specific ARARS tor Landfill

Regulation	Title
40 CFR 264.310 (RCRA Subtitle C)	Closure and Post-Closure Care
IDAPA 16.01.05.008	Closure and Post-Closure Care
IDAPA 16.01.01.650 - 01651	Rules for Control of Fugitive Dust and General Rules

Table 11-2 Federal and State Location-Specific ARARS for Landf Units

Regulation	Title	Categ
36 CFR 8OO	Protection of Historic and Cultural Properties	Applic
43 CFR 7	Protection of Archeological Resources	Applic

11.2.4 To-be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to conside procedures or guidance documents that are not legally binding. The foll documents are to be considered as guidance documents:

- OSWER 9234.2-04FS, October 1989, "RCRA ARARs: Focus on Closure Requirements";

- OSWER 9476.00-1, September 1982, "Evaluating Cover Systems for S Hazardous Waste" (Revised).

These OSWER directives provide additional guidance on the design specifi constructing and maintaining a cover system.

11.3 Cost Effectiveness

The selected remedial action is cost effective because it is protective environment, achieves ARARS, and its effectiveness in meeting the remedi proportional to its costs.

11.4 Use of Permanent Solutions and Alternative Treatment Technologies t Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent sol treatment technologies can be utilized in a cost-effective manner. In a EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites, the select provides protection by minimizing the risk of contaminant migration to t access to the landfill contents. Presumptive remedies, such as the cont selected for the landfill units, are based on historical patterns of rem scientific and engineering evaluation of performance data on technology similar sites.

Implementation of the selected cover remedy will reduce the mobility of substances, pollutants, and contaminants from the landfill units to the cover remedy does not employ alternative treatment or resource recovery use of alternative treatment technologies was determined to be impractic availability and applicability of a presumptive remedy.

11.5 Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a princip met. Extraction and treatment of the landfill contents is not considere means of reducing the risks to human health and the environment. The id be reduced to acceptable levels by implementing the presumptive remedy. which includes containment, monitoring, and land use controls, is based patterns of effective risk reduction.

12. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes have been made from the recommendations presented Proposed Plan.

APPENDIX A: RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Overview

A Remedial Investigation of the Naval Reactors Facility Industrial Waste 8-07) was performed due to known discharges of waste water containing or inorganic constituents. Track 2 investigations were performed on nine s landfill areas (operable Units 8-05 and 8-06) based on past disposal pra similar to those found in municipal landfills. The Proposed Plan was re on April 9, 1994, with a comment period from April 12 to May 12, 1994. summarized remedial action alternatives for the two different types of i the first to include Track 2 investigations for public comment. The age each Track 2 site would need to be presented in a Proposed Plan in order decisions on Track 2 sites. Agency representatives proposed no action f Waste Ditch and, based upon cleanup remedies used at similar sites, reco containment of three historical landfill areas.

This Responsiveness Summary recaps and responds to the comments received comment period. In general, comments supported the selected alternative commentors offered suggestions on cleanup methods for the Track 2 invest considered during the remedial design phase. A few comments opposed imp the preferred remedial alternatives, but supported an action of some typ were submitted in writing during the comment period and verbal comments during public meetings held the week of April 18, 1994.

Community Involvement Highlights

Informative Publications

The March issue of the INEL Reporter contained an events calendar highli involvement activities scheduled for the Naval Reactors Facility.

The INEL Citizens Guide to Environmental Restoration at the INEL contain projects at the Naval Reactors Facility and was distributed on April 9,

An informative update on the investigations completed at the Naval React provided through an update fact sheet on both the Industrial Waste Ditch The fact sheets were distributed to approximately 7,500 citizens via the Relations Plan mailing list on March 17, 1994, and conveyed general info public involvement opportunities.

In March 1994, the INEL News, a newspaper distributed to all employees, concerning the Naval Reactors Facility Proposed Plan and associated publ

Notice of Availability

The first public informational meetings ever held concerning environment investigations performed at the Naval Reactors Facility were announced i Availability display ad. Display ads were published in eight major Idah March 15 and March 23, 1994: the Post Register in Idaho Falls, Idaho St

Pocatello, South Idaho Press in Burley, Times News in Twin Falls, Idaho Idaho Press Tribune in Nampa, Lewiston Morning Tribune in Lewiston, and Moscow. Personal telephone calls were made to key individual stakeholde

groups, and community organizations from INEL regional offices in Pocate Boise, and Moscow.

Press Release

During the week of March 27, 1994, a press release regarding the Naval R public meetings and general information on the investigations was releas 4O media centers for dissemination to the public. Also during this time press release was sent to INEL employees.

Information Sessions/Briefings

Prior to holding the public meetings, information sessions were held at Pocatello on April 12, 1994, from 10 a.m. to 9 p.m., and the INEL region on Aprli 14, 1994, from 10 a.m. to 7 p.m. Representatives from the Depa Environmental Protection Agency Region 10, and Idaho Department of Healt attended these events to discuss the project and answer questions. On A agency representatives conducted a technical briefing via a teleconferen of the League of Woman Voters in Moscow and the Environmental Defense In

The Community Relations Plan coordinator and INEL Twin Falls regional of participated in two radio talk shows; talk shows were broadcast from Bur from Jerome on April 14, 1994. Topics covered during the radio shows in on the public meetings, how the public could obtain information on the p the local INEL regional office, and other upcoming public involvement op

Newspaper and radio advertisements regarding the information sessions at Twin Falls were run during the week of April 1O, 1994. Advertisements w local newspapers and radio advertisements were broadcast by six local st Pocatello, Burley and Twin Falls for three days - five times a day at ea

Public Meetings

Public meetings on the Naval Reactors Facility Industrial Waste Ditch an areas were held in Idaho Falls on April 18, Boise on April 20, and in Mo 1994. A total of 83 people attended the public meetings. Display sessi locations from 10 a.m. to 9 p.m., and informal discussion periods preced meeting. Representatives from the Department of Energy, Environmental P Region 1O, and Idaho Department of Health and Welfare attended the meeti the project and answer questions. Project managers were also available or provide detailed information during the informal discussion periods a public meetings. Each public meeting was recorded by a court reporter.

Newspaper advertisements regarding the public meetings were placed in on newspaper in Boise, Moscow, and Idaho Falls the week of Aprii 18, 1994. advertisements were also run by nine local radio stations in Boise, Mosc during the week of April 18, 1994 for three days - five times a day at e

Public Comment Period

The public comment period on the Proposed Plan for the Naval Reactors Fa from April 12 to May 12, 1994. No requests to extend the public comment

received. A total of nine written comments and six verbal comments were the comment period for both projects presented in the Naval Reactors Fac No oral comments were received during the information sessions in Pocate

This Responsiveness Summary has been prepared as part of the Record of D comments, as given at the public meetings, and all written comments, as repeated verbatim. If appropriate, individual comments have been furthe categorized in order for DOE to address specific issues raised by each c matrix is provided that associates the numbered comment in the Responsiv to the commentor. The Department of Energy has provided a response to e and or issue raised by the commentors. If the comment impacted the agen outlined in the Record of Decision, this fact is highlighted and impacts

The Naval Reactors Facility Record of Decision presents the No Action al Industrial Waste Ditch, the presumptive remedy of containment for three No Action for six landfill areas. The decisions meet and satisfy the in Comprehensive Environmental Response, Compensation, and Liability Act, a the Superfund Amendments and Reauthorization Act. The decision for thes based on information contained in the Administrative Record.

Copies of the proposed plan and the entire Administrative Record are ava in six regional INEL information repositories: the INEL Technical Libra University of Idaho Library in Moscow; Shoshone-Bannock Library in Fort regional offices located in Pocatello, Twin Falls, and Boise.

Summary of Comments Receivea During Public Comment Period

Comments on both the Naval Reactors Facility Industrial Waste Ditch and submitted during the entire comment period are addressed and categorized sections below. Responses address issues pertinent to the IWD and Landf Alpha/numerical characters contained in brackets after the comment relat the commentor in the matrix provided in Appendix B.

Naval Reactors Facility Industrial Waste Ditch

General Comments on Proposed Alternatives

General Background Information on the Naval Reactors Facility

1. Comment: The way these systems operate is that when you put water i most of it seeps in the ground. A little bit evaporates, percent or less evaporated. Most of it infiltrates into t down through the sand, gravel, silt, and clay down to the basalt.

   And while basalt in itself is highly permeable, some of th permeable rocks any where in the country, the top of the b spreads the water out, contrary to your drawing which was But it spreads the water out, and the perched water is abo not in the top of the basalt.

It spreads it out, which is a really good system because t as the water moves through, removes a lot of the contamina then spreads out and seeps down in much smaller quantities can be perched on other sediment beds within the basait be each one of these helps remove contaminants. And so the s a lot of natural cleanup just during the operation of it.

And the fact that the aquifer is like 365 feet below there with a lot of these processes to attenuate the waste. And monitoring we have done over the past 30 years in the Snak Plain Aquifer below Naval Reactors Facility has only shown sodium and chloride principally and a little bit of nitrat doesn't show any of the heavy metals. And so the system h operated over the years, you already have the conclusion t not many contaminants going down. (T-I3)

And I carried a deal in the legislature this year that to the first in Idaho that introduces the fact that risk is a looking at any contaminants. We'll never be able to affor all the waste to what Lewis and Clark would have found had

a well there. But we need to spend our money wisely and a in what is the risk to humans with these contaminants. (T

And so I strongly support the No Action alternative with And then when NRF is ever closed, I would use some native and fill it in. (T-I9)

Response: The agencies appreciate the time and effort that the comme evaluate the material, attend the presentations, and provi on the information. Visual aids used in future presentati reviewed in detail to ensure that they are more representa conditions.

Risk Assessment

2. Comment: While the hazard index ratings of 1.2 and 1.3 are indicati fruits and vegetables, etc., are grown in the area and per consumed these materials. The probability of this means o extremely small due to the arid climatic conditions which area unsuitable for farming and due to the fact that acces Previous irrigation attempts under the Powell project in 1 showed insufficient water reserves for surface irrigation land that is involved.

I am concerned however that the tack taken by the Environm Protection Agency is overly conservative and costly in tha considered the associated risks based on methyl mercury (a form of mercuric compound frequently found in grain treatm fungicide and rodenticide). While this is a hazardous mat the form of mercury that is involved in the NRF ditch. Th areas in the western United States where mining activities

contaminated soils with non-organic forms of mercury. Ele mercury or nitrated forms such as found in the ditch shoul risks applied which are applicable to their type as oppose non-related methyl mercury. When one looks at the broad o the many mining sites, which may require cleanup, the util incorrect compounds in the figuring of associated risk fac translate into excessive costs. When this is multiplied b locations it demonstrates a callous lack of prudence and f responsibility towards the taxpayers. (W-I25)

Response: The species of mercury was not identified in the laborator The methylmercury form was used for risk assessment purpos two reasons; microorganisms in an aquatic environment can inorganic mercury to methylmercury, and the risk assessmen is conservative by nature. The uncertainties of the calcu presented in Section 6.5 of the Remedial Investigation rep used by risk managers to reach the no further action decis EPA guidance provides a process for obtaining toxicologica

on substances. such as inorganic mercury, when information available in the published sources. If the risk calculati an unacceptable risk, then the uncertainty and conservatis been reduced with more specific information. However, una risks were not shown using the conservative assumptions. further refinement of the species of mercury present was n

3. Comment: Assessment and planning seem exceptionally thorough and we Too much reliance on computer modeling, unless assumptions technical basis are periodically reevaluated based on actu inspection, can be very misleading and result in gross err (W-B6)

Response: The commentor is correct that modeling alone should not be Modeling is used to standardize assessments and predict fu impacts from potential releases. The selected remedy incl monitoring and periodic evaluations (every five years) of actions to ensure early detection of any potential migrati contaminants and periodically assess modeling results.

No Action Recommendation

4. Comment: As far as the ditch project goes, I would much rather see evaporation pond being used for on-site discharges, becaus have...I would not like to see continued washing leachate those contaminants that are already in that ditch and the introducing more contaminants into the ditch. (T-M1)

Response: Field investigations indicate that there is little leachin time, and the Baseline Risk Assessment determined that the unacceptable risks. The agencies have determined that the potential for migration does not warrant the need for addi Additionally, the shut down of two of the three prototype

significantly reduced the volume of water discharged to th Waste Ditch because most of the discharge was cooling wate prototype plants. The planned shut down of the remaining plant will further reduce the discharge.

5. Comment: I'd like to come back to the industrial waste ditch and th recommendation. I'm still struggling with the implied...o that it's okay to have continued six million gallons per y which presumably would consist largely of site runoff and continuing to go through this area. To me, I guess, I'd h little bit more about the costs involved if possibly reloc site runoff could go versus leaving it here. If it costs dollars to relocate it, why not relocate it versus--you kn million dollars to relocate it so it no longer runs throug ditch, why, that's a different story. So I guess it's a q

geography is and what it would cost to convince the runoff somewhere else. (T-M7)

Response: The NRF site drainage flows naturally to the northwest cor the outfall of the Industrial Waste Ditch. In order to re a new run off collection system would be required which wo excavation and installation of at least 2,000 feet of pipi stations. Creation of a new discharge point would cost in million. Because the Remedial Investigation showed that c levels are only slightly above background levels, and the assessment determined that there is no significant health environmental risk present, these additional costs would n

6. Comment: Four comments (three written and one verbal) agreed with t Action Alternative for the NRF Industrial Waste Ditch. (W I11, T-I12)

Response: The Agencies appreciate the time and effort that the comme to evaluate the material, attend the presentations, and pr comments on the information.

Naval Reactors Facility Landfill Units

General Comments to Proposed Alternatives

7. Comment: Several years ago DOE-ID created a large gravel pit about of NRF along the road way to Test Area North. It is locat the Big Lost River bridge on the west side of the road as north. Gravel mining stopped as the lacustrine clay layer Ancient Lake Terreton were encountered. The utilization o for the cover of the landfills serves several purposes:

1. It avoids natural surface disturbance of additional ar site, hence larger amounts of forage and native grasse remain for wild life. Environmental impact for this a already been determined and money could be saved by re

this same area.

2. It provides a short haul path for materials to NRF the tax dollars. I would estimate that it could be accomp within the $2 million budget estimate of option #2.

3. It provides a clay and silt content greater than nativ tend to be largely alluvial gravels and loess type mat would improve the impervious nature of the cap.

4. The final closure of the pit could be done with a port clay materials and thereby sealing the bottom of the p would transform a dry pit into a water storage reservo to the Big Lost River.

During high-water years when there is flow in the Big Lost gravel pit basin could be filled and provide a 20 to 25-fo While the INEL area near NRF area has about an 8 to 9-inch rainfall, the evaporation rate is about 3 to 4 times that in a net evaporation loss of about 2 feet per year. A pon could provide a wetland environment for migrating waterfow watering hole for wildlife. With the depth created, it co carry-over for several years. Some funding offset may be under wetland improvement programs or Idaho state wildlife improvement programs.

With the downsizing of NRF and the reduced flows of sewage lagoons, and reduced industrial waste ditch flows, the ava ditch for wildlife watering will diminish. Remediation of a pond could provide the needed transitional establishment water source.

Currently, the state of Idaho is paying deprivation money to the north as antelope and other wildlife seek forage an farmers irrigated acreages. This is largely caused by DOE of the Big Lost River to diversion areas near the Big Sout Upstream irrigation uses of the water have also contribute of this traditional water source for wildlife. Nowadays w flows to the traditional "sink" areas of the playas where migrated for centuries.

By using this pit I feel that the following can be accompl

a. Costs could be controlled
b. An improved product could be delivered
c. Another dry hole in the desert will not be formed
d. It provides the DOE the opportunity to finally do some positive for the environment. (W-I13)

Response: The gravel pit described in the comment will be considered of material during the engineering evaluation and design o covers. The landfill covers will consist of native soil,

factor is the permeability of the cover material. The pri of the cover are to prevent direct contact with the landfi reduce infiltration, which can be effectively done with na which meets the design criteria at a minimum cost can be f to the landfill areas than the referenced gravel pit, it w landfill cover. Other cost factors indude excavation, tra contouring, compaction, and revegetation. Although the cr pond may improve the wildlife habitat in the area, it is u outside the scope of this remedial action. The commentors

suggestion will be shared with the INEL organizations resp evaluating wildlife habitat.

8. Comment: As far as the characterization, that is, the self-characte constituents in the landfills, I'm real dubious of that pa the context of what's going on right now when the Navy has nearly two years to release its worker exposure and dosime to the National Centers for Disease Control that's conduct dossier construction study of workers on the INEL site and effective off-site populations. You know, when the Navy i stunts like that and refusing to release those records for studies, I'm a little bit concerned when there's not an in assessment of some of those records of material that may h into those landfill sites. That's it. (T-M14)

Response: The Agencies acknowledge that the contents of the landfill not fully characterized. Available historical information estimate the landfill contents. However, because of the u involved, the agencies support the selected remedy, which monitoring. The full characterization of a heterogenous s that found in municipal landfills is a costly and difficul stated in the Investigation Reports, Feasibility Study, an Decision, the Agencies believe that Government funds are b on remedial actions rather than further characterization. remedy is designed to control and monitor any releases fro

9. Comment: Regarding the Naval Reactors Facility Industrial Waste Dit areas, I have read the three remedial alternatives and I r none of the alternatives be used. Too much risk in assumi the alternatives could be successful.

Use the same logic as used in the disposal of underground gasoline tanks (this portion of statement was unreadable d damage to the response form in the mail)...By EPA and All. There will be no deviation, no changes, regardless. The s decisions should be used on landfill units.

The Federal Govemment caused the problem, they should repl land like it was originally. (W-I18)

Response: The methodology used for the assessment of the NRF Landfil the Presumptive Remedy for CERCLA Municipal Landfill Sites

method of capping and monitoring landfill sites has been d across the country in a variety of settings to be protecti environment. The Agencies' expectation was that containme technologies generally would be appropriate for municipal because the volume and heterogeneity of the waste generall treatment impracticable. On the other hand, petroleum pro generally liquid, and leave a homogeneous waste pattern in

The investigation tecnniques, the remediation technologies risks associated with these two types of remediation sites significantly different, and are not readily comparable.

10. Comment: But my thoughts about the landfills kept coming back that much worse sites in the U.S. that need to be cleaned up an now a threat to drinking water supplies of a larger popula problem of potential contamination after 30 years of being appear to be an emergency whereas $2 million - the propose expenditure - could be used better elsewhere. (W-M19)

Response: The Agencies agree that the funding for aggressive remedia be used for high priority sites. We have evaluated the po associated with these sites in comparison to other remedia on the INEL. Since these areas are not fully characterize uncertainties regarding the site risk. To reduce these un would cost nearly as much as the selected alternative. Th Agencies believe that this level of funding is appropriate Capping the landfills and monitoring is a reasonable actio compensate for the uncertainties, and yet be protective of and the environment.

11. Comment: Agree with INEL preferred alternatives. Suggest that land treated even more conservatively, if possible, i.e., highe and frequent monitoring to assure contamination has not sp waste contains high levels of lead and other hazardous com other industrial chemicals could have included VOCs which more rapidly than anticipated. (W-B20)

Response: The primary purposes of a soil cover are twofold: (1) pre contact by personnel with the landfill contents, and (2) r infiltration. Based on the low precipitation and infiltra the installation of a clay cover would not provide enough benefit to warrant the additional expense. Monitoring wil to provide early detection of any potential contaminant mi

12. Comment: On the landfills, I did mention the bio-barrier, and the v at all is something that has a geomembrane and then about material on it so that the -- and the gravel sold cover fo animals so that the water can infiltrate the cap, be held evaporation removes all the water, and you actually can-- how caliche is formed. So you actually make the soil cove permeable with time by natural processes. (T-I21)

Response: The excact design of the soil cap will be determined by an evaluation during the remedial design stage. This comment considered when the final design specifications are determ

Risk Assessment

13. Comment: I didn't see any results of a baseline risk assessment for and 3 considered for landfill areas. Was there any perfor

Response: Due to the incomplete characterization of these sites, a q baseline risk assessment was not possible. The Agencies a presumptive remedy process to these areas to reduce the ov of the project and still implement the appropriate remedia baseline risk assessment was performed. The qualitative r calculations are provided in the Summary Assessment report show there is no significant risk to human health.

14. Comment: ...in my judgement, the amount of risk from the contaminan landfills and the relatively small amount of water infiltr going to be an insult to the aquifer. So, I really suppor alternative on that: on the landfills.

And again, I think your analysis is very good ... basicall confirms my preconceived notion. (T-I16)

Response: The agencies appreciate the time and effort that the comme evaluate the material, attend the presentations, and provi on the infommation.

Landfill Units Alternative #1. No Action

15. Comment: Gentlemen, again, given an un-pressured choice, it would m sense to apply alternative 1, No Action. It is doubtful t be an occasion to build homes and playgrounds over that si or four lifetimes. When we become serious about spending the above would apply. (W-T22)

[Having said that,] the only alternative would be alternat should be more than adequate to meet the criteria of the N We see the day when our government will be bankrupt. Then alternative will you apply? (W-T24)

Response: The Agencies rejected Alternative One (No Action) because were not fully characterized, and the cost to support a No decision would be prohibitive. Alternative One has no pro restrict access to these areas. Although it may appear un these areas will be used for residential purposes, it is p Agencies believed that the cost of Alternative Two is reas protection it will provide to public health and the enviro

Landfill Alternative #2. Containment with Native Soil Cover

16. Comment: I do not agree that a $2,026,000 expense is warranted for operable units. With finite funds available and the minus these landfill units, it would appear that an inexpensive "monitoring only" program would be satisfactory. If there little migration of contaminants that some landfill units found after 30 to 40 years, it is a waste of resources to monitor (call it Alternative 1).

With either alternative 2 or 3, monitoring could show the action after 30 years. Do the same with alternate 1 and s dollars to attack the problems that can use additional res (W-I23)

Response: Currently, the landfill areas are unevenly covered and deb on the surface in some places. This condition does not re potential for wind erosion, infiltration by rain or snowme minimize the potential migration of leachate to the aquife there is no current evidence that migration has occurred, not protective of the environment.

The installation of the soil cover is only a small portion implement this action. The installation of monitoring wel term analysis of water samples make up the majority of the Agencies believe that the cost to install the cover is rea worthwhile for the added protection achieved.

The Agencies concur that Alternative 2 is the best choice.

17. Comment: At the public presentation, I noted that the proposed nati (option #2) is the proposed method of capping the landfill Option #3, which was over 3 times more costly would includ engineered soil covering with clay to prevent the infiltra through the cap.

I support the proposed action of capping, however, I feel combination of these two options could be accomplished in reasonably easy manner. (W-I25) (See comment W-I13 for co comment).

Response: Alternative 2 will prevent contact with the landfill conte native soil will cost less than any combination of soil wi arid climate, such as that present at the INEL, leaching i concern as it would be in other areas, and the additional result in any additional benefit.

Landfill Alternative #3, Containment with Single Barrier Cove

18. Comment: Two or more of the audience and a respected engineer with experience differed regarding whether or not the imperviou should be installed over the municipal waste. The impervi

vital and might be as presented the preferred choice (#3 - million) but less costly and more effective in the long ru #2 (about $12 Million). (W-B26)

Response: The Agencies have determined that a native soil cover is a prevent direct contact with the landfill contents; in an a of an impervious layer does not necessary provide a signif benefit. Monitoring will also be performed to ensure the the covers.

General Comments on Public Meeting/Public Participation

19. Comment: I'd like to thank the presenters for bringing this to us t that they were kind of lumped together in that I would hav have blown a perfectly good evening on a landfill and a di that in mind, I think that the landfills and ditches certa minor part of the problems we have at INEL. I would hope, that DOE and others do continue to monitor these sites for problems and that they continue to bring these sites, as i they may seem, forward to the public and let the public ma decisions based on the information that is available rathe assuming that these are too small for our concern. Thank y

Response: Monitoring will continue at the Industrial Waste Ditch and and the Agencies will continue to provide public comment o for all INEL remediation projects.

20. Comment: I would like to comment on your plans for clean up at nine landfills at your Naval Reactors Facility at INEL. I atte information meeting in Moscow, ID on April 21, 1994 and wa impressed by the presentation. I feel that any cleanup is good and worthy. (W-M28)

Response: The Agencies appreciate the time and effort that the comme evaluate the material, attend the presentations, and provi on-the information presented by the Agencies.

21. Comment: The amount of advertising on radio and T.V. before the 20 Boise meeting was commendable and probably responsible for public attendance.

The visuals of the presentation boards on easels were supe speakers seemed cordial and well prepared with others avai on-site experience to address questions and other aspects.

I hope the presentation boards and visuals will be preserv again at schools and other public meetings. We do hope fo continuous consideration of costs for effective solutions.

Response: The Agencies will evaluate the use of the presentation mat settings. The INEL Community Relations once retains these for future use. A comparison of cost versus benefit will

performed for all environmental restoration activities at

22. Comment: No comments at this time, but would like to receive a copy Record of Decision and Responsiveness Summary. (W-P30)

Response: The Agencies appreciate the time and effort that the comme evaluate the material. Copies of the Record of Decision w Responsiveness Summary will be provided to individuals who them.

23. Comment: First, I would like to thank both you and the Westinghouse Corporation representative. Mr. Nieslanik, for the presen at the Grand Teton Mall. It was informative, well present visual displays were easily understood. (W-I31)

Response: The Agencies appreciate the time and effort that the comme evaluate the material, attend the presentations, and provi on the information presented.

APPENDIX B: PUBLIC COMMENT/RESPONSE LIST

PUBLIC COMMENT/RESPONSE LIST

All of the comments submitted by the public in either written or verbal and assigned a code number. The commentors are listed alphabetically in the comment code appears in the second column. The first symbol in the the comment was written (W) or transcribed by the court reporter present meetings. The second symbol indicates the geographic area the comment w from; 'B' for Boise, 'I' for Idaho Falls, 'M' for Moscow, 'P' for Pocat The page number the response to the comment appears on is listed in the

NAME	COMMENT CODE	RESPONSE
Barraclough, Jack	T-I3	A-5
Barraclough, Jack	T-I4	A-5
Barraclough, Jack	T-I9	A-5
Barraclough, Jack	T-I16	A-11
Barraclough, Jack	T-I21	A-10
Barry, Warren	W-T24	A-11
Barry, Warren	W-T22	A-11
Bjornsen, Fritz	T-B27	A-13
Brissenden, Marjorie	W-B26	A-13
Brissenden, Marjorie	W-B29	A-14
Broscious, Chuck	T-M1	A-6
Broscious, Chuck	T-M14	A-9
Creek, Alex	W-I18	A-10

Drewes, Kenneth	W-I11	A-7, A
Drewes, Kenneth	W-I13	A-8
Drewes, Kenneth	W-I25	A-5, A
Drewes, Kenneth	W-I31	A-14
Hamilton, Joel	T-M7	A-7
Hampsen, W. L.	W-B6	A-6
Hampsen, W. L.	W-B10	A-7
Hampsen, W. L.	W-B20	A-10
Leedom, George L.	W-M19	A-10
Leedom, George L.	W-M28	A-13
Rice, Charles M.	W-I8	A-7
Rice, Charles M.	W-I23	A-12
Sorensen, Stan	W-P30	A-14
Straka, M.	W-I5	A-11
White, C. E.	T-I12	A-7

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APPENDIX C: ADMINISTRATIVE RECORD INDEX

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 2 INVESTIGATION OPERABLE UNIT 8-05
05/25/94

FILE NUMBER

AR3.6 TRACK 2 INVESTIGATION

Document #: NR-IBO-94/082
Title: DOE Decision Statement and Feasibility Study for Opera
8-05 and 8-06 and Summary Report for Operable Unit 8-0
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 04/11/94

AR3.14 TRACK 2 SUMMARY REPORTS

Document #: NR:IBO-93/301
Title: Track 2 Summary Report for NRF Operable Unit 8-05
Author: Newbry, R.D.E.
Recipient: Nygard, D., Pierre, W.
Date: 11/15/93

AR4.2 FEASIBILITY STUDY REPORTS

Document #: NR-IBO-94-048
Title: Draft Feasibility Study for NRF Landfill Areas (Operab
05 and 8-06)
Author: Newbry, R.D.E.

Recipient: Nygard, D., Pierre, W.
Date: 03/11/94

Document #: 5668
Title: Feasibility Study for NRF Landfill Areas (Operable Uni 8-06)
Author: Newbry, R.D.E.
Recipient: Nygard, D., Pierre, W.
Date: 11/15/93

TRACK 1 INVESTIGATION OF OU 8-05 05/25/94

FILE NUMBER

AR4.3 PROPOSED PLAN

Document #: NR:IBO-94/034
Title: Transmittal Letter and Draft Proposed Plan for NRF Ope Units 8-03, -20 and 22 (Track 1 Investigations), 8-05 (Landfill Site Track 2 Investigations, and 8-07 (Exter Waste Ditch RI/FS)
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 02/28/94

Document #: 5770
Title: Proposed Plan for NRF OU 8-03, -20 and 22 (Track 1), 8 (Landfill Site Track 2) and 8-07 (Exterior Industrial RI/FS)
Author: INEL Community Relations
Recipient: N/A
Date: 04/01/94

AR6.1 COOPERATIVE AGREEMENTS

Document #: ERD1-070-91*
Title: Pre-signature Implementation of the CERLA Interagency Agreement Action Plan
Author: EPA, Findley, C.E.
Recipient: DOE, Solecki, J.E.
Date: 05/17/91

Document #: 3205*
Title: U.S. DOE INEL Federal Facility Agreement and Consent O
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 2919*
Title: INEL Action Plan For Implementation of the Federal Fac Agreement and Consent Order
Author: N/A

Recipient: N/A
Date: 07/22/91

TRACK 1 INVESTIGATION OF OU 8-05 05/25/94

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

Document #: 1088-06-29-120*
Title: U.S. DOE INEL Federal Facility Agreement and Consent O
Author: N/A
Recipient: N/A
Date: 12/04/91

Document #: 3298*
Title: Response to Comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Orde
Author: N/A
Recipient: N/A
Date: 02/21/92

Document #: DOE/ID-10340(92)*
Title: Track 1 Sites: Guidance for Assessing Low Probability Sites at the INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 07/21/92

Document #: DOE/ID-10389 Rev. 6*
Title: Track 2 Sites: Guidance for Assessing Low Probability Sites at the INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 01/01/94

AR9.1 NOTICES ISSUED

Document #: AM/SES-ESD-92-256*
Title: Natural Resource Trustee Notification
Author: Pitroli, A.A.
Recipient: Andrus, C,D,
Date: 07/07/92

TRACK 1 INVESTIGATION OF OU 8-05 05/25/94

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

Document #: AM/SES-ESD-92-257*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

Document #: AM/SES-ESD-92-258*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Edmo, K.
Date: 07/07/92

Document #: AM/SES-ESD-93-007*
Title: Invitation to Natural Trustee Representatives to Discu
Resources and Environmental Restoration at the INEL
Author: Hinman, M.B.
Recipient: Addressee List
Date: 01/25/93

Document #: AM/SES-ESD-93-097*
Title: Agenda for Meeting of Potential Natural Resource Trust
March 17, 1993
Author: Twitchell, R.L.
Recipient: Addressee List
Date: 03/02/93

Document #: AM/SES-ESD-93-159*
Title: INEL Natural Resource Trustee Meeting "Group Memory" M
17, 1993
Author: Hinmann, M.B.
Recipient: Addressee List
Date: 03/30/93

TRACK 1 INVESTIGATION OF OU 8-05 05/25/94

FILE NUMBER

AR9.1

NOTICES ISSUED (continued)

Document #: AM/SES-ESD-93-162*
Title: Department of Energy Idaho Field Office (DOE-ID) Propo
Consultation and Coordination between Natural Resource
Author: Hinman, M.B.
Recipient: Addressee List
Date: 04/02/93

Document #: AM/SES-ESD-93-276*
Title: Department of Energy Idaho Field Office (DOE-ID) Actio
Report to Potential Natural Resource Trustees
Author: Hinmann, M.B.
Receipt: Addressee List

Date: 06/16/93

Document #: 5357*
Title: Natural Resource Trustee Representation Designation
Author: Andrus, C.D., Governor
Recipient: Pitrolo, A.A.
Date: 08/11/92

Document #: 5338*
Title: Response to Natural Resource Notification
Author: Polityka, C.S.
Recipient: Pitrolo, A.A.
Date: 08/28/92

AR10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 5703
Title: Public Meeting Transcripts for the NRF Industrial Wast and Landfill Areas
Author: Ecology and Environment, Inc.
Recipient: N/A
Date: 05/24/94

This document can be found in the INEL OU 8-07 Administrative Record Bin

TRACK 1 INVESTIGATION OF OU 8-05 05-25-94

FILE NUMBER

AR10.6 PRESS RELEASES

Document #: 5640
Title: DOE Seeks Public Comment on Industrial Waste Ditch and Landfills at the NRF
Author: N/A
Recipient: N/A
Date: 03/01/94

AR11.1 EPA GUIDANCE

Document #: 5163 Revision 3*
Title: Administrative Record List of Guidance Documents
Author: EPA
Recipient: N/A
Date: 08/12/92

AR11.4 TECHNICAL SOURCES

Document #: NR-IBO-94-076
Title: Radioactivity controls In Prototype Plants at the Nava Facility
Author: Newbry, R.D.E.

Recipient: Nygard, D.; Pierre, W.
Date: 03/31/94

This document can be found in the INEL OU 8-01 Administrative Record Bin

AR12.1 EPA COMMENTS

Document #: 5636
Title: Track 2 Summary Report for the Naval Reactors Facility Unit 8-05
Author: Meyer, L.
Recipient: Newbry, R.D.E.
Date: 12/20/93

TRACK 1 INVESTIGATION OF OU 8-05 05-25-94

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

Document #: 5663
Title: Draft Feasibility Study for NRF Landfill Areas (Operab (OU) 8-05 and 8-06)
Author: Meyer, L.
Recipient: Newbry, R.D.E.
Date: 03/29/94

AR12.2 IDHW COMMENTS

Document #: 5657
Title: IDHW-DEQ Recommendations for Track-Two Operable Units 8-05 and 8-06
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 03/23/94

Document #: 5664
Title: Review of the Draft Proposed Plan for Operable Units (8-06, and 8-07
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 03/31/94

Document #: 5666
Title: IDHW Comments - Review of the Draft Focused Feasibilit for Operable Units (OU) 8-05 and 8-06
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 04/04/94

* Document filed in INEL Federal Facility Agreement and Consent Order (FFA/CO) Administrative Record Binder

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 2 INVESTIGATION OPERABLE UNIT 8-06
05/25/94

ADMINSTRATIVE RECORD VOLUME 1

FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

Document #: 5669
Title: Track 2 Summary Report for Naval Reactors Facility OU
Author: Golder Associates, Inc.
Recipient: N/A
Date: 04/01/94

ADMISNITRATIVE RECORD VOLUME II

AR3.6 TRACK 2 INVESTIGATION

Document #: NR:IBO-94/082
Title: DOE Decision Statement and Feasibility Study for Opera
and 8-06 and Summary Report for Operable Unit 8-06
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 04/11/94

AR3.21 SCHEDULES

Document #: NR:IBO-94/018
Title: Revised Schedules for OU 8-06 and 8-09 Track 2 Investi
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 02/07/94

AR4.2 FEASIBILITY STUDY REPORTS

Document #: NR-IBO-94/048
Title: Draft Feasibility Study for NRF Landfill Areas
(Operable Units 8-05 and 8-06)
Author: Newbry, R.D.E.
Recipient: Nygard, D., Pierre, W.
Date: 03/11/94

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
EXTERIOR INDUSTRIAL WASTE DITCH RI / FS OPERABLE UNIT 8-07
05/25/94

ADMINISTRATIVE RECORD VOLUME I

FILE NUMBER

AR3.3 RI/FS WORK PLAN

Document #: 5195
Title: RI/FS Final Work Plan For the Exterior Industrial Wast
Naval Reactors Facility, Idaho Falls, Idaho
Author: Westinghouse Electric Corporation
Recipient: N/A
Date: 09/24/94

Document #: NR-IBO-92/328
Title: DOE/IBO Transmittal of Final Work Plan for the RI/FS f
Industrial Waste Ditch
Author: Newbry, R.D.E., DOE-IBO
Recipient: Nygard, D., EPA
Date: 11/26/91

Document #: 5196
Title: Corespondence between EPA, State of Idaho, and DOE-IBO
Author: N/A
Recipient: N/A
Date: 09/24/92

ADMINISTRATIVE RECORD VOLUME II

AR3.4 REMEDIAL INVESTIGATION REPORTS

Document #: NR-IBO-93/198, VOL. 1
Title: Transmittal Letter and Draft Remedial Investigation Re
Operable Unit 8-07
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME III

FILE NUMBER

AR3.4 REMEDIAL INVESTIGATION REPORTS (continued)

Document #: NR:IBO-93/198, VOL. 2
Title: Draft Remedial Investigation Report for NRF OU 8-07
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME IV

AR3.12 RI/FS REPORTS

Document #: NR:IBO-93/296, VOL. 1
Title: Transmittal Letter and Draft Remedial Investigation / Report for NRF Operable Unit 8-07 (Exterior Industrial
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 11/08/93

ADMINISTRAITVE RECORD VOLUME V

Document #: NR-IBO-93/296, VOL. 2
Title: Draft Remedial Investigation / Feasibility Study Repor Unit 8-07 (Exterior Industrial Waste Ditch)
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME VI

Document #: 5626, VOL. 1
Title: Final Remedial Investigation / Feasibility Study Repor Unit 8-07, (Exterior Industrial Waste Ditch)
Author: Lee, S.D.
Recipient: N/A
Date: 02/01/94

ADMINSTRATIVE RECORD VOLUME VI

FILE NUMBER

AR3.12 RI/FS REPORTS (continued)
Document #: 5626, VOL. 2
Title: Final Remedial Investigation / Feasibility Study Repor Unit 8-07 (Exterior Industrial Waste Ditch)
Author: Lee, S.D.
Recipient: N/A
Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VII

AR4.3 PROPOSED PLAN

Document #: NR-IBO-94/034
Title: Transmittal Letter and Draft Proposed Plan for NRF OU

8-03, -20 and 22 (Track 1), 8-05 and 06 (Landfill Site
(Exterior Industrial Waste Ditch RI/FS)
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 02/28/94

Document #: 5770
Title: Proposed Plan for NRF OU 8-03, -20 and 22 (Track 1), 8
(Landfill Site Track 2) and 8-07 (Exterior Industrial
Author: INEL Community Relations
Recipient: N/A
Date: 04/01/94

AR6.1 COOPERATIVE AGREEMENTS

Document #: ERDI-070-91*
Title: Pre-signature Implementation of the CERLA Interagency
Action Plan
Author: EPA, Findley, C.E.
Recipient: DOE, Solecki, J.E.
Date: 05/17/91

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

Document #: 3205*
Title: U.S. DOE INEL Federal Facility Agreement and Consent O
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 2919*
Title: INEL Action Plan For Implementation of the Federal Fac
and Consent Order
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 1088-06-29-120*
Title: U.S. DOE INEL Federal Facility Agreement and Consent O
Author: N/A
Recipient: N/A
Date: 12/04/91

Document #: 3298*
Title: Response to Comments on the Idaho National Engineering
Federal Facility Agreement and Consent Order
Author: N/A

Recipient: N/A
Date: 02/21/92

Document #: DOE/ID-10340(92)*
Title: Track 1 Sites: Guidance for Assessing Low Probability
INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 07/01/92

Document #: DOE/ID-10389 Rev.6*
Title: Track 2 Sites: Guidance for Assessing Low Probability
INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 01/01/94

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05/25/94

FILE NUMBER

AR9.1 NOTICES ISSUED

Document #: AM/SES-ESD-92-256*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Andrus, C,D,
Date: 07/07/92

Document #: AM/SES-ESD-92-257*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

Document #: AM/SES-ESD-92-258*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Edmo, K.
Date: 07/07/92

Document #: AM/SES-ESD-93-007*
Title: Invitation to Natural Trustee Representatives to Discu
and Environmental Restoration at the INEL
Author: Hinman, M.B.
Recipient: Addressee List
Date: 01/25/93

Document #: AM/SES-ESD-93-097*
Title: Agenda for Meeting of Potential Natural Resource Trust
March 17, 1993
Author: Twitchell, R.L.

Recipient: Addressee List
Date: 03/02/93

Document #: AM/SES-ESD-93-159*
Title: INEL Natural Resource Trustee Meeting "Group Memory" M
Author: Hinman, M.B.
Recipient: Addressee List
Date: 03/30/93

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05/25/95
FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

Document #: AM/SES-ESD-93-162*
Title: Department of Energy Idaho Field Office (DOE-ID) Propo
Consultation and Coordination between Natural Resource
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Recipient: Addressee List
Date: 04/02/93

Document #: AM/SES/ESD-93-276*
Title: Department of Energy Idaho Field Office (DOE-ID) Actio
to Potential Natural Resource Trustees
Author: Hinman, M.B.
Recipient: Addressee List
Date: 06/16/93

Document #: 5337*
Title: Natural Resource Trustee Representative Designation
Author: Andrus, C.D., Governor
Recipient: Pitrolo, A.A.
Date: 08/11/92

Document #: 5338*
Title: Response to Natural Resource Notification
Author: Polityka, C.S.
Recipient: Pitrolo, A.A.
Date: 08/28/92

AR10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 5703
Title: Public Meeting Transcripts for the NRF Industrial Wast
Landfill Areas
Author: Ecology and Environment, Inc.
Recipient: N/A
Date: 05/24/94

AR10.6 PRESS RELEASES

Document #: 5640

Title: DOE Seeks Public Comment on Industrial Waste Ditch
Author: N/A
Recipient: N/A
Date: 03/01/94

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05/25/94

FILE NUMBER

AR11.1 EPA GUIDANCE

Document #: 5163 Revision 3*
Title: Administrative Record List of Guidance Documents
Author: EPA
Receipt: N/A
Date: 08/21/92

AR11.4 TECHNICAL SOURCES

Document #: NR-IBO-94-076
Title: Radioactivity controls In Prototype Plants at the Nava
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 03/31/94

This document can be found in Administrative Record Binder OU 8-01

AR12.1 EPA COMMENTS

Document #: 5634
Title: EPA Comments: Draft Remedial Investigation for the Ex
Waste Ditch Operable Unit 8-07
Author: Meyer, L.
Recipient: Newbry, R.D.E.
Date: 09/02/93

Document #: 5638
Title: EPA Comments: Draft Remedial Investigation/Feasibilit
Exterior Industrial Waste Ditch
Author: Meyer, L.
Recipient: Newbry, R.D.E.
Date: 12/23/93

AR12.2 IDHW COMMENTS

Document #: 5635
Title: IDHW Comments: Technical Review of the Draft RI/FS
Author: English, M.
Recipient: Bradley, T.M.
date: 09/02/93

FILE NUMBER

AR12.2 IDHW COMMENTS (continued)

Document #: 5637
Title: IDHW Comments: Technical Review of the Draft RI/FS
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 12/21/93

Document #: 5664
Title: Review of the Draft Proposed Plan for Operable Units (
and 8-07
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 03/31/94

AR12.3 DOE RESOLUTIONS TO COMMENTS

Document #: NR-IBO-93/272
Title: Response to EPA/IDHW Comments On IWD RI Report
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 10/04/93

* Document filed in INEL Federal Facility Agreement and Consent Order (F
Administrative Record Binder

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OPERABLE UNIT 8-07
05-25-94

ADMINISTRATIVE RECORD VOLUME 1

FILE NUMBER

AR3.3 RI/FS WORK PLAN

Document #: 5195
Title: RI/FS Final Work Plan For the Exterior Industrial Wast
Naval Reactors Facility, Idaho Falls, Idaho
Author: Westinghouse Electric Corporation
Recipient: N/A
Date: 09/24/92

Document #: NR:IBO-92/328

Title: DOE/IBO Transmittal of Final Work Plan for the RI/FS f
Industrial Waste Ditch
Author: Newbry, R.D.E., DOE-IBO
Recipient: Nygard, D., EPA
Date: 11/26/91

Document #: 5196
Title: Correspondence between EPA, State of Idaho, and DOE-IB
Author: N/A
Recipient: 09/24/92
Date: 7/15/93

ADMINISTRATIVE RECORD VOLUME II

AR3.4 REMEDIAL INVESTIGATION REPORTS

Document #: NR:IBO-93/198, VOL. 1
Title: Transmittal Letter and Draft Remedial Investigation Re
Operable Unit 8-07
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 07/15/93

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05/25/94

ADMINISTRATIVE RECORD VOLUME III

FILE NUMBER

AR3.4 REMEDIAL INVESTIGATION REPORTS (continued)

Document #: NR:IBO-93/198, VOL. 2
Title: Draft Remedial Investigation Reports for NRF OU 8-07
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME IV

AR3.12 RI/FS REPORTS

Document #: NR:IBO-93/296, VOL. 1
Title: Transmittal Letter and Draft Remedial Investigation /
Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Di
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME V

Document #: NR-IBO-93/296, VOL.2
Title: Draft Remedial Investigation / Feasibility Study Repor

Unit 8-07 (Exterior Industrial Waste Ditch)
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME VI

Document #: 5626, VOL. 1
Title: Final Remedial Investigation / Feasibility Study Repor
Unit 8-07 (Exterior Industrial Waste Ditch)
Author: Lee, S.D.
Recipient: N/A
Date: 02/01/94

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05-25-94

ADMINISTRATIVE RECORD VOLUME VI

FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

Document #: 5626, VOL. 2
Title: Final Remedial Investigation / Feasibility Study Report f
Unit 8-07 (Exterior Industrial Waste Ditch)
Author: Lee, S.D.
Recipient: N/A
Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VII

AR4.3 PROPOSED PLAN

Document #: NR:IBO-94/034
Title: Transmittal Letter and Draft Proposed Plan for NRF OU
8-03, -20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track) a
(Exterior Industrial Waste Ditch RI/FS)
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 02/28/94

Document #: 5770
Title: Proposed Plan for NRF OU 8-03, -20 and 22 (Track 1), 8
(Landfill Site Track 2) and 8-07 (Exterior Industrial
Author: INEL Community Relations
Recipient: N/A
Date: 04/01/94

AR6.1 COOPERATIVE AGREEMENTS

Document #: ERD1-070-91*
Title: Pre-signature Implementation of the CERLA Interagency

Action Plan
Author: EPA, FIndley, C.E.
Recipient: DOE, Solecki, J.E.
Date: 05/17/91

EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05-25-94

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

Document #: 3205*
Title: U.S. DOE INEL Federal Facility AGreement and Consent O
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 2919*
Title: INEL Action Plan For Implementation of the Federal Fac and Consent Order
Author: N/A
Recipient: N/A
Date: 07/22/91

Document #: 1088-06-29-120*
Title: U.S. DOE INEL Federal Facility Agreement and Consent O
Author: N/A
Recipient: N/A
Date: 12/04/91

Document #: 3298*
Title: Response to Comments on the Idaho National Engineering Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

Document #: DOE/ID-10340(92)*
Title: Track 1 Sites: Guidance for Assessing Low Probability INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 07/01/92

Document #: DOE/ID-10389 Rev. 6*
Title: Track 2 Sites: Guidance for Assessing Low Probability INEL
Author: INEL, EPA, IDHW
Recipient: N/A
Date: 01/01/94

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Recipient: Andrus, C,D,
Date: 07/07/92

Document #: AM/SES-ESD-92-257*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

Document #: AM/SES/ESD-92-258*
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EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OU 8-07 05-25-94

FILE NUMBER

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Recipient: Newbry, R.D.E.
Date: 09/02/93

Document #: 5638
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Author: Meyer, L.
Recipient: Newbry, R.D.E.
Date: 12/23/93

AR12.2 IDHW COMMENTS

Document #: 5635
Title: IDHW Comments: Technical Review of the Draft RI/FS
Author: English, M.
Recipient: Bradley, T.M.
Date: 09/02/93

AR12.2 IDHW COMMENTS (continued)

Document #: 5637
Title: IDWH Comments: Technical Review of the Draft RI/FS
Author: English, M.
Recipient: Newbry, R.D.E.
Date: 12/21/93

Document #: 5664
Title: Review of the Draft Proposed Plan for Operable Units (
and 8-07
Author: English, M.
Recipient: Newbry, R.D.E.

Date: 03/31/94

AR12.3 DOE RESOLUTIONS TO COMMENTS

Document #: NR-IBO-93/272
Title: Response to EPA/IDHW Comments On IWD RI Report
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 10/04/93

* Document filed in INEL Federal Facility Agreement and Consent Order Administrative Record Binder

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/02/1994
Operable Unit: 15
ROD ID: EPA/ROD/R10-95/086

Media: soil, groundwater

Contaminant: Carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEL. The majority of the organic contamination associated with the Organic Contamination in the Vadose Zone (OCVZ) operable unit is within the subsurface. The highest contaminant concentrations are found immediately beneath the Subsurface Disposal Area (SDA), an area with several disposal pits and trenches previously used for the disposal of organic wastes. The SDA is an 88-acre area located within the RWMC. The RWMC encompasses 144 acres and consists of both the SDA and the Transuranic (TRU) Storage Area.

The RWMC was established in the early 1950s as a disposal site for solid, low level waste generated by INEL operations.

Current land use at the INEL is primarily nuclear research and development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEL is surrounded by a 500-square-mile buffer zone used for cattle and sheep grazing.

The OCVZ operable unit is defined as the part of the vadose zone beneath and within the immediate vicinity of the RWMC where there are organic contaminants in the vapor state. The presence of the contaminants is the result of the burial at the SDA disposal pits of organic wastes from the Rocky Flats Plant in Colorado. OCVZ does not include the wastes remaining in the disposal area (i.e., contaminated solids, drums, etc.). It only includes those organic compounds that have migrated from the wastes. The organic compounds are primarily carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, and tetrachloroethylene.

Sampling conducted for the remedial investigation (RI) has documented that volatile organic compounds (VOCs) have migrated from the disposal pits into the vadose zone. In the vadose zone, VOCs are migrating both vertically and laterally away from the disposal pits. Vertical migration of contaminants occurs both by vapor diffusion and infiltration of moisture through the vadose zone. Lateral migration occurs primarily by diffusion of VOC vapors. VOCs have been detected in soil vapor, surficial soils, perched water and in the Snake River Plain Aquifer (SRPA).

Remedy: The major components of the selected remedy include: installation and operation of five vapor extraction wells at the RWMC; installation and operation of off-gas treatment systems to destroy the organic contaminants present in the vapor removed by the extraction wells with off-gas treatment in the form of catalytic oxidation or an equally effective organic contaminant destruction technology; addition of soil vapor monitoring wells to monitor performance of the vapor extraction wells and verify the attainment of remedial action objectives as well as provide information used to evaluate potential modifications to the selected remedy to continue it beyond a first phase; and maintenance of institutional controls, which includes: using signs to restrict access, maintaining fences/barriers, and monitoring the existing production well supplying water to workers at the RWMC.

Text: Full-text ROD document follows on next page.

November 1994

IDAHO DEPARTMENT
ÿ OF HEALTH AND WELFARE
DIVISION OF
ENVIRONMENTAL QUALITY

<IMG SRC 1095086>

Idaho NationalEngineering Laboratory
Record of Decision

Declaration for Organic Contamination
in the Vadose Zone

Operable Unit 7-08

Idaho National Engineering Laboratory
Radioactive Waste Management Complex
Subsurface Disposal Area

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Organic Contamination in thc Vadose Zone (OCVZ)
Subsurface Disposal Area
Radioactive Waste Management Complex
Idaho National Engineering Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Organic Contamination in the Vadose Zone (OCVZ) site located at the Idaho National Engineering Laboratory (INEL). The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300). Information supporting the selection of the remedy is contained in the Administrative Record for the OCVZ Remedial Action.

The lead agency of this decision is the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) approves of this decision and, along with the Idaho

Department of Health and Welfare (IDHW), has participated in the evaluation of final action alternatives. The IDHW concurs with the selection of the preferred remedy for the OCVZ.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this record of decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment. Implementation of the remedial action selected in this ROD will provide extraction of the organic contaminants present in the most significant concentrations in the vadose zone beneath and within the immediate vicinity of the Radioactive Waste Management Complex (RWMC). These extracted contaminants will be destroyed through treatment at the surface of the RWMC. Extraction and destruction of the organic contaminants will prevent the long-term contamination of the Snake River Plain Aquifer (SRPA) above acceptable levels. The selected remedial action is not intended to address potential contaminants such as radionuclides and metals. These contaminants will be investigated as part of a comprehensive remedial investigation and feasibility study scheduled to begin in 1996.

DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses the OCVZ at the RWMC of thc INEL. The RWMC has been designated as Waste Area Group (WAG) 7 of the 10 WAGs currently under investigation at the INEL pursuant to the Federal Facility Agreement and Consent Order (FFA/CO) between the IDHW, the EPA, and the U.S. Department of Energy Idaho Operations Office (DOE-ID). OCVZ, designated as Operable Unit (OU) 7-08, is part of WAG 7.

The vadose zone extends from the ground surface to the top of the SRPA, approximately 580 ft below the surface. The vadose zone contains volatile organic compounds, primarily in the form of organic vapors, which have migrated from organic wastes disposed of in pits at the Subsurface Disposal Area (SDA) of the RWMC. Organic wastes remaining in the pits are not addressed with the selected remedy described in this ROD. Instead, risks to human health and the environment associated with these wastes will be evaluated as part of the remedial investigation and

feasibility study which is to begin in 1994 for the disposal pits.

The selected remedy for OCVZ will provide extraction/destruction of organic contaminant vapors present in the vadose zone beneath and within the immediate vicinity of the RWMC. In addition, thc selected remedy will include monitoring of vadose zone vapor and the SRPA. The objective of this selected remedy will be to reduce the risks to human health and the environment associated with the organic contaminants present in the vadose zone and to prevent Federal and state safe drinking water standards from being exceeded in the future.

The major components of the selected remedy include:

- The installation and operation of five vapor extraction wells (in addition to an existing vapor extraction well) at the RWMC as part of a first phase effort to extract organic contaminant vapors from thc vadose zone. The selected remedy includes options to expand the number of vapor extraction wells for potential second and third phases. Additional system modifications will be evaluated with each phase transition.

- The installation and operation of off-gas treatment systems to destroy the organic contaminants present in the vapor removed by the extraction wells. Off-gas treatment will be in the form of catalytic oxidation or an equally effective organic contaminant destruction technology.

- The addition of soil vapor monitoring wells to monitor the performance of the vapor extraction wells and verify the attainment of remedial action objectives. Soil vapor monitoring will also provide information used to evaluate potential modifications to the selected remedy to continue it beyond the first phase. The expected duration of the first phase is approximately two years; potential second and third phases would operate for approximately two years each. The actual duration of each phase is dependent on elements such as equipment procurement and installation that may be involved with each potential phase transition.

- The maintenance of institutional controls, which includes: using signs, restricting access, maintaining fences/barriers, and monitoring the existing production well supplying water

to workers at the RWMC. It is presumed that this level of institutional control will be maintained at the RWMC through the year 2091.

Organic wastes remaining in the pits could extend the timeframe required to achieve remedial action objectives using the selected remedy since the remaining organic wastes could act as a "long-term" source of organic contamination in the vadose zone.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and state applicable or relevant and appropriate requirements (ARARs), and is cost-effective. This remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. The most concentrated areas of organic contaminants present in the vadose zone will be extracted and destroyed. As such, the selected remedy satisfies the statutory preference for treatment as a principal element of the remedy.

For those remedial actions that allow hazardous substances to remain on-site. Section 121 (c) of CERCLA requires that a review of the remedy be conducted within five years after initiation of the remedial action and at least once every five years thereafter. The purpose of this review is to evaluate the remedy's performanceÄÄto ensure that the remedy has achieved, or will achieve, the remedial action objectives set forth in the ROD and that it continues to be protective of human health and the environment. Reviews for the OCVZ selected remedy will be conducted as described below.

The potential progression of the selected remedy to a second and third phase is dependent on the ability of the vapor extraction system to achieve the remedial action objectives, i.e., ensure that risks to future groundwater users are within acceptable guidelines and that future contaminant concentrations in the aquifer remain below Federal and state safe drinking water standards. During implementation of the selected remedy at OCVZ, the remedy's performance will be reviewed on a two year (24 month) cycle, with each phase of operation under the selected remedy expected to last at least two years. The actual duration of each phase is dependent on elements such as equipment procurement and installation that may be involved with each transition. The following description

of the review cycle assumes that transitions will occur in a timely fashion every 24 months.

The first review will commence after 18 months of operation under the first phase. Data accumulated over these 18 months will be analyzed and a decision made by DOE, EPA, and the IDHW as to what will comprise the second phase of the selected remedy (if a second phase is necessary to attain remedial action objectives). The selected remedy will continue under first phase operations up to 24 months, at which time, after the data analysis period, a transition to the second phase will occur. Data analyzed will be relevant to the attainment of remedial action objectives (e.g., contaminant recovery rates, equilibrium contaminant concentrations in the vadose zone, etc.).

Considerable engineering judgement will be used in deciding what modifications to the first phase will be made to continue the selected remedy into a second phase in order to achieve remedial action objectives. Potential options for continuing the selected remedy into a second phase include:

(1) continuing operation with no changes to the first phase of operation; (2) adding more vapor extraction wells; (3) extracting from different depths within existing extraction wells; (4) converting monitoring wells into extraction wells; and (5) adding and/or converting existing wells to passive venting wells. These options and others not currently identified may be carried out singly or in combinations, with the intent being to ensure that the selected remedy achieves remedial action objectives.

The need for additional phases beyond a second phase will be evaluated using the same general approach as outlined above for the transition between the first and possible second phase. If a second phase is implemented, then the data evaluation and decision regarding a possible third phase will begin 18 months into the second phase (i.e., 42 months from the start of the selected remedy) with the third phase beginning, if necessary, approximately 48 months from the start of the selected remedy. Potential options for continuing the selected remedy into a third phase would be similar to those listed above. This type of phased operation will continue through phases lasting 24 months each until remedial action objectives are achieved. In addition to the 2 year reviews associated with

the potential phases under the selected remedy, a review will be conducted five years after remedial action objectives have been achieved, and extraction/treatment operations have been discontinued.

Signature sheet for the foregoing OCVZ located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

John M. Wilcynski Date
Manager
U.S. Department of Energy, Idaho Operations Office

Signature sheet for the foregoing OCVZ located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Clarke Date
Regional Administrator, Region 10
U.S. Environmental Protection Agency

Signature sheet for the foregoing OCVZ located in the Subsurface Disposal Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Jerry L. Harris Date
Director
Idaho Department of Health and Welfare

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
AT	Averaging Time
BW	Body Weight
CCl4	carbon tetrachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
COCA	Consent Order and Compliance Agreement
CFM	cubic feet per minute
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ECU	Environmental Chemistry Unit
ED	Exposure Duration
EF	Exposure Frequency
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
ft	feet
HEAST	Health Effects Assessment Summary Tables

IDHW	Idaho Department of Health and Welfare
in.	inch
INEL	Idaho National Engineering Laboratory
IR	Ingestion Rate
IRIS	Integrated Risk Information System
kg	kilogram
l	liter
lbs	pounds
m	meter
MCL	Maximum Contaminant Level
mi	mile
min	minute
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OCVZ	Organic Contamination in the Vadose Zone
OU	Operable Unit
PCE	tetrachloroethylene
PRG	preliminary remediation goal
PPB	parts per billion
PPMV	parts per million volume
RAG	Risk Assessment Guidance
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RR	Respiration Rate
RWMC	Radioactive Waste Management Complex

SARA	Superfund Amendments and Reauthorization Act
SDA	Subsurface Disposal Area
SRPA	Snake River Plain Aquifer
TCA	trichloroethane
TCE	trichloroethylene
TRU	Transuranic
TSA	Transuranic Storage Area
VOC	volatile organic compound
VVE	Vapor Vacuum Extraction
WAG	Waste Area Group
yr	year
æg	microgram

Decision Summary

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE) located 32 miles (mi) west of Idaho Falls, Idaho, and occupies 890 miý of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEL (Figure 1). The majority of the organic contamination associated with the Organic Contamination in the Vadose Zone (OCVZ) operable unit (OU) is within the subsurface of the area outlined in Figure 1, and the highest contaminant concentrations are found immediately beneath the Subsurface Disposal Area (SDA), an area with several disposal pits and trenches previously used for the disposal of organic wastes. The SDA is a 88-acre area located within the RWMC. The RWMC encompasses 144 acres (approximately 0.23 miý) and consists of both the SDA and the Transuranic (TRU) Storage Area.

Current land use at the INEL is primarily nuclear research and development and waste management. Surrounding areas are managed by the Bureau of Land Management for

multipurpose use. The developed area within the INEL is surrounded by a 500 miý buffer zone used for cattle and sheep grazing.

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Of the 11,700 people employed at the INEL, approximately 100 are located at the RWMC. The nearest off-site populations are in Atomic City (12 mi southeast of RWMC), Arco (16 mi northwest of RWMC), Howe (19 mi north of RWMC), Mud Lake (36 mi northeast of RWMC), and Terreton (37 mi northeast of RWMC).

The INEL property is located on the northeastern edge of the Eastern Snake River Plain, a volcanic plateau that is primarily composed of volcanic rocks and relatively minor amounts of sedimentary interbeds. The basalts immediately beneath the RWMC are relatively flat and covered by 20 to 30 feet (ft) of alluvium.

The depth to the Snake River Plain Aquifer (SRPA) underlying the INEL varies from 200 ft in the northern portion to 900 ft in the southern portion. The depth to the SRPA at the RWMC is about 580 ft. Flow of the aquifer in this region is generally to the south-southwest. Organic contaminants beneath the RWMC are currently migrating toward the aquifer. Some contaminants have already reached the aquifer, but they are at concentrations that are below Federal and state safe drinking water standards [i.e., Maximum Contaminant Levels (MCLs)]. Contaminants that reach the aquifer are carried by the flow of the groundwater in the southwest direction, potentially beyond the southern boundary of the INEL.

The INEL has semi-desert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 inches per year (in/yr), with estimated evapotranspiration of 6 to 9 in/yr. The only surface water present in the southern portion of the INEL is the Big Lost River, which is approximately 1.5 mi northwest of the RWMC; however, due to irrigation diversions upstream, this river is typically dry. Surface water is present at the RWMC only during and following periods of heavy rainfall and snowmelt, which generally occur in January through April.

To minimize the potential for surface water to flow onto the RWMC during periods of high

surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. To further enhance surface water diversion from disposal pits and trenches, berms have also been constructed immediately around the SDA.

Twenty distinctive vegetative cover types have been identified at the INEL. Big sagebrush is the dominant species, covering approximately 80 percent of the ground surface. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Several bird species at the INEL that warrant special concern because of sensitivity to disturbance or their threatened status include the ferruginous hawk (Buteo regalis), bald eagle (Haliaeetus leucocephalus), long-billed curlew (Numenius americanus), and the loggerhead shrike (Lanius Ludovicianus). In addition, the Townsend's big-eared bat (Plecotus Townsendii) and pygmy rabbit (Brachylagus Idahoensis) are listed by the U.S. Fish and Wildlife Service as candidate species for consideration as threatened or endangered species. The ringneck snake, whose occurrence is considered to be INEL-wide, is listed by the Idaho Department of Fish and Game as a Category C sensitive species.

The OCVZ operable unit is defined as that part of the vadose zone beneath and within the immediate vicinity of the RWMC where there are organic contaminants in the vapor state. Their presence is a result of the burial at the SDA disposal pits of organic wastes from the Rocky Flats Plant in Colorado. OCVZ does not include the wastes remaining in the disposal pits

(i.e., contaminated solids, drums, etc.). It only includes those organic compounds that have migrated from the wastes. The organic compounds are primarily carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, and tetrachloroethylene.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The RWMC was established in the early 1950s as a disposal site for solid, low level waste generated by INEL operations. Within the RWMC is the SDA, where hazardous substances, including radioactive wastes and organic wastes, have been disposed of in underground pits, trenches, soil vault rows, and Pad AÄÄan aboveground pad. TRU waste was disposed of in the SDA from 1952 to 1970 and was received from the Rocky Flats Plant for disposal in the SDA from 1954 to

1970.

The Rocky Flats Plant is a DOE-owned facility located west of Denver, Colorado. The Rocky Flats Plant is used primarily for the production of plutonium components for nuclear weapons. Also located at the RWMC is the Transuranic Storage Area (TSA), where interim storage of TRU waste occurs in containers on asphalt pads. The TSA accepted TRU waste from off-site generators for storage from 1970 through 1988. TRU waste generated at the INEL is still stored at the TSA.

Organic contaminants that are part of the OCVZ operable unit are present in the subsurface fractured basalt and sedimentary interbeds (i.e., the vadose zone) beneath and within the immediate vicinity of the RWMC, above the SRPA. The presence of organic contaminants in the vadose zone is a result of the burial, and breach, at the SDA of containerized organic wastes from the Rocky Flats Plant. From 1966 to 1970, approximately 88,400 gallons of organic wastes were mixed with calcium silicate to reduce free liquids and form a grease- or paste-like material prior to being placed in containers and sent to the INEL for disposal in several pits at the SDA. Pits 4, 5, 6, 9, and 10 have been identified as receiving the organic wastes. Also, Pit 2 received an unknown quantity of organic waste before 1966, and the acid pit may have received organic wastes during past operations. The locations of these pits are shown in Figure 2. Section 11 of this record of decision (ROD) provides additional information on the waste inventory at the disposal pits of the SDA.

A Consent Order and Compliance Agreement (COCA) was entered into between DOE and the U.S. Environmental Protection Agency (EPA) pursuant to the Resource Conservation and Recovery Act (RCRA) Section 3008(h) in August 1987. The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL and set up a process for conducting any necessary corrective actions.

On July 14, 1989, the INEL was proposed for listing on the National Priorities List (NPL) [54 Federal Register (FR) 29820]. The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The INEL was listed on the NPL on November 21, 1989 (54 FR 44184).

As a result of the INEL's listing on the NPL in November 1989, DOE, EPA, and the Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent

Order (FFA/CO) on December 9, 1991. Under the FFA/CO, OCVZ was identified for a Remedial Investigation/Feasibility Study (RI/FS). This ROD documents the results of the RI/FS and the remedy selected. The entire RWMC will be evaluated in the Waste Area Group (WAG) 7 Comprehensive RI/FS which is scheduled to begin no later than July 1996.

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3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA 113(k)(2)(B)(i-v) and 117, a series of opportunities for public information and participation in the remedial investigation and decision process for OCVZ were provided over thc course of 29 months beginning in November 1991 and continuing through April 1994. For the public, the activities ranged from receiving a fact sheet that briefly discussed the OCVZ investigation to date, INEL Reporter articles and updates, and a proposed plan, to having a telephone briefing, four public scoping meetings, three public meetings, and two open houses to offer verbal or written comments during two separate 30-day public comment periods.

On November 19, 1991, a fact sheet concerning OCVZ was conveyed through a "Dear Citizen" letter to a mailing list of 5,600 individuals of the general public and 11,700 INEL employees in advance of the public scoping meetings scheduled on December 9, 10, 11, and 12, 1991. On November 20, the DOE issued a news release to more than 40 news media contacts concerning the beginning of a 30-day public scoping comment period, which ended January 3, 1992, on the OCVZ remedial investigation. Both the letter and release gave notice to the public that OCVZ documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Display ads announcing the same information appeared in eight major Idaho newspapers. Large ads appeared in the following newspapers from November 22 to the 27: Post Register (Idaho Falls); Idaho Sate Journal (Pocatello); South Idaho Press (Burley); Times News (Twin Falls); Idaho Statesman (Boise); Idaho Press Tribune (Nampa); Lewiston Morning Tribune (Lewiston); and Idahonian (Moscow).

Similar display ads concerning upcoming meetings appeared in seven of these newspapers several days preceding each local meeting to encourage citizens to attend and provide verbal or written comments. All three mediaÄÄthe Dear Citizen letter, news release, and newspaper adsÄÄgave public notice of four scoping meetings concerning the beginning of the investigation of OCVZ and the beginning of a 30-day public comment period that was to begin December 4, 1991. Additionally, two radio stations in Idaho Falls and newspapers in Idaho Falls and other communities repeated announcements from the news release to the public at large. A total of seven radio advertisements were made by local stations where meetings were scheduled several days before and the day of the meetings.

Personal phone calls concerning the availability of OCVZ documents and public meetings were made to individuals, environmental groups and organizations by INEL Outreach Office staff in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator made calls in Idaho Falls and Moscow.

Scoping meetings on OCVZ were held December 9, 10, 11, 12, 1991 in Boise, Moscow, Twin Falls, and Idaho Falls, respectively. An informal open house was held one hour prior to each of the meetings to allow the public to visit with State and Federal representatives about OCVZ. During these meetings, representatives from DOE and INEL discussed the project, answered both written and verbal questions, and received public comments. Written comment forms were distributed at the meetings. Comments from the scoping meetings were evaluated and considered as part of the RI/FS process.

Regular reports concerning the status of the OCVZ project were included in the INEL Reporter and mailed to those who attended the meetings and who were on the mailing list. Reports appeared in the March, May, July, and November 1992; and the January, March, and July 1993 issues of the INEL Reporter. During this time the number of individuals on the mailing list increased to 7,000. Individuals on the mailing list, those who attended the meetings, and all INEL employees received issues of thc INEL Reporter.

Opportunities for public involvement in the decision process of OCVZ were provided beginning

in March 1994. For the public, the activities ranged from receiving the proposed plan, conducting one teleconference call, and attending open houses and public meetings to informally discuss issues and offer verbal and written comments to the agencies during the 30-day public comment period.

On March 18, 1994, the Department of Energy Idaho Operations Office (DOE-ID) issued a news release to more than 40 news media contacts concerning the beginning of a 30-day public comment period on the OCVZ proposed plan. The release also gave notice to the public that OCVZ documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library in Idaho Falls, the Shoshone-Bannock Library at Fort Hall, the University of Idaho Library in Moscow, the Idaho State Library in Boise; as well as city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow.

Copies of the proposed plan for OCVZ were mailed to 7,000 members of the public and 400 INEL employees on the INEL Community Relations Plan mailing list on March 28, 1994 urging citizens to comment on the plan and to attend public meetings. Display ads announcing the same information and the location of open houses in Pocatello and Twin Falls, and public meetings in Idaho Falls, Boise, and Moscow appeared in seven major Idaho newspapers. Large ads appeared in the following newspapers from March 15 to 20: Post Register (Idaho Falls), Idaho State Journal (Pocatello), South Idaho Press (Burley), Times News (Twin Falls), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and The Daily News (Moscow).

Similar display ads concerning upcoming meetings appeared in each of these newspapers several days preceding each local open house or meeting to encourage citizens to attend and provide verbal or written comments. Both media, the news release and newspaper adds, gave public notice of public involvement activities and offerings for briefings, and the beginning of a 30-day public comment period that was to begin March 31 and run through April 30, 1994. Additionally, radio stations in Idaho Falls, Blackfoot, Pocatello, Burley, and Twin Falls ran advertisements during the three days prior to the open houses in Pocatello and Twin Falls.

The open houses were held in Pocatello and Twin Falls on April 12 and April 14, respectively, and the public meetings were held in Idaho Falls, Boise, and Moscow on April 18, 20, and 21, 1993, respectively. Written comment forms, including a postage-paid business reply form, were made available to those attending the meetings. The forms were used to turn in written comments at the meeting, and by some, to mail in comments later. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep a verbatim transcript of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for OCVZ, OU 7-08, in eight INEL Information Repositories.

On April 13, 1994, a teleconference call between the League of Woman Voters of Moscow and the Environmental Defense Institute, DOE-ID, EPA, and the IDHW concerning INEL environmental restoration issues was conducted at the request of Moscow area residents. The call consisted of an overview of the proposed plan, questions and answers, and general discussion of OCVZ issues.

Personal phone calls concerning the availability of the proposed plan and the public meetings were made to individuals, environmental groups, and organizations by INEL Community Relations Plan staff in Idaho Falls and Boise. Outreach Office staff made calls to citizens in northern, southwestern, and southeastern Idaho.

Another series of ads were placed in the same local papers several days before the public meetings to encourage citizens to attend and comment on the plan. Additionally, a special feature article in the July issue of the INEL Reporter was mailed to individuals on the INEL Community Relations Plan mailing list as a reminder of the meetings and the opportunity to comment on the proposed plan.

A Responsiveness Summary has been prepared as part of the ROD. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

A total of about 83 people attended the OCVZ public meetings. Overall, 27 provided formal comments; of these 27 people, 12 people provided oral comments and 15 people provided written comments. DOE further divided the oral and written comments into 91 separate comments. All comments received on the proposed plan were considered during the development of this ROD. The decision for this action is based on the information in the Administrative Record for this OU.

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the FFA/CO, the INEL is divided into 10 WAGs. The WAGs are further divided into OUs. The RWMC has been designated WAG 7 and consists of 14 OUs. Data from shipping records, along with process knowledge, written correspondence, and existing monitoring data, were available to allow OCVZ, OU 7-08, to be evaluated in an expeditious manner. OCVZ consists of the organic contaminants present in the vadose zone beneath and within the immediate vicinity of the RWMC, but does not include the waste materials disposed of in the pits of the SDA. Potentially, organic wastes remaining in the pits could impact alternatives considered for remediation of the vadose zone. However, given the current level of information available on the organic wastes present within the pits, it is impossible to predict with any certainty whether these wastes will impact remediation at all.

A complete evaluation of all cumulative risks associated with CERCLA actions at WAG 7 will be conducted as part of the WAG 7 Comprehensive RI/FS (OU 7-14) to ensure all risks have been adequately evaluated. Conducting a remedial action at OCVZ is part of the overall WAG strategy and is expected to be consistent with any planned future actions.

5. SUMMARY OF SITE CHARACTERISTICS

The following sections provide a summary of the physical characteristics of the site as well as a summary of the contaminants present in various media at the site. Much information on the characteristics of the vadose zone (including contaminant behavior in the vadose zone) was obtained during a treatability study using vapor vacuum extraction (VVE); therefore, a summary of the treatability study is included as Section 5.3.

5.1 Geology and Hydrology

The INEL is located along the northern edge of the Eastern Snake River Plain, a 50- to 70-mi wide northeastern trending geologic basin extending from the vicinity of Twin Falls on the southwest part of the plain to the Yellowstone Plateau on the northeast. The Eastern Snake River Plain is underlain by a substantial volume of volcanic rocks with relatively minor amounts of sediment, except along its margins where drainages emerge from the nearby mountain ranges.

The RWMC is underlain by a thick sequence of basaltic lava flows interbedded with thin layers of sediments termed "interbeds". A layer of surficial sediments ranging from 0 to 22 ft thick directly underlies the RWMC. It is within these sediments that the organic wastes were buried at the RWMC. The basalts range from highly fractured and vesicular along the margins of the flows to more dense and less fractured in the interior portions of the flows. The interbeds consist of silt, sand, clay, and fine gravel and are generally less permeable than the fractured basalt.

The RWMC is located in the Pioneer Basin, a topographically closed basin which includes most of the INEL. The Pioneer Basin receives intermittent surface water flow from three drainages that flow onto the INEL from the northwest: The Big Lost River, Little Lost River, and Birch Creek. These drainages usually only flow onto the INEL following wet winters. Precipitation at the INEL averages only 9.1 in (approximately 23 centimeters) per year, but the mountain ranges in the upper reaches of The Big Lost and Little Lost River Basins to the north and west of INEL receive up to 50 in (approximately 125 centimeters) of precipitation per year. Annual average infiltration rates at the RWMC are on the order of a few centimeters per year.

During periods of high runoff in the Big Lost River, water is diverted from the river to spreading basins located to the west of the RWMC. Except for a few hours in the Spring of 1993, water has not been diverted to the spreading areas since 1985. The SDA has flooded three times (1962, 1969 and 1982) prior to completion of the extensive dike system surrounding the SDA. Flooding was a result of local runoff from rain or rapidly melting snow in the spring. Because the SDA is located in a basin, water entered the SDA on each occasion and flooded some pits and trenches. Each of these flooding events may have resulted in recharge to perched water

zones and to the SRPA.

The SRPA is present beneath the RWMC at a depth of about 580 ft and, as in the vadose zone, consists of a series of basalt flows with interbedded sedimentary deposits. The EPA designated the SRPA a sole source aquifer under the Safe Drinking Water Act on October 7, 1991 (194 FR 50634). The aquifer is relatively permeable due to the presence of fractures, fissures, and voids such as lava tubes within the basalt. Groundwater flow in the SRPA is to the south-southwest at rates on the order of 5 to 20 ft/day. Infiltration of surface water from the spreading basins to the aquifer has in the past temporarily changed the local gradient beneath the SRPA to the east.

Perched water has been detected in 7 of 45 groundwater monitoring wells drilled at the RWMC. Perched water occurs where infiltrating water accumulates above relatively less permeable zones in the subsurface such as the sedimentary interbeds. Limited zones of perched water have been identified above interbeds located at both 110 and 240 ft. The perched water bodies appear to be laterally discontinuous and are generally only a few feet thick. As such, they are not a viable source of water in the site area.

5.2 Nature and Extent of Contamination

The presence of organic contaminants in the vadose zone is a result of the burial, and presumed breach, at the SDA of containerized organic wastes from the Rocky Flats Plant in Colorado. According to Kudera (Estimate of Rocky Flats Plant Organic Wastes Shipped to the RWMC, internal note, EG&G Idaho, Inc., July 24, 1987), from 1966 to 1970, approximately 88,400 gallons of containerized organic wastes were disposed of in the SDA. The organic wastes were mixed with calcium silicate to reduce free liquids and form a grease- or paste-like material which was usually double-bagged and placed in drums prior to disposal in several pits at the SDA. In addition, small amounts of absorbent, such as Oil-Dri, were normally mixed with the waste to bind free liquids. The organic wastes consisted of lathe coolant (Texaco Regal Oil and carbon tetrachloride), used oils, and degreasing agents (i.e., chlorinated hydrocarbons) such as 1,1,1-trichloroethane, tricholoethylene, and tetrachloroethylene. Hereinafter, carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, and

tetrachloroethylene will be referred to using their common abbreviations of CCl_4, 1,1,1-TCA, TCE, and PCE, respectively. Specific components of thc organic wastes were estimated by Kudera to include 24,000 gallons of CCl_4 and 25,000 gallons of other chlorinated hydrocarbons. The balance of the 88,400 gallons was primarily Texaco Regal Oil. Pits 2, 4, 5, 6, 9, and 10 have been identified as receiving thc organic wastes, and the acid pit may have received organic wastes. These pits, shown in Figure 2, are suspected of being the source of organic contamination in the vadose zone. Section 11 of this record of decision (ROD) provides additional information on the waste inventory at the disposal pits of the SDA.

CCl_4, 1,1,1-TCA, and PCE are considered spent solvents, meeting the definition under IDAPA 16.01.050.05 (40 CFR 261.31). However, the spent solvents were disposed of in the pits at INEL prior to the promulgation of the RCRA regulations in 1980. The RCRA regulations are relevant and appropriate to these spent solvent wastes according to the criteria of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) regulations.

Sampling conducted for the remedial investigation (RI) has documented that volatile organic compounds (VOCs) have migrated from the disposal pits into the vadose zone. In the vadose zone, VOCs are migrating both vertically (primarily downward) and laterally away from the disposal pits. Vertical migration of contaminants occurs both by vapor diffusion and infiltration of moisture through the vadose zone. Lateral migration occurs primarily by diffusion of VOC vapors. VOCs have been detected in soil vapor, surficial soils, perched water, and in the SRPA. The occurrence of VOCs in each of these media is discussed in the following paragraphs.

Shallow Soil Vapor

VOC concentrations in shallow soil vapor were evaluated through soil-gas surveys and gas chromatography conducted in 1987 and 1992. Soil vapor samples were collected through a vapor probe driven 30 in into surficial soil. In general, both surveys yielded the highest VOC concentrations in the vicinity of the pits known to contain organic waste. Of the VOCs analyzed, CCl_4 concentrations were highest in both surveys. The results of the 1992 shallow soil-gas survey are plotted for CCl_4 on Figure 3. Elevated concentrations of CCl_4 were detected above

several of the pits including Pits 2, 4, 6, 9, and 10. These results document that VOCs have migrated in the vapor phase from the source pits into shallow soils at the SDA.

The rate at which VOC vapors are being emitted from the shallow soils to the atmosphere was measured using a surface flux chamber at 12 locations at the SDA. Detectable concentrations of one or more VOCs were measured by gas chromatography at 11 of the 12 flux chamber test locations. CCl_4 was the target compound measured most frequently and at the highest concentrations. The highest calculated emission rate, 38 micrograms per square meter per minute (æg/mý/min), occurred at a location near Pit 6. TCE and chloroform were the compounds with the next highest emission rates (up to 6.6 and 4.3 æg/mý/min, respectively). Although there are no records indicating chloroform was one of the organic wastes placed in thc disposal pits, its presence was confirmed during field investigations. Clarification on the presence of chloroform can be found in this ROD in Section 6.1.1, Identification of Contaminants of Concern. Acetone and PCE had calculated emission rates up to 3.7 and 3.1 æg/mý/min, respectively, while none of the other compounds had emission rates above 2 æg/mý/min.

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Shallow Soils

Shallow borings drilled in 1990 around the perimeter of Pit 9 and the Acid Pit were sampled from depths ranging from 0-2 ft to 23 ft. Over 40 samples were analyzed for VOCs. Sampling results indicated that with a few exceptions, all of the positively identified VOC concentrations were at depths of 8 to 23 ft, indicating that VOCs are generally present in the lower portions of the surficial sediments. None of the VOC concentrations exceeded 40 micrograms/kilogram (æg/kg) and all reported concentrations were well below risk-based screening levels.

Vadose Zone Vapor

A total of 19 vapor port monitoring wells were used to evaluate the extent and concentration of VOC vapors in the vadose zone. These wells are shown on Figure 4. Samples were

collected between July 1992 and March 1993 and analyzed at the Site by a portable Sentex Scentograph Gas Chromatograph Unit. The Sentex was calibrated to detect three VOCs: CCl_4, TCE, and chloroform. Approximately 10% of the samples collected between July and September 1992 were submitted to the Environmental Chemistry Unit (ECU) laboratory at the Central Facilities Area for analysis of a more complete suite of organic compounds using a modified EPA TO-14 method. These results are summarized in Table 1.

The ECU data provide a means of comparing CCl_4 concentrations with concentrations of less prevalent VOCs. CCl_4 concentrations are generally one order of magnitude higher than TCE, chloroform, and 1,1,1-TCA concentrations. Concentrations of PCE, toluene, 1,1,2-trichloro-1,2,2-triflouroethane, and acetone are generally two orders of magnitude less than CCl_4 concentrations. These data indicate that CCl_4 is the VOC with the highest concentrations in vadose zone vapor. CCl_4 concentrations are highest in vapor port monitoring wells located inside the SDA (8801, 8902, and D02), which are located in the central portion of the SDA around Pits 4, 5, 6, and 10.

Mean CCl_4 data from 1992 samples are plotted on cross section A-A' (Figure 5). Cross section A-A' is identified on Figure 4. The cross section illustrates that concentrations decrease laterally from the area beneath the source pits and decrease substantially with depth below the 240-foot interbed. The 240-foot interbed appears to provide a layer which impedes or delays downward vapor migration, based on VOC concentration in the deeper vapor port monitoring wells located outside the SDA. The 110-foot interbed also appears to provide a barrier, especially in the central portion of the SDA such as at Well 8801. In this area where higher VOC concentrations are present, concentrations decrease significantly below the 110-foot interbed. No vapor ports have been completed below the 240-foot interbed within the SDA so it is not possible to evaluate the VOC concentrations below the 240-foot interbed directly beneath the source pits.

Data from the new vapor port monitoring wells indicate that CCl_4 has migrated in the vapor phase laterally as far as 3,000 ft beyond the SDA boundary. However, CCl_4 concentrations in wells located greater than 500 to 1,000 ft from thc SDA boundary are three to four orders of magnitude

less than concentrations in the immediate source areas.

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Table 1. VOC concentrations in monitoring well vapor ports (ECU data).

	VVE-1		VVE-3		VVE-4		VVE-6	VVE-7		VVE-10	
Compound Port=	P1	P2	P2	P3	P2	P3	P3	P2	P3	P2	P3
Depth (ft)=	189	127	155	92	145	75	108	133	77	138	75
CCl4	23	32	23	16	11	14	1.8	0.84 J	2.0	12	26
Chloroform	1.4	2.1	1.9	1.5	1.2	1.8	0.16 J	.080 J	0.13 J	0.63 J	4.0
PCE	0.67 J	1.0	0.55 J	0.45 J	0.39 J	0.39 J	<0.12	.043 J	.070 J	0.36 J	<0.49
Toluene	0.17 J	<0.37	<0.20	<0.14	0.28 J	2.5	<0.11	<.032	.046 J	<0.1	<0.45
1,1,1,-TCA	1.8	2.1	1.6	1.3	0.76 J	1.1	0.27 J	0.13 J	0.22 J	1.1	2.1
TCE	3.8	6.2	3.8	3.2	2.6	3.1	0.46 J	0.24 J	0.38 J	2.3	4.8
1,1,2-trichloro-1,2,2-trifluoro-ethane	0.73	0.67 J	0.50 J	0.44 J	0.19 J	0.60 J	0.13 J	.043 J	.045 J	0.33 J	1.3
Acetone	0.82	<1.2	0.80 J	<0.45	0.27 J	<0.34	0.34 J	<0.10	0.14 J	0.58 J	<1.4

	M1S		M3S		M4D	M6S	M7S	M10S
Compound Port=	P1	P3	P1	P2	P1	P1	P1	P3
Depth (ft)=	566	319	559	505	555	588	547	357

CCl4	0.36 J	0.16 J	0.83 J	1.8	0.69 J	1.3	0.81 J	2.3
Chloroform	.064 J	.034 J	.078 J	0.11 J	.086 J	.073 J	.049 J	0.11 J
PCE	.018 J	<.014	.038 J	.053 J	.030 J	.042 J	.038 J	0.34 J
Toluene	.023J	<.013	.028 J	.013	0.27 J	0.93 J	.064 J	.090 J
1,1,1-TCA	.029 J	.022 J	.066 J	0.21 J	.050 J	0.15 J	0.11 J	0.22 J
TCE	0.14 J	.072 J	0.22 J	0.39 J	0.14 J	0.20 J	0.17 J	0.23 J
1,1,2-trichloro-1,2,2-trifluoroethane	<.014	<.014	.018 J	.033 J	.029 J	.045 J	.033 J	0.13 J
Acetone	0.39 J	.062 J	<0.73	0.12 J	<.084	.087 J	0.21 J	.088 J

Table 1. (continued).

	WWW1		8801		8902		D02
Compound Port=	P1	P3	P4	P6	P6	P2	P2
Depth (ft)=	240	135	78	71	71	60	60
CCl4	6.3	18	3000	1200	2500	1200	1300
Chloroform	0.93 J	1.3	640	190	470	190	190
PCE	0.16 J	0.65 J	<29	18	<22	18	18
Toluene	<.058	<0.25	<27	<11	<20	<11	<14
1,1,1-TCA	0.36 J	1.4	110	54	88	54	54
TCE	1.6	4.0	480	190	360	190	200

1,1,2-trichloro-1,2,2-trifluoroethane	0.24 J	0.56 J	<28	14	21	14	<15
Acetone	0.64 J	<0.80	<83	<36	<163	<36	<44

Note: Port numbers are preceded by a P. All concentrations are in parts per million volume (ppmv). 8902, and D02 have duplicate data for the same port numbers; both are shown here. J indicates that value is estimated below the contract required quantitation limit. A less than symbol (<) indicates that the sample contained less than the noted detection limit.

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Perched Water

Prior to 1992, perched water had been detected in seven wells or boreholes (Figure 6). Wells known to contain perched water were sampled in 1992. Only three wells, 77-2, USGS 92, and D10, yielded enough water for samples. Results of analyses on these samples for VOCs are summarized in Table 2. The highest VOC concentrations in perched water samples were detected in Well USGS 92. CCl_4, TCE, chloroform, and PCE were the VOCs with the highest concentrations within this well. The concentrations of these VOCs in Wells 8802D and D10 were an order of magnitude less than the concentrations found in USGS 92. The CCl_4 and TCE concentrations in all of the perched water samples exceed their respective MCLs; however, perched water is not used for any purpose in thc RWMC area and is too limited in both vertical and lateral extent to provide a dependable source of water.

Groundwater

The results of sampling and analysis of groundwater in the SRPA from both USGS and new "M" series wells are illustrated on Figure 7. While no significant VOC contamination was present in monitoring wells upgradient of the SDA, VOCs were detected in all eight USGS wells and all six new "M" series monitoring wells located in the immediate vicinity of the SDA.

The most widely detected VOCs in USGS wells near the SDA were CCl4 and TCE. The compounds detected in decreasing order of maximum historically detected concentrations are: CCl4, [6.6 micrograms per liter (æg/l)], dichlorodifluoromethane (2.4 æg/l), TCE (1.4 æg/l), toluene (1.2 æg/l), chloroform (1.0 æg/l), and 1,1,1-TCA (0.9 æg/l). Only the CCl4 concentration of 6.6 æg/l in Well USGS 88 was above its MCL of 5 æg/l. This sample was collected in 1987; all subsequent samples from this well have contained less than 5 æg/l. All other results for VOCs from samples collected in USGS wells have been below MCLs.

New monitoring Wells M1S, M3S, M4D, M6S, M7S, and M10S (Figure 7) were sampled and analyzed for VOCs three times between October 1992 and May 1993. Mean VOC concentrations in these new wells are listed in Table 3. Toluene had the highest mean concentrations of any of the VOCs in the new wells. Mean toluene concentrations ranged from not detected in Wells M3S and M6S to 1.0 æg/l in Wells M1S and M7S, 5.4 æg/l in Well M10S and 10.8 æg/l in Well M4D. CCl4 concentrations of 1.7 and 3.3 æg/l were detected in Wells M6S and M7S, respectively. TCE was detected at a mean concentration of 2.0 æg/l in Well M7S. Methylene chloride was detected at a concentration of 2.3 æg/l in Well M1S. None of thc detected concentrations in the new groundwater monitoring wells exceeded MCLs.

5.3 Results of VVE Treatability Studies

To provide information on thc viability of vapor vacuum extraction (VVE) as a remedial process for the OCVZ, a treatability study was conducted at the SDA in 1993. The treatability study used a pilot-scale VVE system consisting of a vapor extraction well (8901D), a vacuum pump, and a vapor treatment system. Two carbon bed adsorbers placed in series were used to remove the VOCs from the extracted air. In addition to providing performance information on VVE, the treatability study yielded information on the characteristics of the vadose zone. This information is noted below.

<IMG SRC 1095086F>

Table 2. Concentrations of validated data for VOCs in perched water (æg/l or ppb).

Wells

Parameter	USGS 92	8802D	D10b	D10	Trip blank
Methylene chloride	<100	<10	ND	ND	1
1,1-dichloroethane	<100	<10	<1	0.3J	<1
Chloroform (100)a	1,500	ND	ND	ND	34
1,1,1-TCA (200)a	<100	15	3	3	<1
CCl4 (5)a	2100	190	18	21	0.4J
1,1-dichloropropane	<100	<10	<1	<1	<1
TCE (5)a	1600	150	13	15	<1
1,2-dichloropropane	<100	<10	1	1	<1
Bromodichloromethane	<100	<10	<1	<1	3
Toluene (1000)a	<100	3J	0.6J	0.7J	<1
PCE (5)a	230	13	4	5	<1
Dibromochloromethane	<100	<10	<1	<1	0.6J
Ethylbenzene	<100	<10	0.5J	0.7J	<1
p&m-Xylene	<100	<10	2	2	<1
Styrene	9J	<10	<1	<1	<1
1,2,4-trimethylbenzene	<100	<10	0.2J	0.2J	<1
1,2,4-trichlorobenzene	<100	<10	ND	<1	0.2

Hexachlorobutadiene	ND	<10	<1	<1
1				
Napthalene	<100	<10	ND	0.3BJ
0.4				
1,2,3-trichlorobenzene	<100	<10	<1	<1
<1				

a. EPA Primary Drinking Water Standard 40 CR 141.61, æg/l or ppb.

b. Duplicate analysis conduced on sample from D10.

B = Compound was also detected in a blank

J = Estimated value below contract required quantitation limit

ND = Not detected, compound detected at higher levels in a blank.

<IMG SRC 1095086G>

Table 3. Mean VOC concentrations in new groundwater monitoring wells (æg/l or ppb).

			Wells					
VOCs	MCL	Detection limit	M1S	M3S	M4D	M6S	M7S	M10S
Methylene chloride	ÄÄ	1	2.3	ND	ND	ND	ND	ND
Chloroform	100	1	ND	ND	ND	ND	ND	ND
1,1,1-TCA	200	1	ND	ND	ND	ND	ND	ND
CCl4	5	1	ND	ND	ND	1.7	3.3	ND
TCE	5	1	ND	ND	ND	ND	2.0	ND
Bromo-dichloromethane	100	1	ND	ND	ND	ND	ND	ND
Toluene	1,000	1	1.0	ND	10.8	ND	1.0	5.4
PCE	5	1	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	ÄÄ	1	ND	ND	ND	ND	ND	ND

Note: Mean concentrations calculated by taking the mean of the mean concentrations for each of the three quarters of monitoring data. Mean concentrations below the detection limit of 1 æg/l reported as not detected.

ND = Not Detected.

Several tests were conducted during the 1993 treatability study to optimize VVE performance and to evaluate hydraulic characteristics of the vadose zone. During extraction well

testing, a straddle packer was used to isolate various intervals to define zones of high permeability that could sustain high flowrates. These tests showed that a zone adjacent to the 110-ft interbed had the highest calculated permeability (15 darcies) and, therefore, the highest sustainable pumping rate. Extraction rate tests, in conjunction with vertical permeability study results, indicate that horizontal permeability varies considerably, ranging from less than 0.01 to 15 darcies, while vertical permeability ranges from 0.5 to 4 darcies.

When the treatability study began in April 1993, the total VOC concentration was approximately 1,000 parts per million volume (ppmv) in the extraction stream at a flowrate of about 170 cubic feet per minute (cfm). By June 3, 1993, the total VOC concentration dropped to 300 to 500 ppmv at the same flowrate. From June 3 to July 20, the system was not operated due to the need to replace spent carbon beds. After carbon bed replacement, the system was restarted on July 21 and the total VOC concentration had rebounded to approximately 600 ppmv in the extraction stream. The total VOC concentration stabilized and remained between 400 and 500 ppmv for the remainder of the treatability study. The 1993 treatability study operation recovered approximately 1,340 kg (2,900 lbs) of VOCs.

Long-term VVE testing showed that continued operation of the VVE system influenced VOC concentrations in vapor monitoring wells as far away as 450 ft from the extraction well. Concentrations in nearby vapor monitoring wells showed the greatest decreases in the 110-ft interbed but also decreased above and below the 110-ft interbed.

VOCs extracted during the treatability study were captured effectively from extracted vapor using carbon adsorption beds. These beds were shipped to an approved facility in Texas for final disposal at the completion of the treatability study.

6. SUMMARY OF SITE RISKS

The human health risk assessment for OCVZ evaluated both present and future potential exposures to contaminants. The risk assessments were conducted in accordance with the EPA Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual and Volume II:

Environmental Assessment Manual and other EPA guidance. The risk assessment methods and results are summarized in the following sections.

6.1 Human Health Risks

The risk assessment consisted of contaminant identification, exposure assessment, toxicity assessment, and human health risk characterization. The organic contaminants identified for OCVZ were based on existing inventory records and site characterization data. The exposure assessment detailed the exposure pathways that exist at the site for workers, off-site residents and potential future on-site residents. The toxicity assessment documented the adverse effects that may be caused in an individual as a result of exposure to a contaminant associated with OCVZ.

The human health risk assessment evaluated current and future potential noncarcinogenic health effects and carcinogenic risks associated with exposure to organic contaminants identified in the waste inventory. The human health evaluation used both the exposure concentrations and the toxicity data to determine a hazard index for potential noncarcinogenic effects and an excess cancer risk level for potential carcinogenic contaminants. In general, when a hazard index exceeds one, there may be a concern fat potential noncarcinogenic health effects. The excess cancer risk level is the increase in the probability of contracting cancer. The NCP acceptable risk range is 1 in 10,000 to 1 in 1,000,000 (i.e., 1 x 10-4 to 1 x 10-6). An excess lifetime cancer risk of 1 in 10,000 indicates that an individual has up to one chance in ten thousand of developing cancer over a lifetime of exposure to a site-related contaminant.

6.1.1 Identification of Contaminants of Concern

Organic contaminants of concern (COCs) evaluated in the baseline risk assessment were selected based on historical waste records and on the nature and extent of these contaminants in vadose zone media. The COCs selected for OCVZ are CCl4, PCE, TCE, and 1,1,1-TCA. These compounds have been identified as known waste constituents.

Chloroform was not identified in the waste history for the SDA; however, it was detected in site monitoring samples. Investigations pertaining to this contaminant indicate that the chloroform may

have two sources, both of which are difficult to quantify. Dose reconstruction activities for the Rocky Flats Plant in Colorado have identified chloroform usage associated with weapons component production; however, the presence of chloroform in the INEL waste is not documented. Chloroform may also have resulted from anaerobic degradation of CCl_4, a known contaminant at the SDA. Therefore, chloroform may have either been initially present in the waste as a source term (but not reported), or it may have been produced by degradation of CCl_4. Since estimates from these potential sources have not been quantified, it is impossible to quantitatively evaluate the risk to human receptors from the migration of chloroform. Similarly, no data are available which document the presence of acetone or toluene in the waste. As such, chloroform, acetone, and toluene were not identified as COCs. The uncertainty associated with not including these contaminants in the risk assessment is discussed in Section 6.1.5.

6.1.2 Exposure Assessment

An exposure assessment was performed to estimate the magnitude, frequency, duration, and routes of human exposure to the organic contaminants present in the vadose zone.

Exposed Populations

Only exposure pathways deemed to be complete (i.e., where a plausible route of exposure can be demonstrated from the site to an individual) were quantitatively evaluated in the risk assessment. The populations at risk due to exposure to organic COCs present in the vadose zone were identified by considering both current and future land use scenarios.

The human health risk assessment evaluated carcinogenic risks and noncarcinogenic health effects for the period from 1992 through 2121. This window of time for evaluating risks was selected because it is during this time that peak contaminant concentrations occur in the SRPA. The period was further divided into three current and future use time periods:

1. Current period (1992-2021). Control of the RWMC will be maintained by the DOE during this period of time. Potential exposures to on-site workers or visitors and residents adjacent to the INEL were evaluated. Institutional control of the RWMC is defined in an Institutional Control Plan for the INEL per DOE Order 5820.2a.

2. Institutional control period (2022-2091). Control of the RWMC will be

maintained by the DOE during this period of time. Institutional controls would be implemented to control the facility and may include, but are not limited to, restricting land use, controlling public access, and the posting of signs, fencing, or other barriers. Potential exposures to on-site workers or visitors and residents adjacent to the INEL were evaluated.

3. Post-institutional control period (2092-2121). Only potential exposures on residents were evaluated for this time period. Hypothetical residents were evaluated at 200 meters (which is approximately the distance from the center of the SDA to its boundary), 500 meters, and 5,200 meters from the center of the SDA. Each of these three locations is southwest of the SDAÄÄthe normal direction of flow for the SRPA. Note that the 5,200 meter location is the southern INEL boundary.

Exposure Pathways

The following exposure pathways were evaluated in the risk assessment for the current, institutional, and post-institutional control periods. In order to complete the pathways evaluation, contaminant fate and transport modeling was performed. The use of modeling is discussed in the following section.

- Outdoor inhalation of organic vapors
- Indoor inhalation of organic vapors
- Indoor inhalation of organic vapors released from indoor use of groundwater
- Dermal contact with groundwater
- Ingestion of groundwater (by hypothetical residents only).

Ingestion of contaminated groundwater by workers during the current and institutional control periods was not considered a viable pathway because the water supplied to workers from the RWMC production well is tested for contaminants. If contaminants in this well were to exceed MCLs, the water would be treated, or water from an uncontaminated source would be supplied to the workers.

The estimated risks and potential health effects associated with the pathway of dermal contact

with groundwater turned out to be very low relative to the pathways of inhalation and ingestion. As such, for purposes of summarizing risk in this ROD, following discussions focus on inhalation and ingestion. Details for all of the pathways considered can be found in Sections 5 and 6 of Remedial Investigation/Feasibility Study Report for the Organic Contamination in the Vadose ZoneÄÄOperable Unit 7-08 (EGG-ER-10684).

Contaminant Fate and Transport Modeling

A two-dimensional numerical transport model was developed to characterize the migration of contaminants from the disposal pits, through the vadose zone to the SRPA and to the atmosphere. Two additional models used the results of the vadose zone modeling to subsequently simulate the transport of contaminants in the SRPA and in the atmosphere. Also, the vadose zone model results were used to calculate COC concentrations in hypothetical building basements.

The computer code PORFLOW Version 2.39 was used to simulate transport of contaminants in the vadose zone. The source term of the model was based on Kudera's estimates which are described in Section 5.2. The model was calibrated using 1992 vapor concentration measurements of CCl4 from wells instrumented with vapor sampling ports. The model was then used to predict the mass flux of each COC to the atmosphere and the SRPA from 1966 to the year 2193. The material properties used in the model are based on data collected during the RI, historical data, and calibration of the model.

The vadose zone model results provide mass fluxes to the air and groundwater pathways as a function of time and provide the basis for COC concentrations at receptor locations. As expected,

the CCl4 flux is higher than the other COCs. The peak flux to the atmosphere for each COC occurs shortly after disposal ceased in 1970. CCl4 flux to groundwater is predicted to peak in 2071, with flux to groundwater of the other COCs peaking in 2074.

A two dimensional transient analytical model, AT123D, was used to simulate the migration of COCs in the SRPA from beneath the SDA and predict concentrations of the four COCs through time (1966 through 2193) at three receptor locations downgradient. ISCLT Version 2.0

was used to model airborne contaminant transport to predict maximum average concentrations of COCs in air at specified receptor locations. The predicted groundwater and air concentrations were then used in the baseline risk assessment.

Results of the vadose zone model were also used to estimate COC vapor concentrations in hypothetical building basements at the 200 and 500 meter receptor locations for use in the baseline risk assessment. Estimates of building concentrations were made with a simple mixing equation for each exposure period. This equation assumes instantaneous mixing and steady state conditions for each time period. The results of this model are building concentrations for 1966 through 2193 for each COC for the 200 and 500 meter receptor locations. These concentrations were then used in the baseline risk assessment.

Exposure Point Concentrations

COC concentrations at points where the potential for human exposure is expected to occur are necessary to evaluate the intake of potentially exposed individuals. The contaminant fate and transport models described above provided COC concentrations in both air and groundwater at selected exposure point locations.

COC transport modeling indicated that the flux of COCs from the vadose zone to the atmosphere and the resultant airborne COC concentrations have peaked and will continue to decrease through the current, institutional, and post-institutional control periods. As such, exposure to airborne COCs will be greatest during the current control period. Figure 8 shows total COC emission to the atmosphere over time. The emission of COCs to the atmosphere results in an airborne COC concentration during the current period that ranges from approximately 15 æg/m3 at the WAG 7 boundary (200 m from center of SDA) to 0.00637 æg/m3 at the southern INEL boundary (5,200 m from center of SDA).

Unlike the airborne COC concentrations, the COC concentrations in groundwater will not peak until around the year 2071, which is during the latter part of the institutional control period. As shown in Figure 9, each COC peaks at a different concentration, with CCl4 peaking the highest at approximately 125 æg/l or ppb. Three of the COCs, CCl4, TCE, and PCE are predicted to remain

above MCLs beginning early in the current period and extending beyond the institutional control period. The concentrations shown on Figure 9 are predicted for groundwater at the SDA boundary.

Detailed discussions on exposure point concentrations can be found in Volume I, Section 5 of the Remedial Investigation/Feasibility Study Report for the Organic Contamination in the Vadose ZoneÄÄOperable Unit 7-08 (EGG-ER-10684).

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6.1.3 Toxicity Assessment

The toxicity assessment addresses the potential for a contaminant to cause adverse effects in exposed populations and estimates the relationship between extent of exposure and extent of toxic injury (i.e., dose response relationship).

Two types of toxicity values were used in the risk assessment: chronic reference doses, which are used to evaluate noncarcinogenic effects; and slope factors, which are used to evaluate carcinogenic effects. The Integrated Risk Information System (IRIS) database, an EPA online computer database, and the EPA Health Effects Assessment Summary Tables (HEAST) provided toxicity values and slope factors for the COCs present at OCVZ. These reference doses and slope factors are listed in Tables 4 and 5, respectively. Reference doses and slope factors are "pathway specific;" that is, they are dependent on the means of contaminant exposure.

The COCs, except for 1,1,1-TCA, are known carcinogens that target the liver and lungs. The potential carcinogenic effects of 1,1,1-TCA cannot be evaluated due to insufficient data on the carcinogenic effects of this compound. Each of the contaminants has harmful noncarcinogenic effects (both acute and chronic) on the central nervous system, liver, and lungs.

6.1.4 Risk Characterization

Risk characterization is the process of combining the results of the exposure and toxicity assessments. This process provides numerical quantification relative to the existence and magnitude

of potential public health concerns related to the potential release of contaminants from the site.

Exposure parameters, such as exposure frequency and duration, used in the risk assessment were obtained from Standard Default Exposure Factors guidance (EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors, OSWER Directive 9285.6-03, 1991). The exposure parameters used are shown in Table 6. As noted earlier, the summary format of this ROD focuses on inhalation and ingestion because, relative to these pathways, dermal absorption contributed very little health risks or effects.

Risk calculations are divided into carcinogenic and noncarcinogenic categories. The calculation of health risks from potential exposure to carcinogenic compounds involves the multiplication of cancer slope factors for each carcinogen and the estimated intake values for that contaminant.

Noncarcinogenic health effects are assessed by comparison of an estimated daily intake of a contaminant to its applicable reference dose. A reference dose is a provisional estimate of the daily exposure to the human population that is likely to be without an appreciable risk of deleterious effects during a portion of an individuals lifetime. The estimated daily intake of each contaminant by an individual route of exposure is divided by its reference dose and the resulting quotients are added to provide a hazard index.

Carcinogenic risk and noncarcinogenic health effects associated with OCVZ are summarized in Table 7. As shown in this table, carcinogenic risks are estimated to be below or within the acceptable risk range of 1 x 10-4 to 1 x 10-6 for all receptors under the current period and for the worker receptors under the institutional control period. An estimated two additional residential receptors out of 10,000 (2 x 10-4) are at risk of developing cancer as a result of the use of contaminated

Table 4. Constants for evaluating noncarcinogenic health effects from exposure to COCs.

Chronic reference doses

Chemical	Oral (mg/kg/day)	Inhalation (mg/kg/day)	Inhalation (æg/m3)	Subchronic RfD (mg/kg/day)
Total organ				

CCl4	7 x 10-4 a	1.8 x 10-3 b	6.1b	7 x 10-3 c	Liver
PCE	1 x 10-2 d	1 x 10-2 e	35e	1 x 10-1 f	Liver
TCE	NA	NA	NA	NA	Lung/Liver
1,1,1-TCAg	9 x 10-2 h	3 x 10-1	1 x 100	9 x 10-1	Liver

a. IRIS (2/93). Last update 10/7/92.

b. Calculated from oral RfD assuming inhalation: oral absorption ratio of 0.4 (see carcinogenicity data table).

c. HEAST (1992)

d. IRIS (2/93). Last update 4/6/92.

e. Calculated from oral RfD assuming an inhalation volume of 20 m3/day for a 70-kg adult. No correction for relative absorption efficiency.

f. HEAST (1991).

g. Information from HEAST (1991). Last IRIS update 10/7/92.

h. Notes in HEAST (1991) indicate that this value is based on extrapolation from inhalation data. The assumed relative absorption efficiency (inhalation: oral) appears to be 0.3.

Table 5. Constants for evaluating carcinogenic effects associated with exposure to the COCs.

			Slope factors	
Chemical	Weight of evidence classification	Target organ	Oral (mg/kg/day)-1	Inhalation unit risks (mg/kg/day)-1 (æg/m3)-1
CCl4a	B2	Liver	0.13	5.3 x 10-2 b 1.5 x 10-5 c
PCEd	B2	Liver	5.1 x 10-2	1.8 x 10-3 e 5.2 x 10-7
TCEf	B2	Lung,liver	1.1 x 10-2	1.7 x 10-2 1.7 x 10-6

a. Information from IRIS (accessed 2/93); last update 10/7/92.

b. Calculated from inhalation unit risk assuming inhalation rate of 20 m3/day by a 70-kg adult.

c. As described in IRIS (2/93), this value is calculated from the oral slope factor assuming that absorption efficiency via inhalation is 40% of absorption efficiency via the oral route.

d. Information from HEAST (1991). Last IRIS update 4/6/92.

e. Calculated from inhalation unit risk. No correction for inhalation absorption efficiency has been made.

f. Information from HEAST (1991). Last IRIS update 8/7/92.

Table 6. Parameters used to model inhalation and ingestion exposures by current and future receptors.

Parameter	Receptor group	RME value	Reference
Inhalation			
Respiration Rate (RR)	Adult/child	20 m3/day (total) 15 m3/day (indoor)	EPA RAGSa
Exposure Frequency (EF)	Adult/child	350 days/year	EPA RAGS
	Worker	250 days/year	
Exposure Duration (ED)	Adult	24 years	EPA RAGS
	Child	6 years	
	Worker	25 years	
Body Weight (BW)	Adult/worker	70 kilogram (kg)	EPA RAGS
	Child	15 kg	
Averaging Time (AT)	Adult	8,760 days (noncarcinogens)	EPA RAGS
	Child	2,190 days (noncarcinogens)	
	Worker	9125 days (noncarcinogens)	
	Adult/worker	25,550 days (carcinogens)	
Ingestion			

Ingestion Rate (IR)	Adult	2.0 l/day	EPA RAGS
	infant (0-3 years)	0.53 l/day	EPAb
	child (3-6 years)	0.74 l/day	EPAb
Exposure Frequency (EF)	Adult/child	350 days/year	EPA RAGS
Exposure Duration (ED)	Adult	24 years	EPA RAGS
	Child	6 years	
Body Weight (BW)	Adult	70 kg	EPA RAGS
	Child	15 kg	
Average Time (AT)	Adult	8,760 days (noncarcinogens)	EPA RAGS
	Child	2,190 days (noncarcinogens)	
	Adult	25,550 days (carcinogens)	

a. Risk Assessment Guidance for Superfund (RAGS), U.S. EPA, 1991.

b. Statement of Work RI/FS Risk Assessment Deliveries, EPA Region 10, U.S. EPA, 1990.

Table 7. Summary of baseline risk assessment results.

Receptora	Primary contributing exposure route	Exposure timeframe	Carcinogenic riskb	Noncarcinogenic risk (hazard index)c
Current Scenario (1992 to 2021)				
WorkerÄÄ200 meters	Air	1992-2016	6 in 100,000 (6 x 10-5)	2
WorkerÄÄ500 meters	Air	1992-2016	4 in 1,000,000 (4 x 10-6)	0.1
Resident adultÄÄ5,200 meters	Groundwater	1992-2021	1 in 100,000 (1 x 10-5)	0.3
Resident childÄÄ5,200	Groundwater	1992-2021	ÄÄd	0.3
Institutional Control Scenario (2022 to 2091)				
WorkerÄÄ200 meterse		2062-2086	9 in 10,000,000 (9 x 10-	

7) 0.03 Air

WorkerÄÄ500 meterse 2062-2086 2 in 1,000,000 (2 x 10-
6) 0.07 Air

Resident adultÄÄ5,200 meters 2062-2091 2 in 10,000 (2 x 10-
4) 5 Groundwater

Resident childÄÄ5,200 meters 2062-2091 ÄÄd
6 Groundwater

Post-Institutional Control Scenario (2092 to 2121)

Resident adultÄÄ200 meters 2092-2121 2 in 10,000 (2 x 10-4)
6 Groundwater

Resident childÄÄ200 meters 2092-2121 ÄÄd
5 Groundwater

Resident adultÄÄ500 meters 2092-2121 2 in 10,000 (2 x 10-4)
3 Groundwater

Resident childÄÄ500 meters 2092-2121 ÄÄd
7 Groundwater

Resident adultÄÄ5,200 meters 2092-2121 2 in 10,000 (2 x 10-4)
5 Groundwater

Resident childÄÄ5,200 meters 2092-2121 ÄÄd
5 Groundwater

a. Risks are calculated for three different distances from receptor to center of SDA. 200 meters = 656 ft, 500 meters = 1,640 ft, 5,200 meters = 17,060 ft.

b. The NCP defines an acceptable level of carcinogenic risk as less than 1 additional incidence of cancer in 10,000 to 1,000,000 individuals (i.e., 1 x 10-4 to
1 x 10-6).

c. A hazard index (the ratio of level of exposure to an acceptable level) greater than 1 indicates that there may be concern for noncarcinogenic effects.
Hazard indices listed are cumulative across all exposure pathways.

d. Carcinogenic risks are calculated for the population exposed over a period of time to contaminant concentrations for which cancer for noncarcinogenic effects.

e. Concentrations of CCl4 in the SRPA beneath the SDA is predicted by the model to peak in the year 2071 at a concentration of about 125 mg/m3 (ppb).
However, ingestion of groundwater by workers during the institutional control scenario was not considered in the risk assessment due to institutional controls
preventing the use of SRPA water above MCLs by workers.

groundwater during the latter part of the institutional control period and the post-institutional control period. The risk increases with increasing concentrations of contaminants in groundwater. Therefore, organic contamination in the vadose zone, if not addressed by a remediation alternative, could migrate to the SRPA and contaminate the groundwater to a degree that results in risks to human health of 2 x 10-4, which is slightly greater than the acceptable risk range. In addition, concentrations of CCl4, TCE, and PCE in groundwater are predicted to peak above their respective MCLs (see Figure 9).

The hazard indices estimated for the current period are less than 1 except for the worker at the SDA boundary. The estimated hazard index of 2 for the current worker is related to outdoor inhalation of organic contaminants. This estimate is based on conservative assumptions associated with exposure duration and the air model used to predict outdoor concentrations of organic contaminants. Due to the conservative nature of these assumptions, the actual hazard index for this receptor is expected to be less than 1. Generally, hazard indices greater than 1 indicate that the potential exists for noncarcinogenic effects to be seen in exposed individuals. For the institutional and post-institutional control periods, hazard indices greater than 1 were calculated for each of the residential receptors. The primary exposure routes for these hazard indices are ingestion of groundwater and inhalation of organic vapors released from indoor use of groundwater.

6.1.5 Uncertainty

Risk assessments are subject to uncertainty from inventory records, sampling and analysis, fate and transport estimation, exposure estimation, and toxicological data. Uncertainty was addressed by using health protective assumptions that systematically overstate the magnitude of health risks. This process is intended to bound the plausible upper limits of risk and to facilitate an informed risk management decision. Table 8 is a summary of risk assessment uncertainty factors and their effects on the modeling results.

6.2 Environmental Concerns

In order for organic contaminants to elicit adverse ecological impacts, credible pathways of ecological exposure must be identified. Three potential pathways of exposure are:

- Absorption or inhalation of vapors through the airborne route

- Uptake or ingestion of groundwater containing COCs which have migrated from the vadose zone to the saturated zone
- Direct exposure or uptake from burrowing or root penetration of the vadose zone contamination.

Modeling suggests that the peak concentration of volatilized COCs measured at the ground surface has already occurred and will continue to decrease with time. The groundwater pathway is not currently a complete pathway because groundwater is not being developed for irrigation at the Site. The concentration of COCs in groundwater are expected to peak and begin to decline during the institutional control period. Lastly, because COC concentrations in soil were extremely low or

Table 8. Uncertainty factors, OU7-08, INEL.

Uncertainty factor	Effect of uncertainty	Comment
	Sampling and analysis	
Vapor plume extent	May slightly over- or under-estimate risk	Since the source term is static, a larger vapor plume would affect a larger exposure area, but result in seduced concentrations.
Detection limits/COC screening	May slightly over- or under-estimate risk	Measurements used in COC screening had different detection limits in the laboratory equipment than in the field equipment. However, since maximum concentrations are used in screening, the effect is expected to be small.
Exclusion of surface soil from the sampling and analysis program	May slightly under-estimate risk	Since the COCs are volatile, they would volatilize from surface soils. Therefore, sampling

and analysis was not conducted for this medium. Surface soil is the subject of OU7-05.

	Fate and transport estimation	
Assumed house volume and ventilation rate	May slightly over- or under-estimate risk	The indoor concentration of soil gas penetrating the foundation depends on indoor ventilation.
Near field indoor soil-gas concentrations	May over- or under-estimate risk	Indoor soil-gas concentrations at 200 m were assumed equal to modeled concentrations at 500 m, since the model assumptions do not facilitate near-field resolution.
Source term assumptions	May over- or under-estimate risk	The heterogeneous sources (pits) were assumed to be a homogeneous disk of 200 m in radius. Chloroform may have been present in the source term, but not recorded.
Natural infiltration rate	May over-estimate risk	A conservative value was used for this parameter.
Moisture content	May over- or under-estimate risk	This varies seasonally in the upper vadose zone and may be subject to measurement error.

Table 8. (continued).

Uncertainty factor	Effect of uncertainty	Comment
	Fate and transport estimation (continued)	
Modeling use of a 100 foot	May over- or under-estimate	Active thickness of

SRPA is 250 ft.

screen interval	risk	
Volume of theoretical mixing term area for the space in near-field air used, dispersion model flux will be	May over-estimate risk	The initial source vadose zone model was although the surface emitted over a larger area.
	Exposure estimation	
Receptor locations in the contaminant tend to exposure.	May over- or under-estimate risk	Receptors were located direction of highest concentrations which would overestimate actual However, if a resident lives on top of the SDA, the calculated exposure is an underestimation of actual exposure.
Exposure duration individual reside at 30	May over-estimate risk	The assumption that an will work at the RWMC or the INEL boundary for 25 or years is conservative.
Exclusion of food pathway homegrown negligible	May under-estimate risk	VOC uptake by vegetables is considered a exposure route.
Non chemical-specific values constants (e.g., exposure parameters such as inhalation calculations rates, exposure duration, etc.)	May over-estimate risk	Conservative or upper bound were used for all parameters incorporated into intake
Contaminant concentrations contaminant centered	May over-estimate risk	Assumptions regarding concentrations as averages

		around peak concentrations may not characterize actual exposures.
Assumed aquifer mixing depth of 100 ft.	May over- or under-estimate risk	Wood (1991) indicates that the active depth of the aquifer is estimated to be 250 ft. However, for receptors close to the source, mixing depth is mostly dependent on the screened interval of the well.

Table 8. (continued).

Uncertainty factor	Effect of uncertainty	Comment
	Exposure estimation (continued)	
Assumed hydraulic conductivity of 700 ft/day	May over- or under-estimate risk	Higher hydraulic conductivities may send the plume to receptors faster, but may disperse contaminants faster as well.
Model does not consider biotic decay	May over-estimate risk	Biotic decay would tend to reduce contamination over time. However, the modeling effort did not account for this process.
Exclusion of chloroform	May under-estimate risk	Chloroform may be either a source or transformation product. Its detection is sporadic and was not modeled.
Exclusion of transformation products	May under-estimate risk	Not all transformation products of the identified organic

compound
were evaluated.

Toxicological data

Use of cancer slope factors	May over estimate risk	Potencies are upper 95th percentile confidence limits. Considered unlikely to underestimate true risk.
Critical toxicity values derived primarily from animal studies	May over- or under-estimate risk	Extrapolation from animal to humans may induce error due to differences in absorption, pharmacokinetics, target organs, enzymes, and population variability.
Critical toxicity values derived primarily from high doses, most exposures are at low doses	May over- or under-estimate risk	Assumes linear at low doses. Tend to have conservative exposure assumptions.
Critical toxicity values and classification of carcinogens	May over- or under-estimate risk	Not all values represent the same degree of certainty. All are subject to change as new evidence becomes available.

Table 8. (continued).

Uncertainty factor	Effect of uncertainty	Comment
Toxicological data (continued)		
Lack of RfDs	May under-estimate risk	Inhalation RfDs are not available for TCE.
Effect of absorption	May over- or under-estimate risk	The assumption that absorption is equivalent across species is implicit

			in the derivation of the critical toxicity values. Absorption may actually vary with chemical.
Dermal absorption toxicity values	May slightly under-estimate risk	The unavailability of consensus absorption values does not facilitate	comparison of absorbed dose to toxicity constants based on administered dose.

not detected, plants and burrowing animals are not expected to be adversely affected by COCs at the Site. Therefore, while it is acknowledged that potential ecological receptors are currently present on-Site, contact with COCs is unlikely under current Site conditions.

Consequently, an ecological risks assessment was not conducted for the OCVZ RI/FS. The ecological impacts from OCVZ COCs will be evaluated in the comprehensive WAG 7 RI/FS (OU 7-14).

6.3 Basis for Response

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or, the environment.

7. DESCRIPTION OF ALTERNATIVES

Remedial action alternatives were developed and analyzed in detail for the OCVZ operable unit. Prior to developing alternatives, remedial action objectives were established. These objectives and descriptions of the developed alternatives are included in the following sections.

7.1 Remedial Action Objectives

The intent of the remedial action objectives is to set measurable goals for protection of human health and the environment. The goals are designed specifically to mitigate the potential adverse effects that could result from the continued migration of the vadose zone COCs to the air or groundwater.

The risk assessment indicates that there is a current and future risk to workers and a future risk to the public due to the organic contaminants present in the vadose zone beneath and within the

immediate vicinity of the RWMC. For workers, the primary contributing exposure route is inhalation of air contaminated with organic vapors that migrate upward from the vadose zone to the atmosphere. Exposure to contaminated groundwater was not considered a complete exposure pathway for current and future on-site workers due to the fact that if contaminant concentrations in the RWMC production well exceed permissible standards, the water would be treated or water would be supplied to workers from an uncontaminated source. For public receptors, the primary contributing exposure route was the use of groundwater. The baseline risk assessment concluded that future residential exposure to groundwater both on- and off-site would result in carcinogenic risks and noncarcinogenic hazards that are unacceptable. In addition, modeling of contaminant migration through the vadose zone and into the SRPA indicated that contaminant concentrations in the aquifer would continue to increase until sometime around the year 2071, at which time they would begin to decrease (see Figure 9 in Section 6). The resultant contaminant concentrations in groundwater could continue to remain above Federal and state MCLs for a period of several hundred years.

The results of the RI and baseline risk assessment indicated that the contamination of groundwater due to the migration of the vadose zone organic contaminants to the SRPA will present the most significant future risk to human health if no action is taken. Specifically, the baseline risk assessment indicated that the highest risk to a human receptor from the inhalation of contaminants emanating from the vadose zone is on the order of 10-5, while the highest risk from the future ingestion of contaminated groundwater is on the order of 10-4. The baseline risk assessment also shows that the risk from the inhalation of vapors emanating from the subsurface is at or below the 10-6 level for all of the future risk scenarios. That is, contaminant flux to the atmosphere has already peaked and will continue to decrease naturally. These results suggest that the primary objective of the FS should be to develop alternatives that would prevent vapor-phase organic contaminants in the vadose zone from reaching groundwater in concentrations that would result in future groundwater contaminant concentrations that exceed Federal and state MCLs. The MCLs result in an overall risk value within the acceptable range of 10-4 to 10-6. As such, the primary remedial action objective, and the focus of remedial action alternative development, is to ensure that risks to future groundwater users are within acceptable guidelines and that future contaminant concentrations in the aquifer remain below Federal and state MCLs. To ensure that this remedial action objective is

met and maintained, a long-term groundwater and soil vapor monitoring program would be conducted. The monitoring program would be designed to provide an early indication of the possibility of future groundwater contamination above acceptable levels.

Remedial action objectives also include the identification of preliminary remediation goals (PRGs) that are established based on both risk and frequently used standards referred to as Applicable or Relevant and Appropriate Requirements (ARARs). PRGs are typically expressed as contaminant concentrations (i.e., cleanup levels) desired after a remedial action for various contaminated media. Contaminants associated with OCVZ are primarily organic vapors of CCl_4, TCE, PCE, 1,1,1-TCA, and chloroform present in the vadose zone. Because there are currently no ARAR-based standards available for determining cleanup levels for organic vapors in subsurface soils, an approach using groundwater MCLs to estimate PRGs for OCVZ was used. Such an approach relied on the contaminant fate and transport modeling, which was used as part of the baseline risk assessment, to estimate cleanup levels that would satisfy the primary remedial action objective. The fate and transport modeling predicts PRG levels for CCl_4, which is the COC present in the most

significant concentrations, that may range from 30 to 200 ppmv, depending on the location within the vadose zone. The other COCs are predicted to have similar PRG levels that also vary depending on the location within the vadose zone. The PRGs only apply to alternatives that focus on removal of the COCs from the vadose zone; however, the remedial action objectives apply to any alternative.

The PRG range of 30 to 200 ppmv for CCl_4 is an estimate based on information available to date. Any alternative that removes COCs from the vadose zone would also include steps to further define characteristics (i.e., extent and concentrations) of the vadose zone COCs. Better definition of thc COC characteristics will allow PRGs to be refined. The future refinement of PRGs will be agreed upon by the DOE, EPA, and the IDHW. Such a refinement will increase the three agencies' confidence that remedial action objectives can be met and maintained. It should be noted that PRGs for the OCVZ operable unit cannot be identified as discrete COC concentrations in the vadose zone.

Alternatives designed to achieve the remedial action objectives were assembled using combinations of the following general response actions.

- ù Institutional ControlsÄÄincludes soil vapor and groundwater monitoring. Monitoring is effective for observing changes in vadose zone as well as groundwater contaminant concentrations and in identifying imminent hazards.

- ù ContainmentÄÄonly option for containment that can be implemented for the OCVZ is capping. A cap over the SDA may effectively prevent water from reaching the source pits and contributing to leaching of contaminants; thereby, minimizing the migration of contaminants to the environment. A cap would minimize migration of contaminants to the atmosphere at the surface of the SDA.

- ù Vapor ExtractionÄÄincludes methods to extract vapor from the various regions of the vadose zone beneath thc RWMC.

- ù In-Situ Treatment of VaporsÄÄonly reasonable option for in-situ treatment is bioremediation.

- ù Ex-Situ Treatment of VaporsÄÄincludes several options for biological, physical, thermal, and chemical treatment of vapors recovered from the vadose zone. Ex-situ treatment would attempt to reduce the toxicity, mobility, and volume of recovered contaminants.

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the Feasibility Study (FS) identified alternatives that (a) achieve the stated remedial action objectives, (b) provide overall protection of human health and the environment, (c) meet ARARs, and (d) are cost-effective.

The alternatives evaluated in the FS for OCVZ were Alternative 0ÄÄNo Action; Alternative 1ÄÄ Containment of Vadose Zone Vapors by Capping; Alternative 2ÄÄExtraction/ Treatment by Vapor Vacuum Extraction (VVE); Alternative 3ÄÄExtraction/Treatment by VVE with Vaporization Enhancement; and Alternative 4ÄÄIn Situ Bioremediation. Alternatives 3 and 4 propose to use a catalytic oxidation unit to treat vapor. This technology is fairly new and may be substituted with other

technologies such as carbon adsorption, biological treatment, ultraviolet treatment, etc. if implementation of the catalytic oxidation system proves to be ineffective or difficult due to site-specific circumstances. Although Alternative 4 was developed, it was not analyzed in detail with the other alternatives since it was decided early in the FS process that in situ bioremediation would be ineffective as well as very difficult to implement in the fractured basalt region beneath the RWMC. Descriptions of Alternatives 0 through 3 are provided in the following sections.

Substantive action-specific ARARs are identified for Alternatives 1-3. These ARARs, are listed in Table 9. Note that there are no action-specific ARARs for the No Action Alternative. The majority of ARARs focus on the management of materials and waste, including the regulation of air emissions from vapor treatment and remediation activities at the OCVZ operable unit. Specific requirements are:

- Characterization of hazardous wastes that may be generated from remediation activities
- Control of emissions from vapor treatment and recovery systems
- Measures to control fugitive dust from well drilling and earth moving.

No chemical-specific ARARs are identified for the considered alternatives. Regulations have not been promulgated specific to soil cleanup levels for vapor-phase contaminants. Also, no location-specific ARARs are identified as there are no known threatened and endangered species, wetlands, rivers, or floodplains located in the area of potential remedial activities under the considered alternatives.

Conservative calculations of organics in or contacting equipment demonstrate that concentrations by weight of hazardous air pollutants are well below the threshold criteria of applicability for the National Emission Standards for Hazardous Air Pollutants (NESHAP) program involving equipment leaks (40 CFR 61.240).

7.3 Alternative 0ÄÄNo Action

Under this alternative, no attempt would be made to contain, treat in place, or extract and treat the organic contaminants present within the vadose zone. Instead, only long-term groundwater and soil vapor monitoring would be implemented. Groundwater monitoring is necessary to detect

contaminant concentrations in the SRPA. Soil vapor monitoring is necessary to track the migration of contaminant vapors in the vadose zone. Changes in contaminant concentrations in groundwater and soil vapor would be evaluated to determine whether measures must be taken to minimize potential risks to public health and the environment. It was assumed that monitoring would continue for a period of 30 years under the No Action Alternative. This alternative was a "baseline" case against which the other alternatives were compared.

There are no ARARs identified for the No Action Alternative. Net present value costs for implementing groundwater and soil vapor monitoring under this alternative for the next 30 years are estimated to be $4.1 million.

Table 9. Summary of ARARs and TBC criteria for OCVZ alternatives.

Statute	Regulation	Alternative 0 no action	Alternative 1 containment	Alternative 2 extraction/ treatment by VVE	Alternative 3 extraction/treatment by VVE with VVE enhancement
RCRA	IDAPA 16.01.050.5005, (40 CFR 261.10, 261.20-261.24) "Idaho Rules, Regulations and Standards for Hazardous Waste"	Not ARAR	Not ARAR	R/Yes	R/Yes
	40 CFR 264.600 Subpart X, Miscellaneous Units	Not ARAR	Not ARAR	R/Yes	R/Yes
Clean Air Act	40 CFR 61.92, "National Emission Standards for Radionuclide Emission from DOE Facilities"	Not ARAR	Not ARAR	A/Yes	A/Yes
	IDAPA 16.01.01.577, "Ambient Air Quality Standards for Specific Air Pollutants"	Not ARAR	Not ARAR	A/Yes	A/Yes
Idaho Toxic Air	IDAPA 16.01.015.85	Not ARAR	Not ARAR		

A/Yes A/Yes
Pollutants Non-
Carcinogenic
Increments

Idaho Toxic Air IDAPA 16.01.015.86 Not ARAR Not ARAR
A/Yes A/Yes
Pollutants
Carcinogenic
Increments

Table 9. (continued).

Statute Regulation Alternative 0 Alternative 1
Alternative 2 Alternative 3
no action containment extraction/
extraction/treatment
treatment
by by VVE with

VVE enhancement

Idaho Rules for IDAPA 16.01.01.651 Not ARAR A/Yes
A/Yes A/Yes
Control of Fugitive
Dust

Idaho Demonstration IDAPA 16.01.01.210.10 Not ARAR Not ARAR
R/Yes R/Yes
of Preconstruction
Compliance with
Toxic Standards

DOE Order DOE 5820.2A, "Radioactive TBC TBC TBC
TBC
Waste Management"

A = Applicable

R = Relevant and Appropriate

TBC = To Be Considered.

7.4 Alternative 1ÄÄContainment of Vadose Zone Vapors by Capping

Alternative 1 consists of the installation of a cap over the SDA to minimize
infiltration of
rainwater, surface water, and snowmelt into thc subsurface. Capping would reduce the
amount of
infiltrating moisture that reaches the waste buried in the SDA and contributes to

downward migration of organic contaminants in the vadose zone. Capping is the systematic covering of an area with layers of soil, clay, and/or synthetic material that would be used, in this case, to provide a relatively impermeable barrier to surface water. Typical applications of capping are municipal landfills where contaminated water (i.e., leachate) is formed via infiltrating surface water. A cap of the SDA would consist of three layers of earthen fill over the entire 88-acre surface of the SDA.

Under Alternative 1, removal and treatment of organic contaminants would not occur. By minimizing the infiltration of water, capping would decrease the contact of water with organic contaminants at shallow depths directly beneath the disposal area; thus, migration of organic contaminants dissolved in infiltrating moisture would be reduced. However, even with capping, contaminants would continue to migrate both vertically and laterally in the vadose zone, primarily in thc vapor phase.

The only ARAR identified for this alternative is Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.651). This ARAR would be met during the construction of a cap through appropriate engineering controls to minimize dust generation.

The net present value cost of Alternative 1 is estimated to be $43.3 million, including a nine million dollar contingency to cover unanticipated costs associated with capping materials acquisition. It is expected that it would take no more than 20 workers five years to construct the cap. As such, there are no significant socio-economic impacts associated with this alternative. Periodic maintenance of the cap would be needed to maintain its integrity. In addition, soil vapor and groundwater monitoring would be conducted to monitor the migration of organic contaminants in the vadose zone and SRPA.

7.5 Alternative 2ÄÄExtraction/Treatment by VVE

Alternative 2 would use VVE to remove organic vapors from the vadose zone. Extracted vapors would subsequently be treated at the surface. This alternative would utilize the existing VVE extraction well and several additional extraction wells which would be located in areas of the SDA known to have significant levels of organic vapors in the vadose zone. The existing VVE system was installed to determine the viability of VVE as a technology for the recovery and treatment of the

vadose zone contaminants. The system consists of one vapor extraction well, a blower, and a carbon adsorption vapor treatment system. The extraction well is configured to draw vapors at a flowrate of approximately 200 cubic feet per minute from the 110-foot sedimentary interbed. This configuration recovers vapor organic contaminants from above and below the interbed. Figure 10 shows a conceptual cross-sectional view of the existing VVE system with geological features of the vadose zone and a conceptual representation of the vapor contaminant plume included.

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Under a phased approach to Alternative 2, the existing VVE system would be augmented with additional vapor extraction wells, monitoring wells, and vapor treatment equipment. The first phase would include the installation of five additional vapor extraction wells (see Figure 11) to augment the contaminant recovery capability of the existing vapor extraction well. Additional vapor treatment units and vapor monitoring wells would support these five wells. Subsequent phases may also include more vapor extraction wells, monitoring wells, passive venting wells, and vapor treatment units. In order to clarify the range of cost for Alternative 2, it was assumed that a second phase would involve the installation of four additional vapor extraction wells and accompanying support equipment, for a total of 10 wells (including those installed under the first phase). A maximum number of fourteen vapor extraction wells and accompanying support equipment would be expected under a third and final phase of Alternative 2. A more detailed discussion on the use of phases under Alternatives 2 is included below. In addition to contaminant recovery and treatment, Alternative 2 would include long-term soil vapor and groundwater monitoring.

Each vapor extraction well would be linked to a catalytic oxidation unit or equivalent vapor treatment system. Such a treatment system could typically achieve a sufficient contaminant destruction efficiency for the extracted vapors, and be capable of maintaining an airflow that would

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range between 125 and 150 cfm. Catalytic oxidation is basically a thermal process that is capable of

converting chlorinated hydrocarbons (such as the CCl_4, TCE, PCE, 1,1,1-TCA, and chloroform present at OCVZ) into carbon dioxide, water, and hydrochloric acid (HCl) gas. It accomplishes thermal destruction at a relatively low temperature in the presence of a catalyst. It is expected that under a possible third phase of this alternative, which would entail the most extensive use of catalytic oxidation, the HCl emission would be below applicable air discharge requirements, even without scrubbing for acid gas removal. Overall, catalytic oxidation was favored as the representative process option for air treatment because of its proven ability to destroy types of contaminants present at OCVZ, its availability in modular compact units that could be placed adjacent to each vapor extraction well, and its relatively low operation and maintenance costs. Potentially, one catalytic oxidation unit would be dedicated to each extraction well due to the large distances between wells. The units would require fuel such as propane to maintain the contaminant oxidation process.

The FS considered other vapor treatment technologies such as biological treatment, ultraviolet treatment, and carbon adsorption. Based on available performance data, biological and ultraviolet treatment would require further development in order to be a viable vapor treatment option for the large-scale application that would be required under Alternative 2. Carbon adsorption has already been demonstrated as a viable vapor treatment option during the OCVZ treatability studies; however, difficulties associated with the handling and regeneration of contaminant-saturated carbon must be resolved in order to utilize this technology for large-scale vapor treatment at the RWMC. Further investigation of available air treatment technologies that would be most appropriate to support VVE at OU 7-08 would continue through the design of Alternative 2.

Each of the ARARs identified for this alternative would be met through appropriate engineering controls such as vapor treatment. Through the use of catalytic oxidation for vapor treatment, it is expected that no residual treatment wastes would be generated under Alternative 2. Net present value costs for implementing this alternative range from $12.9 to $32.4 million. The cost range corresponds to first phase operations through third phase operations for a period of two years to six years, respectively. It has been assumed that cleanup goals would be attained at some point

in the zero to six year timeframe. The costs also include an assumption of thirty years for soil vapor and groundwater monitoring. It is estimated that a maximum of ten workers would be required to complete this alternative. As such, there would be no significant socio-economic impacts associated with this alternative.

Phases of Alternative 2

The potential progression of Alternative 2 to a second and third phase would be dependent on the ability of the vapor extraction system to achieve the remedial action objectives, i.e., ensure that risks to future groundwater users are within acceptable guidelines and that future contaminant concentrations in the aquifer remain below Federal and state safe drinking water standards. The performance of Alternative 2 would be reviewed on a two year (24 month) cycle, with each phase of operation under the alternative expected to last at least two years. The actual duration of each phase would be dependent on elements such as equipment procurement and installation that may be involved with each transition; however, the following description of the review cycle assumes that transitions would occur in a timely fashion every 24 months.

The first review would commence after 18 months of operation under the first phase. Data accumulated over these 18 months would be analyzed and a decision made by DOE, EPA, and the IDHW as to what would comprise the second phase of Alternative 2 (if a second phase is necessary to attain remedial action objectives). Alternative 2 would continue under first phase operations up to 24 months, at which time, after the data analysis period, a transition to the second phase would occur. Data analyzed would be relevant to the attainment of remedial action objectives (e.g., contaminant recovery rates, equilibrium contaminant concentrations in the vadose zone, etc.).

Considerable engineering judgement would be used in deciding what modifications to the first phase would be made to continue Alternative 2 into a second phase in order to achieve remedial action objectives. Potential options for continuing Alternative 2 into a second phase include: (1) continuing operation with no changes to the first phase of operation; (2) adding more vapor extraction wells; (3) extracting from different depths within existing extraction wells; (4) converting monitoring wells into extraction wells; and (5) adding and/or converting existing wells to passive

venting wells. These options and others not currently identified may be carried out singly or in combinations, with the intent being to ensure that Alternative 2 achieves remedial action objectives.

The need for additional phases beyond a second phase would be evaluated using the same general approach as outlined above for the transition between the first and possible second phase. If a second phase is implemented, then the data evaluation and decision regarding a possible third phase would begin 18 months into the second phase (i.e., 42 months from the start of Alternative 2) with the third phase beginning, if necessary, approximately 48 months from the start of Alternative 2. Potential options for continuing Alternative 2 into a third phase would be similar to those listed above. This type of phased operation would continue through phases lasting 24 months each until remedial action objectives are achieved.

7.6 Alternative 3ÄÄExtraction/Treatment by VVE with Vaporization Enhancement

Alternative 3 would include VVE (as described for Alternative 2) as the primary contaminant recovery method with radio frequency heating to enhance the vaporization of organic contamination in the vadose zone. Radio frequency heating would target contaminants that have partitioned to the aqueous phase in the vadose zone (i.e., organic contaminants dissolved in soil moisture or perched water) or have adsorbed onto material in the sedimentary interbeds. Radio frequency heating would use strategically placed antennae in boreholes to raise the temperature in discrete areas of the subsurface. The increased temperature would induce volatilization of the organic contaminants. Volatilized contaminants would then be recovered by the VVE system. The temperature in the subsurface would be raised gradually to allow the VVE system to recover organic contaminants as they volatilize. The VVE system under Alternative 3 would include 14 vapor extraction wells and 14 boreholes installed to the 110-foot interbed to accommodate the insertion of the radio frequency heating antennae.

Each of the ARARs identified for this alternative would be met as discussed for Alternative 2. Net present value costs for implementing Alternative 3 are estimated to be $59.9

million. This cost is based on operation of a full network of VVE wells and no more than two radio frequency heating antennae operating at any given time over a period of six years. The costs include an assumption of thirty years for soil vapor and groundwater monitoring. It is estimated that no more than ten workers would be required to complete this alternative. As such, there are no significant socio-economic impacts associated with Alternative 3.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires that each remedial alternative be compared according to nine evaluation criteria that have been developed to serve as a basis for conducting the detailed analyses of alternatives and for subsequently selecting an appropriate remedial action. The evaluation criteria are divided into three categories: (1) threshold criteria that relate directly to statutory findings and must be satisfied by each chosen alternative; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction of toxicity, mobility, and volume, and cost; and (3) modifying criteria that measure the acceptability of the alternatives to State agencies and the community. The following sections summarize the evaluation of the candidate remedial alternatives according to these criteria.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives (except the No Action Alternative) for further consideration as potential remedies.

8.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether an alternative provides protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternatives 2 and 3, Extraction/Treatment by VVE and Extraction/Treatment by VVE with Vaporization Enhancement, respectively, satisfy the criterion of overall protection of

human health and the environment. The alternatives accomplish this by recovering and treating organic vadose zone contaminants, thus, preventing unacceptable levels of contaminant migration to the SRPA and also potentially reducing the mass flow of contaminants to the surface soils and atmosphere above the RWMC.

Alternative 1, Containment of Vadose Zone Contaminants by Capping, also satisfies this criterion to the degree that it protects human health by potentially reducing the level of contaminant migration to the SRPA and by reducing the mass flow of contaminants to the atmosphere at the surface of the RWMC. It is not clear, however, how much of a reduction in the amount of organic contaminants reaching the SRPA would occur under this alternative. This uncertainty stems in part from the potential migration of contaminants at greater depths that may still be affected by water infiltrating from areas outside of the SDA. Capping would not affect organic contaminants in the vadose zone that have migrated laterally beyond the boundary of the SDA. Although not considered an ARAR for this OU, it is likely that contaminant concentrations in the aquifer would exceed MCLs in the future under this alternative.

Overall, each of the alternatives, with the exception of Alternative 0, No Action, would result in a lifetime excess cancer risk within the acceptable range of 1 x 10-4 to 1 x 10-6. Also, hazard indices associated with the COCs would be reduced to acceptable levels. Alternative 1 would accomplish this by reducing the migration of contaminants to the SRPA through a reduction in moisture infiltration at the surface of the SDA. Alternatives 2 and 3 would accomplish this by recovering and treating the most significant levels of vadose zone contaminants present. Although there is some uncertainty in the modeling results, it is believed that the No Action Alternative would not satisfy the criterion of Overall Protection of Health and the Environment.

8.1.2 Compliance with ARARs

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with identified substantive applicable requirements identified under Federal and state laws. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable but are relevant and appropriate, in other words, requirements that pertain

to situations sufficiently similar to those encountered at a Superfund site so that their use is well suited to the site. Combined, these are referred to as ARARs. State ARARs are limited to those requirements that are (a) promulgated, (b) uniformly applied, and (c) are more stringent than Federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical, location, and action-specific requirements.

Three of the remedial alternatives considered for OCVZ comply with the identified ARARs through engineering controls and operating procedures. ARARs are not identified for the No Action Alternative since no treatment or containment activities are proposed with this alternative. A summary of the ARAR analysis is presented in the Summary of Alternatives section and listed in Table 9. The action-specific ARARs focus on management of materials and waste and the regulation of air emissions that may result from remediation activities at the OCVZ operable unitÄÄno chemical- and location-specific ARARs are identified. The specific substantive requirements of the action- specific ARARs are:

- Identification of hazardous wastes that may be generated from remediation activities
- Control of emissions from vapor treatment and recovery systems
- Measures to reduce potential fugitive dust from well drilling and capping activities.

8.2 Balancing Criteria

Each alternative that satisfies the threshold criteria is evaluated against each of the five balancing criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. Each criterion is further explained in the following sections.

8.2.1 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of alternatives in maintaining

protection of human health and the environment.

Alternatives 2 and 3 provide the greatest level of long-term effectiveness and permanence by targeting for recovery and treatment vapor contaminants present throughout the upper portion of the vadose zone. Alternative 2 provides a slightly lower level of long-term effectiveness than Alternative 3 because it does not incorporate an option to enhance contaminant recovery. In other words, Alternative 2 has a slightly greater potential than Alternative 3 to leave untreated contaminants in the vadose zone, although this potential is considered to be fairly small because the RI did not indicate that there was a significant amount of the COCs partitioned to perched groundwater and/or the sedimentary interbeds; i.e., regions of the vadose zone that would be targeted for enhanced recovery if contaminants were prevalent there. A degree of risk would remain with Alternatives 2 and 3 because it is not possible to remove and treat all of the vadose zone organic contaminants.

Alternative 1 also provides long-term effectiveness and permanence, but to a lesser degree than Alternatives 2 and 3 due to uncertainties associated with its performance and due to its lack of contaminant removal and treatment. That is, Alternative 1 is a less reliable remedy, and the degree of risk remaining after it is implemented would be greater than the risk remaining under Alternatives 2 or 3.

The No Action Alternative provides the lowest level of long-term effectiveness and permanence as it provides no recovery or measures to reduce the migration of contaminants through the vadose zone toward the SRPA.

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies, which permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

Alternatives 2 and 3 each provide a reduction in the volume of organic contaminants present in the vadose zone. The reduction in volume is accomplished by removing vapors with a VVE system

and treating the removed organic contaminants. Alternative 3 offers an advantage over Alternative 2 because it has a greater potential to achieve the necessary organic contaminant removal more effectively by enhancing the recovery of the VVE system through heating of areas of the vadose zone. The overall improvement in contaminant recovery afforded by Alternative 3 over Alternative 2 cannot he fully evaluated at this time. It is reasonable to assume, however, that some benefit to contaminant recovery would be realized.

Alternative 1 does not provide any treatment of the contaminants present; however, it does limit the mobility of contaminants present in the vadose zone by minimizing the infiltration rate directly below the SDA. The No Action Alternative provides no reduction in toxicity, mobility, or volume of the contaminants present in the vadose zone.

8.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the effects of each alternative during its construction and implementation phase until remedial action objectives are achieved. Under this criterion, the alternatives are evaluated with respect to their impacts on human health and the environment during implementation of the alternative.

In general, alternatives requiring the least amount of construction and/or operation and handling of equipment, residual wastes, etc. rank the highest in terms of short-term effectiveness. As such, the No Action Alternative ranks high under this criterion because it requires no additional on-site activities and does not result in additional acute hazards to the public or the environment.

Alternative 2 ranks slightly higher than Alternative 3 because it is simpler in terms of the amount of equipment and operations personnel involved. Each of these alternatives has a slight potential for worker risks through physical hazards associated with borehole installation and operation/maintenance of the contaminant treatment system. Alternative 3 has additional worker risk associated with the operation of the radio frequency heating system (e.g., electrical and heating hazards). There would be no significant increase in potential risk to the public under any of these treatment alternatives. This is mainly due to the fact that the bulk of the contaminants would remain isolated from the surface environment in their present form within the vadose zone

beneath the RWMC. Those contaminants brought to the surface would be controlled by a surface-based vapor treatment system designed to destroy contaminants on-site. The operation of this treatment system would be monitored to ensure that releases of contaminants to the environment do not exceed acceptable air emission levels.

Alternative 1 ranks the lowest of the considered alternatives under this criterion. This alternative would require a significant level of construction activities associated with the installation of a cap over the SDA. Potential risks to workers, including risks associated with the transportation of needed construction materials to the RWMC, outweigh all other elements under short-term effectiveness.

8.2.4 Implementability

The implementability criterion has the following three factors requiring evaluation: (1) technical feasibility, (2) administrative feasibility, and (3) the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. Administrative feasibility generally includes an evaluation of the coordination of actions between agencies, planning, and personnel training. In terms of services and materials, an evaluation of the following availability factors is required: necessary equipment and specialists, prospective technologies, and cover materials.

Each of the alternatives retained for detailed evaluation is implementable. Alternative 3 ranks lower than Alternatives 2 or O for implementability because of its slightly greater complexity in equipment procurement, installation and operation. Alternative 1 ranks lower than all of the alternatives because of potential difficulties associated with construction of the cap, including: coordination with potential cleanup actions for other OUs at the RWMC (this is an administrative difficulty) and procurement of extensive amounts of materials.

Long-term monitoring under these alternatives would detect any serious failure in recovering

or containing vadose zone contaminants, allowing appropriate steps to be taken to preclude significant exposures to contaminated groundwater from the SRPA. Each of the alternatives ranks equally with regard to the implementability of a long-term monitoring program.

8.2.5 Cost

In evaluating project costs, an estimation of the net present value of capital costs and operation and maintenance costs is required. In accordance with CERCLA guidance, the costs presented are estimates (i.e., -30% to +50%). Actual costs could vary based on the final design and detailed cost itemization. The cost estimates for the alternatives analyzed for OCVZ are presented in Table 10. Note that the costs presented for Alternative 2 are provided for each of the three phases of operation that may be implemented. The total cost of each phase is cumulative in that it includes costs from each prior phase.

8.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. For both of these criteria, the factors that are considered include the elements of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

Table 10. OCVZ alternative cost estimates (net present value).

Cost element	Alternative 0 (no action)	Alternative 1	Alternative 2 Phase I	Alternative 2 Phase II	Alternative 2 Phase III	Alternative 3
Construction	0	39,118,000	3,013,000	5,036,000	6,893,000	8,296,000
Operation and Maintenance	0	140,000	4,955,000	11,443,000	19,071,000	45,211,000
Post-Closure Monitoring	4,069,000	4,069,000	4,888,000	5,495,000	6,393,000	6,403,000

Total	4,069,000	43,330,000	12,860,000	21,970,000	32,360,000	59,910,000

8.3.1 State Acceptance

The IDHW concurs with the selected remedial alternative, Extraction/Treatment by VVE. The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, this ROD, and other project activities such as public meetings.

8.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the Proposed Plan. Specific comments are responded to in the attached Responsiveness Summary portion of this document.

9. SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE-ID, EPA, and IDHW have selected Alternative 2ÄÄExtraction/Treatment by VVE as the most appropriate remedy for OCVZ, OU 7-08 at the RWMC. In terms of public risk, fate and transport modeling indicates that there is a potential unacceptable risk to future residential receptors using groundwater beginning at about the year 2062. The modeling also indicated that Federal and state drinking water standards would be exceeded for CCl4, TCE, and PCE due to the migration of these contaminants to the SRPA. Drinking water standards could potentially be exceeded for these contaminants beginning in about 1997 and extending for several hundred years. The exposure of hypothetical future residents to contaminants in groundwater led to the selection of Alternative. The extraction of the most significant concentrations of contaminants from the vadose zone with subsequent treatment of the contaminants will reduce the amount of contaminants that will migrate to the SRPA. Extraction/treatment by VVE is believed to be the best alternative for minimizing public risk and providing long-term protection of the SRPA. The success of the VVE treatability study conducted at the RWMC supports the selected remedy. The phased approach of the selected remedy provides a high level of assurance that remedial action objectives will be achieved in a cost-effective manner.

9.1 Extraction/Treatment by VVE Description

The major components of Alternative 2ÄÄExtraction/Treatment by VVE include vapor extraction, vapor treatment, and institutional controls such as long-term subsurface vapor and groundwater monitoring. The selected alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the nine CERCLA evaluation criteria. DOE-ID, EPA, and IDHW believe the preferred alternative is protective of human health and the environment, complies with applicable federal and state regulations, and is cost-effective.

Alternative 2 focuses on the extraction of vapor-phase organic contaminants from the vadose zone beneath the RWMC through the use of VVE. Alternative 2 will commence with extraction via the existing vapor extraction well that supported VVE tests and five additional vapor extraction wells located to recover the most significant concentrations of vapor-phase organic contaminants from the vadose zone (see Figure 11). This arrangement of six vapor extraction wells is considered the first phase of Alternative 2. Extracted vapors will be treated at the surface to destroy the organic contaminants. Vapor monitoring wells will also be installed to monitor changes in contaminant concentrations in the vadose zone as a result of the vapor extraction operations. If, following an evaluation of the implemented remedy (approximately two years after implementation), the agencies conclude that data from modeling and monitoring show that vadose zone contamination is not being sufficiently reduced to prevent Federal and state MCLs from being significantly exceeded in the aquifer (see Section 9.2), additional phases of Alternative 2 may be proposed. It is expected that there would be no need for Alternative 2 to be expanded beyond a third phase of operation. A third phase could entail the operation of up to approximately fourteen vapor extraction wells (assumed for cost estimating purposes) located at and within the vicinity of the RWMC. A detailed description of the use of phases under Alternative 2 is provided in Section 7.5 of this ROD.

In addition to the extraction and treatment of the vadose zone contaminants, Alternative 2 will include long-term groundwater and soil vapor monitoring to confirm the ability of the vapor extraction system to prevent contaminants from migrating to the SRPA at levels that would result in unacceptable groundwater contaminant concentrations. Such monitoring will continue after remediation to verify that organic contaminant concentrations in the vadose zone and

groundwater remain below acceptable levels.

9.2 Remediation Goals

The purpose of Alternative 2 is to reduce the concentration of organic contaminants presently in the vadose zone and, consequently, the amount of contaminants reaching the SRPA in the future. This reduction in organic contaminants will ensure that risks to future groundwater users are within acceptable guidelines and that future contaminant concentrations in the aquifer remain below Federal and state MCLs.

The alternative will be designed so that the remedial system achieves the remedial action objectives and associated PRGs. The PRGs have been estimated through fate and transport modeling as vadose zone vapor contaminant concentrations that will not result in future groundwater contaminant concentrations exceeding Federal and state MCLs. The PRG for the contaminant present in the most significant concentrations, CCl_4, is approximately 30 to 200 ppmv, depending on

the location within the vadose zone. The other vadose zone contaminants have similar cleanup goals. Contaminants remaining in the vadose zone after implementing Alternative 2 will not result in unacceptable future risks to human health and the environment, nor will they result in a violation of Federal and state MCLs.

The PRG range of 30 to 200 ppmv for CCl_4 is strictly an estimate of the CCl_4 concentration, which is based on information available to date, that will enable the remedial action objectives to be achieved. It should be noted that PRGs for the OCVZ operable unit cannot be identified as discrete COC concentrations in the vadose zone because of: (1) the complex relationship between vadose zone COC concentrations and future groundwater COC concentrations, and (2) the lack of regulatory driven standards for the COCs in vadose zone soils. During the implementation of the selected remedy, information will be obtained that will allow concentrations of the vadose zone COCs to be further defined. A better definition of the COC concentrations will allow PRGs to be refined, i.e., the targeted concentrations at various locations throughout the contaminated region of the vadose zone could be identified more specifically, and attainment of remedial action objectives

more readily determined. The future refinement of PRGs will be agreed upon by the DOE, EPA, and IDHW. Such a refinement will increase the three agencies' confidence that remedial action objectives, which will not change, can be met and maintained.

Flexibility in cleanup goals for the OCVZ is essential for the selected remedial alternative given the level of additional information on the OCVZ that is expected to be obtained during each of the potential phases of Alternative 2. The cleanup goals will require a significant amount of re-evaluation during the course of remedial action. A re-evaluation will be focused primarily on fate and transport modeling, which will take into account information gathered while carrying out the selected remedy as well as any future cleanup actions that may take place with the pits and trenches at the SDA. Changes in fate and transport modeling will likely have an impact on the PRGs for the OCVZ.

For those remedial actions that allow hazardous substances to remain on-site, Section 121 (c) of CERCLA requires that a review be conducted of the remedy within five years after initiation of the remedial action and at least once every five years thereafter. The purpose of this review is to evaluate the remedy's performanceÄÄto ensure that the remedy has achieved, or will achieve, the remedial action objectives set forth in the ROD and that it continues to be protective of human health and the environment. During implementation of Alternative 2 at OCVZ, the remedy's performance will be reviewed on a two year (24 month) cycle, with each phase of operation under Alternative 2 expected to last at least two years. The review cycle is detailed under the description of the phases of Alternative 2, page 46. Per CERCLA, a review of the site will be conducted five years after extraction/treatment operations are discontinued.

9.3 Estimated Costs for the Selected Remedy

A summary of cost for each of the alternatives was presented in Table 10. A more detailed cost breakdown for each of the three potential phases of Alternative 2 are provided in Table 11. These costs were annualized where appropriate (e.g., long-term monitoring costs) and summarized in net present value (1993) using a five percent annual discount rate.

Table 11. OCVZ selected remedy cost summary.a

Cost Elements	Alternative 2 Vapor Vacuum Extraction (VVE) Phase 1	Phase 2	Phase 3
Construction			
VVE/Monitoring Wells	$558,800	$967,371	$1,337,117
Field Personnel	$76,200	$131,337	$181,235
Site Improvements	$11,025	$21,003	$40,291
Treatment System/Discharge Monitor	$583,473	$937,257	$1,257,423
Additional Direct Costs	$132,691	$219,740	$299,603
Project Supervision & Engineering	$955,532	$1,597,506	$2,186,414
Contingency (30%)	$695,316	$1,162,264	$1,590,624
Construction Subtotal	$3,013,037	$5,036,479	$6,892,706
Operations and Maintenance			
Technical Support	$75,253	$211,765	$373,403
Operating/Maintenance Labor	$144,320	$295,623	$451,363
Materials & Equipment	$132,735	$340,475	$608,127
Vapor Sampling	$1,805,660	$4,126,717	$6,851,732
Additional Direct Costs	$83,919	$203,022	$344,740
Project Supervision & Engineering	$1,569,320	$3,624,321	$6,040,555
Contingency (30%)	$1,143,363	$2,640,578	$4,400,977
O&M Subtotal	$4,954,569	$11,442,502	$19,070,897
Post Closure Monitoring			
Well Closure/Demolition	$7,673	$11,227	$14,241
Vapor & Groundwater Monitoring	$3,128,250	$3,390,684	$3,943,952
Project Management	$625,644	$747,643	$869,642
Contingency (30%)	$1,126,171	$1,345,763	$1,565,355
Post Closure Monitoring Subtotal	$4,887,738	$5,495,316	$6,393,189
TOTAL (b).....	$12,860,000	$21,970,000	$32,360,000

(a) All costs represent 1994 dollars at a 5% discount rate.

(b) Total costs have been rounded to the nearest $10,000 and are cumulative for Alternative 2.

10. STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA, as amended by SARA, and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and compliance with ARARs. CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable and that the implemented action must be cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 9, the selected remedy satisfies the criterion of overall protection of human health and the environment by reducing the level of organic contamination in the vadose zone beneath and within the immediate vicinity of the RWMC and, consequently, reducing the risk associated with the future use of groundwater from the SRPA. The remedy will ensure that cumulative carcinogenic risk levels are maintained within the NCP risk range (1 x 10-4 to 1 x 10-6), and the cumulative hazard index is maintained less than 1.

The selected remedy will extract and treat (i.e., destroy) the most significant concentrations of organic contaminants currently in the vadose zone. The remedy will include long-term groundwater and soil vapor monitoring to confirm the ability of the vapor extraction system to prevent unacceptable levels of contaminants from migrating to the SRPA. The agencies will be involved in reviewing the performance of the remedy as part of potential phase transitions expected to occur every two years after commencement (see description of Alternative 2 phases on page 46 as well as the description of remediation goals on page 54). Once remedial action objectives are achieved and maintained and the remedy is discontinued, the agencies will review the OCVZ after a period of five years to ensure that human health and the environment are being protected. No unacceptable short term risks will be associated with this remedy.

10.2 Compliance with ARARs

The selected remedy of Extraction/Treatment by VVE will be designed to meet all substantive requirements of the identified Federal and state ARARs. The ARARs that will be achieved by the selected alternative follow.

10.2.1 Chemical-Specific ARARs

No chemical-specific ARARs are identified for the selected remedy. Soil-specific regulatory standards have not been promulgated by EPA or the State of Idaho.

10.2.2 Action-Specific ARARs

The action-specific ARARs identified for the selected remedy focus on the management of materials and waste and the regulation of air emissions that may result from any remediation activities at OCVZ. Regulations that focus on hazardous contaminants include:

RCRA

- IDAPA 16.01.050.5005 (40 CFR 261.10, 261.20 through 261.24), "Idaho Rules, Regulations, and Standards for Hazardous Waste" identification and characterization. (Relevant and Appropriate)

  If there are residuals that are hazardous, then Idaho's standards for generators of hazardous waste (IDAPA 16.01.050.06) will be complied with throughout the implementation of this alternative.

- 40 CFR 264.600 et seq involving prevention of releases from hazardous waste constituents in miscellaneous units. The overall intent of this regulation is to provide protection of human health and the environment. (Relevant and Appropriate)

Governing regulations that focus on air quality include:

Clean Air Act

- 40 CFR 61.92, "National Emission Standards for Radionuclide Emission from DOE Facilities" (Applicable).

- IDAPA 16.01.01.577, "Ambient Air Quality Standards for Specific Air Pollutants" (Applicable).

Idaho Toxic Air Pollutants for Non-carcinogenic and Carcinogenic Increments

- IDAPA 16.01.015.85 and 16.01.015.86 for any source constructed after May 1, 1994 (Applicable).

Idaho Rules for Control of Fugitive Dust

- IDAPA 16.01.01.651 (Applicable).

Idaho Demonstration of Preconstruction Compliance with Toxic Standards

- IDAPA 16.01.01.210.10 (Relevant and Appropriate).

10.2.3 Location-Specific ARARs

No location-specific ARARs are identified for the selected remedy as there are no known threatened and endangered species, wetlands, rivers, or floodplains located in the area of remedial activities.

10.2.4 To-Be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to consider DOE Order 5820.2A, "Radioactive Waste Management" as to-be-considered guidance. The guidance is not legally binding.

DOE Order 5820.2A establishes policy, guidelines, and minimum requirements for radioactive and mixed waste management. The policy establishes that radioactive and mixed waste generation, treatment, storage, transportation, and disposal operations comply with all applicable Federal, state and local requirements. Authorities within DOE who are responsible for policy implementation are identified.

10.3 Cost Effectiveness

Based on expected performance, the selected remedy has been determined to be cost-effective. This is evident when considering the cost of Alternative 1, Containment of Vadose Zone Vapors by Capping, which is estimated to be over three times the estimated costs of the selected remedy, yet there is a high level of uncertainty associated with the ability of capping to achieve remedial action objectives. Likewise, there is a high level of uncertainty in estimating the benefits to effectiveness that Alternative 3, Extraction/Treatment by VVE with Vaporization Enhancement, would have over

the selected remedy. Alternative 3 has an estimated cost that is over four times that of the selected remedy.

10.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable for this site. The NCP prefers a permanent solution whenever possible. Because contamination at OCVZ is so extensive and the concentrations of contaminants decrease with distance from the SDA, the selected remedy focuses on the extraction and treatment of only the most concentrated areas of contamination. Those contaminants remaining in the vadose zone will not pose unacceptable risks to potential receptors. The selected remedy provides protection of human health and the environment by preventing unacceptable levels of organic vapors from migrating to the SRPA and the surface. Based on evaluation of the CERCLA remedial alternative criteria, and in particular the five balancing criteria, extraction/treatment by VVE will provide the best solution in terms of long- and short-term effectiveness, cost, and implementability.

10.5 Preference for Treatment as a Principal Element

Because the OCVZ investigation indicated that no action would lead to unacceptable levels of contaminants reaching the SRPA and that an attempt to contain the contaminants in the vadose zone above the aquifer would not provide reasonable assurance that the aquifer would be protected, extraction and treatment of the vadose zone contaminants was viewed as being the only alternative that would meet remedial action objectives for OCVZ. Extraction and treatment of OCVZ contaminants under the selected remedy includes destruction of the organic contaminant with a vapor treatment system (catalytic oxidation) at the surface. This type of treatment is irreversible because contaminants are converted to carbon dioxide, water, and HCl gas, which will be discharged at acceptable levels to the atmosphere.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The proposed plan for OCVZ was released for public comment in March 1994. The proposed plan identified Alternative 2-Extraction/Treatment by VVE, as the preferred alternative. The agencies reviewed all written and verbal comments submitted during the public comment

period.

Upon review of these comments and preparation of the ROD, it was determined that no significant changes to the remedy would be required.

The source term for fate and transport modeling of contaminant migration in the vadose zone was based on estimates by Kudera (see reference on page 9) of the inventory of organic contaminants shipped from the Rocky Flats Plant in Colorado to the SDA between 1966 and 1970. Since the modeling and the risk assessment were conducted, estimates of the amount of organic wastes buried in the SDA have been revised for the development of the Contaminant Inventory Database for Risk Assessment (CIDRA). The CIDRA database is contained in A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste Buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983, EG&G Idaho, Inc., June 1994 (EGG-WM-10903). According to the CIDRA database, less CCl_4 and more TCE and TCA were disposed of in the SDA than originally estimated by Kudera. The revised estimates are not considered to warrant a significant change to the selected remedy because: (1) the model upon which the risk assessment is based was calibrated to VOC concentrations measured in the vadose zone in 1992; and (2) the selected remedy, VVE, will extract and treat all of the VOCs considered to be COCs, regardless of the relative concentrations of the organic contaminants in the vadose zone.

Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

A.1 OVERVIEW

Operable Unit (OU) 7-08 is an OU within Waste Area Group (WAG) 7 of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). The unit comprises the Organic Contamination in the Vadose Zone (OCVZ), as described in the Record of Decision (ROD) to which this Responsiveness Summary is attached. A Proposed Plan was released March 28, 1994, with a public comment period from March 31 to April 30, 1994. The Proposed Plan recommended a phased approach using Extraction/Treatment by a Vapor Vacuum

Extraction (VVE) system. Under the plan, the existing VVE system would be augmented with additional extraction wells, monitoring wells, and vapor treatment equipment. This Responsiveness Summary recaps and responds to the comments received during the comment period. Generally, the comments reflected a broad range of views, from strong support for the selected alternative to opposition challenging the baseline data used by the agencies to select the selected alternative.

A.2 BACKGROUND ON COMMUNITY INVOLVEMENT

To initiate the OCVZ investigation, public scoping meetings were held December 9, 10, 11, 12, 1991 in Boise, Moscow, Twin Falls, and Idaho Falls, respectively. Approximately 125 people attended the four meetings. The meetings were designed to involve the public early in the investigation; to explain the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process; and to allow representatives from DOE and INEL to discuss the project, answer both written and verbal questions, and receive ideas and suggestions from the public. The scoping meetings were announced via a fact sheet conveyed through a "Dear Citizen" letter mailed on November 19, 1991, to a mailing list of 5,600 individuals in the general public and 11,700 employees of INEL. On November 20, 1991, the U.S. Department of Energy, Idaho Operations Office (DOE-ID), issued a news release to more than 40 newspaper, radio, and television media contacts. Both the letter and release gave notice to the public that OCVZ documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Additionally, the letter and release notified the public of the various ways in which they could participate in the investigations and decision-making process.

Display advertisements announcing the 30-day public comment period on OCVZ appeared between November 20 and November 27, 1991, in eight major Idaho newspaper: the Post Register in Idaho Falls, the Idaho State Journal in Pocatello, the South Idaho Press in Burley, the Times News in Twin Falls, the Idaho Statesman in Boise, the Idaho Press Tribune in Nampa, the Lewiston Morning Tribune in Lewiston, and the Idahonian in Moscow. Similar display advertisements reminding the public of the upcoming meetings appeared in each of these newspapers several days

preceding each local meeting to encourage citizens to attend and provide oral or written comments. All three mediaÄÄthe "Dear Citizen" letter, news release, and display advertisementsÄÄgave notice of the four public scoping meeting and the beginning of the 30-day comment period on December 4, 1991. Two radio stations in Idaho Falls repeated announcements from the news release to the public at large.

Personal telephone calls concerning the availability of OCVZ documents and public meetings were made to key individuals, environmental groups, and organizations by INEL Outreach Office staff in Pocatello, Twin Falls, and Boise. Calls were also made to community leaders in Idaho Falls and Moscow by INEL Community Relations Program staff in Idaho Falls and Boise.

During the meetings that followed, representatives from DOE-ID and INEL discussed the project, answered questions, and received public comments. Forms for written comments were distributed at the meetings and the audience was encouraged to comment on the project. The comments received during the public scoping period were evaluated and considered as part of the Remedial Investigation/Feasibility Study (RI/FS) process.

Regular reports concerning the status of the OCVZ project were included in the INEL Reporter and mailed to those who attended the meetings and who were on the mailing list. Reports appeared in the March, May, July, and November 1992 and January, March, and July 1993 issues of the INEL Reporter.

When the investigation was complete, a Notice of Availability for the OCVZ Proposed Plan was published between March 15 and March 20, 1994, in the Post Register (Idaho Falls), the Idaho State Journal (Pocatello), the South Idaho Press (Burley), the Times News (Twin Falls), the Idaho Statesman (Boise), the Lewiston Morning Tribune (Lewiston), and The Daily News (Moscow). A second advertisement was placed in the same newspapers several days before each open house or meeting to remind citizens of the opportunity to attend the meetings and provide oral or written comments. Radio stations in Idaho Falls, Blackfoot, Pocatello, Burley, and Twin Falls ran advertisements during the three days before the open houses at the Pine Ridge Mall in Pocatello and the INEL office in Twin Falls.

The Proposed Plan for the remedial action of OCVZ was mailed March 28, 1994, to the 7,000 members of the general public and the 400 INEL employees on the INEL mailing list. Copies of the Proposed Plan and the entire Administrative Record are available to the public in six regional INEL information repositories: the INEL Technical Library in Idaho Falls; INEL offices in Idaho Falls, Pocatello, Twin Falls, and Boise; the University of Idaho Library in Moscow; and the Shoshone Bannock Library in Fort Hall. The original documents comprising the Administrative Record are located at the INEL Technical library; copies from the originals are present in the five other repositories.

The public comment period on the Proposed Plan for OCVZ was held from March 31, 1994, to April 30, 1994. No requests for extensions were received. On April 13, 1994, a teleconference between the League of Woman Voters of Moscow, the Environmental Defense Institute, DOE-ID, EPA, and IDHW concerning INEL environmental restoration issues was conducted at the request of Moscow area residents. The teleconference consisted of an overview of the proposed plan, questions and answers, and a general discussion of OCVZ issues.

Open houses were held on April 12 and April 14, 1994, in Pocatello and Twin Falls, respectively; representatives from DOE-ID and IDHW attended the events to discuss the project and answer questions. Mall display sessions were conducted throughout the day of the meeting at each location to provide access to information for individuals unable to attend thc public meetings. Public meetings were held April 18, 20, and 21, 1994, in Idaho Falls, Boise, and Moscow, respectively. Approximately 83 people attended the three meetings. Representatives from DOE-ID, EPA Region X, and IDHW were present at the public meetings to discuss the project, answer questions, and receive public comments. Each public meeting was recorded by a court reporter; transcripts of the meetings have been placed in the Administrative Record.

This Responsiveness Summary has been prepared as part of the ROD. All oral comments, as given at the public meetings, and all written comments are repeated verbatim in the Administrative Record for the ROD. Fifteen people submitted written comments on the OCVZ proposal and 12 people gave oral comments at the public meetings. To more fully respond to each issue raised in the comments, DOE divided the comments received into 91 separate comments. The comments

received were coded to indicate which response in the Responsiveness Summary addresses the comment. It should be noted that the Responsiveness Summary groups similar comments, summarizes them, and provides a single response. The ROD presents the preferred alternative for the OCVZ at the RWMC, selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this OU is based on information contained in the Administrative Record.

A.3 SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

Comments and questions raised during the public comment period on the OCVZ Proposed Plan are summarized below. Several questions were answered during the informal question-and-answer period during the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to the issues and concerns raised during that part of the public meeting. However, the Administrative Record contains complete transcripts of these meetings, which contain the agencies' responses to these informal questions.

As discussed earlier, the public meetings were divided into an informal question-and-answer session and a formal public comment session. The meeting format was described in published announcements and meeting attendees were reminded of the format at the beginning of each meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Comments received during the formal comment portion of each meeting were responded to by the agencies in this Responsiveness Summary. The public was requested to provide their formal comments on the Proposed Plan either during the formal comment session of the meeting or in writing before the close of the public comment period. This Responsiveness Summary responds to those public comments that were recorded by the court reporter during the formal comment portion of the public meeting or that were submitted in writing before the close of the public comment period.

Comments and questions on a variety of subjects not specific to the OCVZ Proposed Plan were submitted during the public comment period. The agencies take public comments very seriously and have made every attempt to respond to all comments. Some comments, however, are beyond the

scope of the OCVZ Proposed Plan (i.e., statements of personal belief, favorable comments about DOE operations in other places, offers of technical assistance). While these comments are summarized and grouped at the end of the Responsiveness Summary, the agencies have not attempted to respond to these out-of-scope comments. However, additional information on these topics can be obtained from the INEL Public Affairs Office in Idaho Falls; the local INEL offices in Pocatello, Twin Falls, and Boise; and the Environmental Restoration Information Office in Moscow. Comments and questions regarding community participation were referred to the INEL Community Relations Coordinator and will be addressed during updates to the Community Relations Plan. Formal comments and questions on OCVZ submitted during the public comment period are answered below.

A.3.1 Public Participation

1. Comment: One commenter expressed serious distrust for the entire public comment process. The commenter suggested that the three agencies had met in secret and that it is farcical for the public to think it can change what the agencies have already predetermined. (W15-1)

   Response: Comments received from the public during the scoping meetings and on the Proposed Plan are taken very seriously by the agencies and have shaped the OCVZ project. For example, one commenter suggested using natural venting or barometric pressure as an alternative method of extracting VOCs from the subsurface, which has the potential to save taxpayer dollars. The agencies are pursuing this suggestion and are currently discussing the use of this approach after the completion of Phase I, especially if there are indications that contaminant concentrations have been reduced to levels that no longer threaten the public health or environment. Through active public participation, the public can and very often does change or modify the agencies' decision.

2. Comment: One commenter is concerned that this project will be lost in the bureaucratic shuffle and reminded the agencies of the importance of accurate record-keeping. The commenter also wanted more information about whether the project data are being kept in computer form and whether the data is kept in places accessible to the public. (T8-6, T8-8)

Response: All sampling data, reports, and project files are kept on electronic media as well as paper copies. Reports are available to the public through the Administrative Record and at the Information Repositories, both of which are accessible to the public during normal business hours. Additional information can be requested through a FOIA (Freedom of Information Act) request filed with the U.S. Department of Energy. It is the agencies' policy to place all information that supports the decision-making processes for the particular operable units in the Administrative Record.

3. Comment: Several commenters commended the agencies for their efforts to include the public. Many commenters indicated that they appreciated the opportunity to be involved and asked to be notified about updated information. (T12-1, W1-1, W1-3, W2-2, W9-1, W11-1, W16-3)

Response: The agencies appreciate the public's efforts to become involved with these cleanup projects. Everyone who commented will receive a copy of the ROD, which includes this

 Additionally, commenters will receive information on future INEL projects.

A.3.2 Risk Assessment

4. Comment: What forces were considered in the model (e.g., gravity, capillary attraction, atmospheric pressure) and the physical phase of the contaminants (e.g., gaseous, liquid, or both)? (W8-2)

Response: The forces considered in the risk assessment model (diffusion of the vapor phase, advection of the aqueous phase, and dissolution or phase-partitioning) were those believed to have the most significant impact on the fate and transport of VOCs in the vadose zone. Vapor advection due to density-gradients or barometric pumping, sorption, degradation, and reactions were considered but not included because of their estimated lack of importance and (in some cases) difficulty to implement and verify. During the comprehensive WAG 7 evaluation, these assumptions will be reevaluated. Barometric pumping will be given an especially close scrutiny

because of its potential usefulness as a passive remediation technology. More information about the forces considered in the risk assessment model can be found in Section 5.3.1.3 of the remedial investigation (Page 5-31).

5. Comment: One commenter asked whether the agencies had allowed for uncertainty. (W13-1)

Response: The agencies allowed for uncertainty by conducting an uncertainty analysis as part of the Baseline Risk Assessment (BRA) (See Section 6.1.5 of Volume 1 of the RI report). Uncertainties in the BRA are due to uncertainties in the risk assessment process in general, specific uncertainties in characterizing and modeling the site, and uncertainties associated with accurately describing exposures. The Superfund process of estimating risk does not yield fully probabilistic risk estimates, but conditional estimates given a considerable number of assumptions about exposure and toxicity. The uncertainty factors associated with OCVZ, which include the extent of the vapor plume, source volumes, and moisture contents in the subsurface, are described in detail in Table 6-18 on page 6-61 of the RI report.

6. Comment: A commenter asked what correlation exists, if any, between the transport model and the model previously used for water (Schmalz and Poker, Soil Science, vol. 108, no. 1, 1969). (W8-1)

Response: It is not known what correlation exists between the transport model and the Schmalz and Polzer model for water movement. However, the transport model was used to simulate the xenon gas injection test conducted in 1960 near Test Area North and reported by Schmalz (1969). The simulation considered vapor diffusion and advection and was successful in recreating the results of the xenon gas injection test. Aqueous advection from natural water movement was not considered due to the short duration of the test and because Xenon-133 has very low solubility in water. Aqueous advection was considered in the OCVZ transport model because of the long time-frame examined and the tendency of the organic compounds to partition into the water.

7. Comment: One commenter asked what degree of conservatism was introduced in the risk analysis: 10, 100, or 10,000? The commenter further stated the public should not

have to search through pages 6-60 in the RI report for this vital information. (W15-8)

Response: Conservatism is introduced into the modeling and risk analysis at various points, making it difficult to estimate the total degree of conservatism. Modeling uncertainty is dealt with by using conservative parameter estimates. The strategy was to use realistic and reasonable parameter values where possible and conservative parameter estimates where there was little supporting data. It is estimated that the conservativeness of the modeling is about an order of magnitude or a factor of 10. Conservatism in the risk analysis is estimated to range from 1 to 2 orders of magnitude. This conservatism comes primarily from uncertainty factors used to account for variation in the general population, extrapolating data from animals to humans, derivation of chronic exposure limits from subchronic studies, exposure parameters, and similar issues. Therefore, the total degree of conservativeness is estimated to range from 2 to 3 orders of magnitude. However, this is not included in the report because of the complexities and difficulty in making this estimate.

A.3.3 General Technical Comments

8. Comment: One commenter suggested that the aquifer is comparable to a huge lake without appreciable movement and any infiltration would simply remain there and decompose. (W5-3)

Response: Unlike a lake, the area beneath the Subsurface Disposal Area at the RWMC compares more closely with a sponge. Air permeability of the vadose zone plays an important role in the vapor-phase contaminant migration to the air and groundwater pathways. Regional horizontal groundwater flow of the Snake River Plain Aquifer is to the south-southwest at rates of about 1.5 to 6 meters (5 to 20 feet) per day. The RI and baseline risk assessment results indicated that groundwater contamination due to the migration of the vadose zone organic contaminants to the aquifer will present the most significant future risk to human health if no action is taken. The modeling done as part of the RI and the risk assessment predicted that the contaminant plume would not remain in place, but rather travel several miles downgradient of the SDA if the vadose zone is not remediated. The selected remedy will be designed to minimize the migration of contaminants and reduce contaminant concentrations to

levels that do not pose a significant threat to human health or the environment.

9. Comment: One commenter stated that there was no mention of the driving force that would continue to expand the vapor plume and suggested that the vapors would decrease to zero as evidenced by the 1960 field experiment. (W15-2)

Response: Lateral migration or expansion of the plume occurs primarily by vapor diffusion. The 1960 experiment referenced by the commenter involved injecting radioactive xenon gas into the subsurface at Test Area North. The gas concentrations decreased quickly because a relatively small amount of gas was injected. The gas also had a short half-life and decayed fairly rapidly. Thus, the results from the earlier experiment are not readily applicable to the situation at OCVZ.

10. Comment: Have any measurable organic contaminants been detected by air sampling at the Subsurface Disposal Area? (W15-3)

Response: Very little data exist regarding VOC concentrations in ambient air at the RWMC. VOCs were detected at the Pad A Excavation Area and at the Pad A Subsidence Hole (which are within the RWMC). Carbon tetrachloride concentrations of 17.0 milligrams per cubic meter were recorded at the Pad A Excavation Area and 11.0 milligrams per cubic meter were recorded at the Pad A Subsidence Hole. Grab air samples were collected at the Subsurface Disposal Area in 1987. These samples were collected above and within wellheads to assess worker exposure. The resulting data were not sufficient to evaluate long-term risks to human health either on or off the INEL. The volatile organics carbon tetrachloride, trichloroethylene, chloroform, tetrachloroethylene, 1,1,1-trichloroethane, and 1,1,2-trichloro-trifluoromethane were detected above their respective method quantitation limits at several of the wells. The samples represented an isolated incident and were not used to establish long-term average concentrations. Air monitoring around the RWMC, however, has not detected adverse atmospheric concentrations of VOCs.

11. Comment: One commenter wanted to know how long DOE-ID has been monitoring the vadose zone. The commenter asked what changes in the rate of vapor expansion were noted

during the 1993 extraction. (W15-4)

Response: Vadose zone investigations at the RWMC began in 1960 and were conducted by several organizations, including the U.S. Geological Survey and EG&G Idaho, Inc. Subsurface monitoring is still being conducted as part of a subsurface investigation program that began in 1985. The investigation, which had focused on subsurface geology and hydrology to assess radionuclide migration, was expanded to include VOCs in 1987 (Mann and Knobel 1987). Because vapor phase volatile organics have only been recognized in the Subsurface Disposal Area vadose zone since 1987, the amount of data available and its distribution in the vadose media is less than the amount of data related to radionuclide and inorganic compounds.

Treatability studies are conducted to assess the effectiveness of treatment technologies that may be used at a specific site. The 1993 treatability study conducted at OCVZ evaluated the hydraulic characteristics of the vadose zone and attempted to determine how to optimize the VVE performance. No attempt was made to evaluate the expansion rate of the vapor plume during this treatability study and, thus, the agencies do not know whether there has been a reduction in the rate of vapor expansion. However, based on the quantities of contaminants extracted and treated during the treatability study, it is logical to conclude that the highest VOC concentration areas may have been temporarily reduced.

12. Comment: One commenter wanted to know what consideration had been given to the effect of "drying out" (removing moisture from) the vadose zone as a result of the flow of large volumes of air through it. For example, will this phenomenon occur, and if so, to what extent, and will it have a positive or negative influence on VOC fate and transport in the subsurface environment? (W14-5)

Response: The selected remedy will have the effect of drawing cleaner air through the vadose zone (from the surrounding uncontaminated subsurface) and will induce VOCs to partition or

separate from water into air. Thus, it is not likely that the selected

alternative, Extraction/Treatment by VVE will significantly "dry out" the moisture from the vadose zone.

13. Comment: One commenter suggested restarting the existing VVE system instead of leaving it idle while the five additional Phase I extraction/monitoring wells are installed. The commenter argued that approximately 13,832 pounds of VOCs can be removed from below the Subsurface Disposal Area before Phase I is scheduled to become operational. Thus, the commenter believes that the agencies should "just get on with it." The commenter also asserted that restarting the existing system would provide a better return on the public's tax dollar investment. (W14-7)

Response: The agencies are not currently considering immediately restarting the existing VVE system because of difficulties associated with the handling and regeneration of contaminant-saturated carbon adsorption beds used during the earlier extraction process. The related disposal problems are one of the reasons that catalytic oxidation (CATOX) is being evaluated as a vapor treatment system. Until the CATOX systems are available, however, the agencies will not be able to begin extraction and treatment. The Proposed Plan includes the use of the existing extraction well and VVE system used (with CATOX modification) in the Treatability Study. By spending the time to pre-plan the remedial action, by locating the most appropriate place for the extraction/monitoring wells to ensure that VOCs are removed from the most permeable zone of the subsurface, and by ensuring that the remedial action is conducted in the safest manner possible, the taxpayers are, in a sense, getting a better return on their dollar.

14. Comment: Two commenters stated that using natural venting or barometric pressure would be more cost effective than the Extraction/Treatment by VVE alternative proposed by the agencies. (T1-4, W14-10) Another commenter, however, argued that natural venting would be slower and would take too many years. (T2-2)

Response: The agencies are currently considering implementing natural venting or a combination of natural venting and Extraction/Treatment by VVE after Phase I, especially if the results from the Phase I activity demonstrate sufficient reduction in contaminant levels.

Originally, barometric pressure to vent contaminants (barometric pumping) was evaluated but it was not considered in the conceptual fate and transport model. The commenter who stated that natural or barometric pumping would remove VOCs at a slower rate than the selected alternative is correct. Therefore, due to uncertainty about the length of time required to reduce contaminant concentrations to safe levels and the potential for ambient air pollution, the agencies decided not to more fully explore this option. Additionally, the agencies did not believe this treatment option would meet the remedial action objective of preventing organic contaminant migration to the groundwater that would result in exceeding acceptable risk levels and/or federal and state maximum-contaminant levels. The natural venting or barometric pressure option may, however, be more fully evaluated during the comprehensive WAG 7 evaluation.

15. Comment: One commenter questioned the agencies' characterization of the rate of movement by contaminants from the surface to the groundwater, stating that too much documentation from other sources contradicts the characterization. (T10-3)

Response: The agencies agree with thc commenter that there is uncertainty in predicting migration rates, especially of volatile organic compounds. Volatile organic compounds are highly mobile due to their ability to exist and move in a vapor state. However, a number of field investigations have been conducted at the RWMC that support the conclusions of the modeling. These investigations included the collection of geologic, hydrologic, and meteorologic data, and sampling and analysis of surficial soil, soil vapor, perched water, and groundwater. The agencies cannot comment on the general statement concerning contradicting documentation mentioned by the commenter, however, the agencies believe predictions of the rate at which contaminants move from the surface to the groundwater are realistic, reasonable, and consistent.

16. Comment: One commenter wants to know whether there is a way to automate the process (VVE) to reduce the labor costs involved with the activity. (T8-2)

Response: The Extraction/Treatment by VVE system is automated, which is one reason why the agencies selected this as the preferred treatment alternative. The system

requires minimal labor hours to operate and maintain. Although monitoring of the system will require additional labor hours, the contractor's use of computerized gas chromatographs will reduce labor hours. Wherever possible, new technology and automated systems will be evaluated and used.

17. Comment: One commenter inquired whether there was a way to recover the organic vapor of the solvents and reuse it elsewhere. (T8-3)

Response: Organic solvents could be recovered and reclaimed from the vadose zone using the PURIS technology. Unfortunately, no viable use could be identified for the mixture of solvents that would be recovered.

18. Comment: One commenter wanted more information about the "hazard" that exists with Texaco Regal oil and whether VVE would work in its removal. (W3-4)

Response: Texaco Regal oil is a lightweight machining oil that was used in the late 1960s as a lathe coolant in the foundry at the Rocky Flats Plant near Golden, Colorado. Texaco Regal oil is a mixture of five base oils that were either solvent-dewaxed, paraffin oils, or napthenic oils. During the process, the lathe coolant was contaminated with carbon tetrachloride and other solvents. The carbon tetrachloride and three other solvents (tetrachloroethylene, trichloroethylene, and 1,1,1-trichloroethane) are the contaminants of concernÄÄnot the Texaco Regal oil. Before disposal, the oil was mixed with calcium silicate (an absorbent) to form a viscous, paste-like, green sludge. The solvents, due to their higher vapor pressure, have migrated into the vadose zone in a vapor phase. The Texaco Regal oil is not believed to have migrated from the pits. The purpose of the VVE system is to remove the vapor phase solvents from the vadose zone, not to remove the oils from the pits.

19. Comment: One commenter stated that he had yet to see an entity relation diagram or a contact's diagram for a data flow diagram. In other words, he states, what are the inputs, outputs and so forth described? (T8-5)

Response: The agencies are not familiar with an entity relation diagram or the terminology used by the commenter. The agencies interpret the comment to question the validity and

usability of the data used as inputs for the results of the RI/FS and Work Plan. Data Quality Objectives were established in the Work Plan (Chatwin et al. 1992) and detailed in Attachment III to the Work Plan. The validation and data usability summary contained in Section 4.6 of the RI presents an evaluation of the data quality supporting the objectives prescribed in the Work Plan for the OCVZ RI/FS. Data Quality Objectives are established to support the overall objective of data collection: to ensure that the information collected for decision-making at the site is of known and adequate quality and is technically sound, statistically accurate, and properly documented. Per EPA guidance, Data Quality Objectives are expressed in quantitative and qualitative terms of precision, accuracy, representativeness, completeness, and comparability.

A.3.4 General Comments on the Proposed Alternatives

20. Comment: One commenter wanted a more in-depth analysis of the in-situ bioremediation alternative. This alternative seems to be passed off lightly as being too difficult to use for subsurface treatment, yet it presents a lower cost alternative. (W1-2)

Response: A discussion of the bioremediation alternative is contained in the Feasibility Study (See Section 3.2.4 at Page 3-24). One of the reasons the agencies decided not to pursue a more in-depth analysis of this alternative is that no bioremediation studies have ever been conducted in the soil type present at the RWMC (i.e., unsaturated, fractured basalt). This lack of information limits the ability to accurately predict bioremediation performance. To perform such an analysis would take many years and increase the cost of such a remedial action. Additionally, it is possible that vinyl chloride may be formed due to incomplete degradation of TCE. Since vinyl chloride is more toxic than TCE, a thorough evaluation of the potential for vinyl chloride formation under site-specific conditions would be required. The variable degradation rates among the organic contaminants of concern caused by site-specific conditions makes it difficult to predict the effectiveness of this option. Thus, the agencies concluded that the uncertainties associated with the bioremediation alternative made it less preferable than the proven effectiveness of Extraction/Treatment by VVE.

21. Comment: Several commenters addressed technology transfer, suggesting that technology developed at environmental restoration sites at the INEL be shared with other DOE sites and private industry and be published in trade publications. (T8-1, W3-5, W14-9, W14-10, W14-11)

Response: DOE agrees with the commenters. One of DOE's highest priorities is to promote United States industrial competitiveness through technology transfer. The science and technology developed in DOE research programs, laboratories, and non-laboratory facilities helps form a knowledge base that is one of our country's most valuable national assets. DOE's technology transfer goals include increasing the level of U.S.-based industry participation in DOE research and development, increasing the level of DOE program and laboratory activity in transferring technology, and accelerating the process of transferring technology and knowledge.

Various tools are used to facilitate technology transfer to the private sector. The Environmental Restoration and Waste Management Technology Integration Program has contractual mechanisms by which industry could become involved with ER&WM activities. These include

direct procurement of innovative technologies and research through Program Research and Development Announcements, Research Opportunity Announcements, and cooperative research efforts through Cooperative Research and Development Agreements (CRADAs). ER&WM can also provide assistance to small businesses in areas such as proposal preparation and technology commercialization and business planning. The ER&WM Technology Integration Program also operates a toll-free telephone number (1-800-736-3282) to identify potential matches between private sector representatives (and their technologies) and DOE points of contact, and disseminates information about DOE's R&D programs and associated business and research opportunities.

Environmental restoration technology is also transferred to the private sector through the presentation of papers at environmental remediation and technology conferences held throughout the country. In the past year, INEL scientists and environmental restoration experts presented more than 40 papers at such conferences, which discussed environmental

remediation technologies used at the INEL.

22. Comment: Two commenters urged the agencies to move forward as soon as possible with implementation of the remedial action. (W3-6, W14-7) Another urged the agencies to start mitigation efforts to head off worse problems in the future. (W4-3)

Response: DOE, with EPA and IDHW concurrence, is accelerating remedial action to the extent practical. Based on the positive comments received in support of Extraction/Treatment by VVE and based on the need to remove organics to reduce the threat to groundwater, the agencies have decided to begin drilling of extraction and monitoring wells. Five extraction wells and 10 monitoring wells have been drilled and procurement actions have been initiated to obtain the extraction and treatment systems.

23. Comment: Two commenters stated that their preferred alternative was "No Action." (W5-1, W7-4, W15-9) Another commenter questioned why so much activity and cost was associated with the "No Action" alternative. The commenter further stated that "No Action means no action" and that monitoring, sampling, and other activities associated with the "No Action" alternative make the alternative meaningless. (W7-3)

Response: The agencies note these commenters' preferences for the "No Action" alternative. However, the "No Action" alternative, which is mandated to be considered by CERCLA and the National Contingency Plan was not considered a viable alternative because the results of the RI and baseline risk assessment indicated that the contamination of groundwater due to the migration of the vadose zone organic contaminants to the Snake River Plain Aquifer will present a significant future risk to human health if no action is taken. Thus, all the alternatives evaluated had to meet the remedial action objective of preventing organic contaminant migration to the groundwater in unacceptable concentrations. The "No Action" alternative did not meet this objective and was not considered further.

The costs associated with the "No Action" alternative are largely associated with a requirement in the National Contingency Plan to monitor every Superfund site at which hazardous substances will remain after the response action. Groundwater monitoring is necessary to detect

contaminant concentrations in the Snake River Plain Aquifer.

24. Comment: One commenter was concerned that some of the tables and figures used to present technical data were unreadable. Further, the commenter stated that if the computer printouts were more readable the public would have more confidence in DOE's actions. (T8-4, T8-7)

Response: Tables and figures used in documents associated with OCVZ are generally used to summarize detailed and complex information. Every attempt is made to make the tables and figures in the Proposed Plan and the Record of Decision as technically accurate as possible while providing information that is understandable by members of the general public. In response to this comment, the ROD was reviewed to identify areas in which the tables and figures could be made more readable and understandable.

25. Comment: Two commenters were concerned that special care be taken with all monitoring and extraction wells located in and around the Subsurface Disposal Area. The commenters asked that all wells be properly capped and monitored so that they do not become conduits for contaminant transport into the aquifer. (T6-1, W14-6).

Response: The agencies concur with the commenters' concern about wells potentially becoming conduits for contaminants into deeper regions under the Subsurface Disposal Area. Because of this concern, each borehole at the Subsurface Disposal Area will be constructed so that it can be used as either an extraction well or a monitoring well. Extraction wells will be completed only to the 110-foot interbed to draw vapor from above the interbed where the highest VOC concentrations have been detected. Boreholes that are drilled through the 110-foot interbed will be sealed at appropriate intervals to avoid creating a conduit for downward vertical migration of VOCs and other contaminants. Finally, because the sedimentary interbeds appear to impede or slow vertical migration of VOCs, boreholes will not be drilled through the 240-foot interbed. The Snake River Plain Aquifer is located approximately 600 feet below the Subsurface Disposal Area. Additionally, engineering controls will be taken to ensure that the extraction wells used in the selected alternative are properly capped, eliminating

the possibility of emissions in excess of regulatory limits.

26. Comment: Two commenters suggested using the OCVZ project as a "research platform" to develop and test new technologies for subsurface characterization and modeling, vapor vacuum extraction, and vapor treatment. One person asserted that this would directly support DOE's and EPA's efforts to expand the development of environmental technologies. (W14-8, W15-11) However, another commenter complimented the agencies for "not studying [the project] to death." (T11-1)

Response: Using OCVZ as a developmental research project is being considered. However, the agencies all agree that the first priority is to cleanup the site and meet the remedial action objectives. Although Extraction/Treatment by VVE is the preferred option, the contractor will be working with DOE's Office of Buried Waste and Technology Integration Program to continually pursue more efficient and cost effective extraction and treatment technologies. Currently, the INEL has teamed up with DOE's Savannah River Operations Office to conduct vapor extraction tests. These tests will be conducted at the Savannah River site. However, if the tests do not interfere with the INEL's ability to meet its cleanup objectives, additional research and development could be conducted at the INEL on vapor extraction technologies.

27. Comment: One commenter questioned the accuracy of the total mass balance used as the basis for the risk assessment. The commenter argued that the impact of this inaccuracy is significant. He requested to see some of the documentation on which the agencies based their figures to assure himself that the numbers are valid. (T10-1) Another commenter agreed that the initial concentrations are extremely crucial and are hard to grasp. (T11-2, T11-4)

Response: The agencies agree with the commenters that waste volume and concentrations are extremely important factors in the risk assessment. To ascertain the volume of waste at the site, three waste characterization investigations were conducted for the VOCs at the Subsurface Disposal Area. In performing the waste characterization investigations, waste management personnel at the Rocky Flats Plant were contacted to obtain as much data as

possible on quantities of volatile organic wastes that were shipped to the Subsurface Disposal Area. The total volume of used oil, carbon tetrachloride, trichloroethane, trichloroethylene, and perchloroethylene received and the dates of receipt were obtained from the Rocky Flats Plant Waste Management monthly reports. These monthly reports also provided data on the amount of lathe coolant received at the Subsurface Disposal Area. Because monthly reports for 1966 and 1969 were not available, quantities of contaminants shipped to RWMC were estimated based on information contained in the other reports. As a result of these investigations, the amounts of hazardous materials stored or disposed of at the RWMC were quantified and the unique waste characteristics attributable to organic material processes were identified. A detailed discussion of the contaminant inventory is presented in Section 3.2 of the OCVZ Final Work Plan and in Section 4 of Volume 1 of the RI report. Both of these documents are in the Administrative Record associated with this remedial action and are available to the public.

The agencies agree that the accuracy of the "total mass balance" is extremely important for accurate assessment of the potential risk to human health and the environment. That is one reason why DOE went to such measures to quantify the sources of the VOCs in the vadose zone. DOE admits that the data is not 100 percent accurate because of lack of data prior to 1966 and the missing monthly reports for the years 1966 and 1969. However, the agencies feel that sufficient data exist to provide meaningful input into the risk assessment and that any inaccuracies caused by estimating the missing data do not significantly affect the quality of the results of the assessment.

28. Comment: One commenter challenged the assumption that institutional controls could be maintained at the remediation site for one hundred years. The commenter cited changes during the last one hundred years as examples of how difficult it is to project what will be happening one hundred years into the future. (T10-2)

Response: As part of the human health evaluation for the OCVZ, it was assumed that DOE would continue to operate and maintain the RWMC and prevent unrestricted public access to

the RWMC until the year 2092. Institutional controls including restricting land use, controlling public access, posting signs, constructing fences or other barriers, and monitoring the environment are employed and will continue to be maintained at the RWMC. DOE has committed to maintain active institutional controls at all low-level radioactive waste disposal facilities for 100 years following closure. (See DOE Order 5820.2A). While the agencies agree that it is difficult to project what will be happening in 100 years, it is reasonable to assume that DOE (or its successor) will still be operating and maintaining the RWMC in 100 years.

29. Comment: One commenter was concerned that some of the input data was unknown (i.e., initial concentrations, time period over which the contaminants are dumped into the pit, reactions with other chemicals) and that other input factors were virtually plucked out of the air (i.e., hydraulic factors, especially porosity and dispersivity). The commenter stated that these inputs are crucial computer inputs which dramatically affect the results; in other words: garbage in, garbage out. (T11-2, T11-3)

Response: The agencies do not contend that this modeling is without any uncertainty. As noted by the commenter, there is a direct relationship between the uncertainty in the model and the amount of historical data available. The source of the contamination observed in the vadose zone below the trenches and disposal pits is documented through historical data from the contaminant inventories (See Response to Comment No. 22). Additional basis for input data into the fate and transport model were obtained from the Radioactive Waste Management Information System (RWMIS), previous waste characterization activities, and waste inventories of the materials disposed at the Subsurface Disposal Area. Parameters for the RWMC vadose zone VOC transport model included thickness, porosity, saturation, effective air porosity, and tortuosity factors. These parameters are based on previous studies and on actual data taken from in and around the RWMC. The value for porosity was estimated from results of analyses conducted on core samples for the surface sediments, interbeds, and basalt flows at the RWMC down to the 240-foot interbed. Saturation values were estimated using results from analyses conducted on vesicular basalt samples. Dispersivity values were based on analysis

of contaminant transport at a nearby INEL facility and checked against ranges reported in relevant literature. Other assumptions used for the development of the transport model are presented in Section 5.3.1.3 of the RI report. As additional data are collected, valuable information on rates and direction of contaminant movement will increase the accuracy of the model and decrease the uncertainty of model predictions because less reliance is placed on estimating past releases.

30. Comment: One commenter stated that the alternatives for handling contaminants in the vadose zone under the RWMC should not include Alternatives 0 or 1. The commenter felt that these alternatives were not acceptable because an earthquake may shift the earth and/or open a direct path of flow to the Snake River Plain Aquifer. (W6-1) Another commenter, however, asked that the first alternative (capping) be given additional consideration, particularly in regard to the order of magnitude of the added cost of the preferred alternative. (W8-3)

Response: The agencies agree that Alternatives 0 or 1 are less protective than the selected alternative, although not because of the catastrophic earthquake scenario envisioned by the commenter. Alternative 0 (the "No Action" alternative) was not chosen because an unacceptable risk remained to both human health and the environment. Alternative 1 (Containment by Capping) also was not chosen for the same reason. Even with a cap in place, organic contaminants would continue to migrate laterally and vertically in the vadose zone, primarily in the vapor phase. However, capping would limit the contact of water with organic contaminants at shallow depths; thus, migration of organic contaminants dissolved in infiltrating moisture might decrease.

31. Comment: One commenter stated that it is not possible to achieve zero contamination at any practical cost and that there is no need to do so. The commenter further stated that carbon tetrachloride, trichloroethylene, tetrachloroethylene, and 1,1,1-trichloroethane contaminants have been with us for years and haven't been shown to be toxic at low levels. (W16-2)

Response: The agencies agree that it is impossible and unnecessary to eliminate

all the organic contamination from the subsurface. It is also true that the contaminants of concern have been around for a long time and are not toxic at concentrations below the MCLs.

A.3.5 Commenter Agreed with Selected Alternative

32. Comment: Several commenters indicated their agreement with the preferred alternative selected by the agencies. The preferred alternative, Extraction/Treatment by VVE, was recognized as presenting the least risk to workers and the public and as being the most cost effective and protective alternative that prevents organic contaminants from migrating to the groundwater, which would result in groundwater contaminant concentrations exceeding acceptable risk levels. (T1-1, T1-3, T2-1, T2-4, T2-5, T5-1, T7-1, T9-1, W3-1, W4-1, W5-2, W9-1, W10-1, W12-1, W14-1, W16-1, W16-3)

Response: DOE, EPA, and IDHW agree that Alternative 2, Extraction/Treatment by VVE, is the alternative that best meets the remedial action objectives and the nine evaluation criteria identified under CERCLA. A long-term groundwater and soil vapor monitoring program will ensure that this selected remedy will be protective of human health and the environment.

33. Comment: One commenter stated that VVE has been definitively shown to be effective at removing vapor-phase VOCs from the subsurface environment and that it is a fairly mature remediation technology (fairly high reliability of performance). The commenter further stated that CATOX is a logical choice for destruction of VOCs that have been removed from the subsurface. (W14-2)

Response: The agencies agree with the commenter's statement.

A.3.6 Commenter Disagreed with Selected Alternative

34. Comment: One commenter stated that it didn't make sense for agency representatives to justify spending his tax dollars by claiming to save lives when the agencies didn't know where the lives are that the agencies claim they're impacting. The commenter continued by stating that he didn't believe the agencies had done their homework. (T3-1) Another commenter stated that there was too much concern over highly improbable happenings. (W5-4)

Response: The results of the Human Health Evaluation (HHE) conducted as part of

the Baseline Risk Assessment showed that the organic contamination present in the vadose zone, if not addressed by the selected alternative or one of the other alternatives, could migrate to the Snake River Aquifer and contaminate the groundwater. Future groundwater users would then be at risk. The agencies believe that implementation of the VVE Extraction/Treatment system will remove the risk posed to future groundwater users.

The agencies are not asserting that the results of the HHE can predict with 100 percent accuracy the exact risk to the future groundwater users. The agencies do believe, however, that sufficient information has been collected and evaluated to make reasonable estimates on the human health risks posed by the organic contamination in the vadose zone.

While the probability of a future resident using groundwater pumped from the vicinity of the RWMC may seem improbable to some, CERCLA and the NCP require the agencies to assess this risk as part of the HHE. It is true that the estimates of carcinogenic and noncarcinogenic risks are based on conservative assumptions associated with both the fate and transport modeling and the risk assessment. The conservative assumptions used in the fate and transport modeling and the risk assessment compensate for the uncertainty inherent in assessing the risks to human health and the environment.

A.3.7 Other Comments on the Selected Alternative

35. Comment: One commenter noted that there are commercially available, trailer-mounted units that should be more cost effective when compared with in-house design and construction. (W14-3)

Response: The agencies plan to employ commercially available VVE systems as part of the selected alternative at this site. Several manufacturers supply modular VVE/CATOX units equipped with a fan, a catalytic oxidation chamber, instrumentation, an exhaust stack, and housing. These units are compact, require very little operator interface, and are cost effective for large-scale treatment of vapor-phase contaminants, such as those present in the vadose zone at the RWMC. Any modifications to these units (in-house design) will involve the adaptation

of these pre-fabricated systems to meet the site-specific requirements at the RWMC.

36. Comment: One commenter stated that contrary to what was presented in the Proposed Plan, wastes would be generated under Alternative 2 (i.e., catalytic waste, hydrochloric acid and/or chloride salt, and particulate matter collected by the HEPA filters). (W14-4)

Response: The commenter is correct in stating that wastes or residues will be produced by the vapor treatment system. However, under Alternative 2 with Extraction/Treatment by VVE as the selected treatment alternative, it is expected that residual treatment wastes would not be generated in quantities above regulatory limits of concern. Because such low concentrations of VOCs are associated with the vadose zone at the RWMC, catalysts are not expected to be changed frequently. At sites that have used catalytic oxidation for similar types of contamination, catalysts must be changed every two years; however, the catalysts can be disposed of as solid (not hazardous) waste. Because the results of the remedial investigation indicated no radionuclide contamination present at OCVZ, no high efficiency particulate air (HEPA) filters are required as part of the extraction and treatment system. Although the commenter is correct in stating that hydrochloric acid would be formed during catalytic oxidation, the quantities generated are below regulatory limits of concern. This small amount of waste may require further treatment through neutralization. If necessary, caustic scrubbing systems could be installed at each treatment location. The scrubbing system would produce neutral pH, low-concentration salt-water solutions that can be discharged to a publicly owned treatment works or to surface drainage.

37. Comment: One commenter stated that Extraction/Treatment by VVE should be initiated in the highest concentration areas and that limits should be placed on VVE operations. The commenter believed that the agencies should not attempt to remove contaminants to minuscule levels only detectable by sophisticated instrumentation. (W3-2, W3-3)

Response: The agencies agree with the commenter. The selected alternative will be centered in those areas with the highest concentrations and will remove and destroy VOCs to the

targeted cleanup goal of 30-200 parts per million volume for carbon tetrachloride. The agencies believe that such a cleanup goal will meet the remedial action objective of preventing organic contaminant migration to the groundwater in levels that pose a threat to human health or the environment.

38. Comment: One commenter suggested incorporating some flexibility into the plan as it will almost certainly have to be modified at least slightly as the activity proceeds. (W13-2)

Response: The selected alternative, Extraction/Treatment by VVE, allows for three possible phases of clean-up activity over a 6-year period. One of the primary reasons the agencies chose a phased approach was to allow for the uncertainties involved with this project. The complexities of the subsurface environment and uncertainty associated with the modeling make it difficult to predict how many wells will eventually be needed. Thus, the agencies have incorporated sufficient flexibility to add more extraction wells if, after Phase 1, contaminants levels do not appear to be decreasing in sufficient amounts. Conversely, the selected alternative also allows for a lower-keyed approach (i.e., natural venting) if, after Phase 1, contaminant levels appear to have been decreased to safe levels.

39. Comment: One commenter stated that there was no indication of the amount or percentage of VOCs expected to be removed or even a goal for the activity. The commenter asserted that "believing you will remove the most significant concentration" is inadequate. (W15-7)

Response: The targeted cleanup goal from carbon tetrachloride ranges from 30 to 200 parts per million volume depending on the depth within the vadose zone. Other vadose zone contaminants have similar goals. The selected alternative will be designed so that the remedial system meets these goals. The goals have been established so that vadose zone contaminant concentrations will result in groundwater contaminant concentrations that meet the remedial action objective.

A treatability study was performed as part of the clean-up activity to assess the effectiveness of treatment technologies that may be used as remedial alternatives on site waste. The treatability

at OCVZ demonstrated that Extraction/Treatment by VVE can reduce vadose zone organic contaminant concentrations. Based on the results from the treatability study, the agencies believe an array of vapor extraction wells at selected locations in the RWMC will effectively reduce contaminant concentrations in the vadose zone to acceptable levels.

40. Comment: One commenter stated that in previous studies, suggestions had been made to introduce cold air down the wells to freeze the moisture in the wells to prevent downward migration of water carrying contaminants. (T1-2)

Response: Introducing cold air during the winter to freeze moisture and possibly prevent or slow downward migration of dissolved contaminants was not examined in the feasibility study because it is an unproven and undemonstrated technology. If it were possible to prevent downward migration of water, VOC contamination reaching the aquifer would be reduced. However, the contaminants would still reach the aquifer as vapors.

A.3.8 Funding, Budgeting, and Scheduling

41. Comment: Several commenters were concerned about the cost of the preferred alternative. Most felt that the agencies were spending too much money. One commenter stated that no business would recommend spending $13-67 million to remove a marginal threat to public health and that he would rather see his taxes spent on saving lives (e.g., Boron Neutron Capture Therapy). However, two people stated that the agencies should err on the side of safety and speed whatever is needed to protect the aquifer and public health. (T4-1, T7-2, W2-1, W15-5, W15-12)

Response: In these tight budgetary times, all the agencies share the commenters' concerns regarding the amount of money spent on remedial actions. The cost estimate of approximately $12-32 million associated with the selected alternative includes direct and indirect costs associated with construction and operations and maintenance, and post-closure costs for long-term monitoring. Contingency costs were included for each of the three primary cost elements (construction, operations and maintenance, and annual post-closure monitoring). Contingency

costs are generally reduced as details of the design for a particular remedial action are refined.

The cost estimates provided in the Proposed Plan are rough estimates (i.e., -30% to +50%) and are given for comparison purposes only. Cost estimates for sampling and monitoring activities will be provided in greater detail in the Remedial Design phase, which follows the ROD. Costs may appear high because overhead rates with the management and operations contractors and general and administrative rates are all factored into the ultimate cost estimate. The administrative costs associated with federal cleanup sites tend to be higher than those associated with private industry sites.

With an ever-shrinking federal budget, a number of measures are being taken to better manage the direct and indirect costs associated with DOE remedial actions. [At the INEL, a 5-year consolidated contract was recently awarded that is designed, in part, to reduce the levels of bureaucracy at the facility.] One cost-saving measure specific to OCVZ was selecting a phased approach to the action allowing agency decision-makers the flexibility to reduce the scope of the project if, following an evaluation of the implemented remedy (approximately two years after implementation), the agencies conclude that indications from monitoring shows that the vadose zone contamination is sufficiently reduced to prevent federal and state maximum contaminant levels from being exceeded in the aquifer. If that conclusion is reached, the agencies may decide to shut down the system or shift to a passive system.

42. Comment: One commenter noted that the agencies must obtain funding every budget period to allocate to this project. The commenter further noted that Alternative 2 has a good chance of getting funded because it can be demonstrated to work. (T2-3, T2-4).

Response: DOE has allocated and forecasted funding for thc OCVZ project and fully expects funding to be available for the duration of this project. However, as with all government moneys, these funds are subject to congressional appropriations and oversight. This fact may potentially influence the funding for OCVZ each fiscal year.

43. Comment: One commenter stated that inadequate justification has been made to

accelerate this applied experiment over a 2-year period. (W15-10)

Response: Extraction/Treatment by VVE is a proven and well-established remediation technology to recover vapor phase organic contaminants from subsurface soils. Based on the results of the treatability study, which proved that Extraction/Treatment by VVE would be effective for the removal of organic contamination in the vadose zone and on the generally positive public support for the project, the agencies decided to implement Alternative 2 as the selected alternative. After evaluating the results from Phase I (lasting approximately two years) a decision will be made as to the level of activity necessary to ensure protection of human health and the environment. If, after Phase I, the remedial action objective has been met (reduction of contaminant levels so that organic contaminant migration to the groundwater will not result in groundwater contaminant concentrations exceeding acceptable risk levels and/or federal and state maximum contaminant levels), then a decision will be made about the level of remedial activity needed during Phase II (i.e., reduce/expand the number of extraction wells, use natural venting, or use a combination of natural venting and Extraction/Treatment by VVE).

A.3.9 Comments Deemed Beyond the Scope of the OCVZ ROD

Comments and questions on a variety of subjects not specific to OCVZ were received during the public comment period. Those subjects included editorial comments concerning language in the Proposed Plan, statements of general distrust for the DOE actions, offers to provide technical assistance on the project, statements concerning past work at the INEL, personal preferences on how taxpayer money should be spent. These out-of-scope comments are not responded to in this Responsiveness Summary. Additional information on these unrelated subjects can be obtained from the INEL Public Affairs Office in Idaho Falls or at the local INEL offices in Pocatello, Twin Falls, and Boise.

Appendix B

Public Comment/Response List Index

Appendix B

Public Comment/Response List Index

The Public Comment/Response List Index was created to enable commenters and other interested persons to locate the agencies' responses to individual public comments. All oral comments, as given at the public meetings, and all written comments, as submitted, were typed into the attached index. Each comment was then subdivided and assigned a comment code. The codes indicate whether the comment was either written (W code) or taken from the public meeting transcript (T code). The agencies tried to divide comments according to specific concerns, issues or points made by the commenter.

Sixteen people submitted written comments (comments W1-W16) and 12 others gave oral comments at the public meetings (comments T1-T12). Copies of oral and written comments annotated with their respective comment codes are located in the Administrative Record.

To locate a response to a specific individual's comments, look up the last name of the individual, identify the specific comment you are looking for, then turn to the comment number or page indicated in the Responsiveness Summary.

If, after reviewing the annotated comments in the administrative record, a reader wishes to locate a response to a specific comment, he/she can use the comment code to locate a response as well. The reader should identify the comment code in the index, look up the comment and page number of the response then turn to that page of the Responsiveness Summary.

Comments involving multiple issues were further subdivided and answers may appear in more than one place in the Responsiveness Summary. This was done for only five of the 95 comments.

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ORGANIC CONTAMINATION IN THE VADOSE ZONE
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Code	Response Number	Commenter	Comment	Page Number

NC NA Jack This is an interesting project to me because I first Out-of-Scope/Not Responded To
Barraclough started studying the burial ground about 30 years ago at the RWMC. And along the studies, we defined the geology of which they're still using and had a feeling for what to do with this waste that's been placed there.

In 1980, we looked for organic contaminants. We looked in the parts per million range and couldn't find them. In 1987, they were detected in the parts per billion range.

The vapor vacuum extraction is a very exciting project, and it's one that Dr. Dave AllmanÄÄabout 10 years ago, Dr. Dave Allman and I recommended it, but we had a little bit different concept where we'd use the natural breathing and venting by using wells as a short circuit and using the changes in barometric pressure as the pump and then filter the air.

T1-1 32 Jack I think the system that they're developed now is A-17
Barraclough superior to our original concept.

T1-2 40 Jack [W]e wanted to introduce cold air during the winter A-20
Barraclough to freeze what moisture was in there to prevent downward migration of water carrying contaminants.

T1-3 32 Jack And I think the analysis is good and I think the A-17
Barraclough modeling studies are good. And I support the preferred alternative, and I think it's probably the most cost-effective and the most dynamic.

T1-4 14 Jack I would suggest that you do seriously consider A-10
Barraclough naturalÄÄusing the changes in barometric pressure as more cost effective, maybe not now, but in the future.

T2-1 32 C. E. I think the alternative that Jack is talking about is A-17
White, Jr. going to be the one.

T2-2 14 C. E. I justÄÄI just don't think that weÄÄwith the A-10
White, Jr. barometric pressure, it's going to take too many years to do it. I think it's going to be a slower process to do it, Jack. I don't know. You may not agree with me, but I think going to be a lot

slower.

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Code	Response Number	Commenter	Comment	Page Number
T2-3	42	C. E. White, Jr.	And we will have toÄÄthe government will have to come up with money every period, every budget period, to allocate to this.	A-22
T2-4	32, 42	C. E. White, Jr.	[I]f we choose the No. 2 one, which is the pump, I think we've got a good chance of getting if funded because I think it will work and I think we can prove it will work.	A-17, A-22
T2-5	32	C. E. White, Jr.	I agree also that that would be the alternative to accept.	A-17
T3-1	34	Bob Belveal	It doesn'tÄÄit doesn't make sense to me for you folks to stand up here and justify spending my tax dollars doing this for the purpose of saving lives when you don't know where the lives are that you're impacting. I don't think you've done your homework.	A-18
T4-1	41	Nicole LeFavour	I'm concerned that possibly the money being spent is perhapsÄÄI guess I should phrase this better. Perhaps you're being cautious with the money you're spending, and I guess I just want to make sure that there isn't the possibility that you need to do perhaps the $59 million treatment. I hoped that you will err on the side of the cautious. And I think it looks good.	A-21
T5-1	32	John Anderson	I really feel that your vapor extraction is a correct method. I'm very familiar with vapor extraction and this is probably as cheapÄÄyou're going to get the best bang for your dollar right there.	A-17
T6-1	25	Fritz Bjornsen	I guess my concern would be simply that during the process, all care be taken that the monitoring	A-14

wells
and the vapor vacuum extraction well be properly capped and monitored to prevent increased migration both of the solvents and potentially other problemsÄÄother things existing in the soil at the RWMC that might find an easy pathway to the aquifer through the wells that are being dug.

T7-1 32 Walt Hamson It looks to me like you've done a pretty thorough job. A-17

T7-2 41 Walt Hamson Personally, it seems to me that the Preferred Alternative looks pretty reasonable, as long as you hold kind of close to that 12 instead of the 32. A-21

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Code	Response Number	Commenter	Comment	Page Number
T8-1	21	Walter Betway	I mentioned earlier the concern for technology transfer, and I think that still should be a very high priority and I don't think it's really being addressed.	A-13
T8-2	16	Walter Betway	We're also not dealing with costs in a more detailed breakdown. If you're going to run the program two years and say it goes to three, can we work at automating this to reduce the labor cost and to let it do its thing even if it takes five or ten years without high labor costs?	A-11
T8-3	17	Walter Betway	We need to look at can we recover this organic vapor solvent and reuse it elsewhere as feed stock for something else? The reason being is that you may not have a lot here, but there is a lot in other dumps elsewhere throughout the world.	A-11
T8-4	24	Walter Betway	And this reinventing the wheel does bother me a bit. I still think that, like you say, I don't trust computers, and just because the computer says this, I can also program computers to make any answer I want. And this is where I needÄÄfeel, I should say, that software documentations should be	A-14

readable and these programs should be described as what they do much more in the public domain. They're right now, as far as I know, almost no indication of this in the INEL Repository, or at least references to such. Part of the data processing which is not unique to INEL, it's throughout the whole computer industry.

We're taking too much in faith that the computer model is accurate or even meaningful. I don't even know what the variables are that go into it or come out of it. All I can do is guess. I think that's unfair and also make is unuseful for other projects in the future.

T8-5 19 Walter I have yet to see an entity relation diagram, that's A-12

Betway how to date and relate to each other. A contact's diagram for a data flow diagram, I've yet to see one of those anywhere mentioned. In other words, what are the inputs, outputs, and so forth described.

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Code	Response Number	Commenter	Comment	Page Number
T8-6	2	Walter	So I'm looking at this equipment, whatever you're	A-6
		Betway	doing on this, to be useful and transferable and do a good job here, rather than do a, shall we say, a least effort and then hopefully forgotten. You known, we did our project, we cleaned it up; but it's all lost like many of the other files and piles of reports and is unusable by anyone else. So record-keeping is still a critical area.	
T8-7	24	Walter	And I'd like to see those computer printouts,	A-14
		Betway	definitely as I mentioned before, be made much more readable. It's a failing that's not professional in my opinion. It's muchÄÄI think hackers even can do better jobs on some of these printouts. And as you do such things, it will give the public confidence by making these things more readable rather than, shall we say, questionable because the AECÄÄor Atomic Energy Commission or the DOE nowÄÄhas	

in the past, hid so much in secrecy or in records that are questionable in value.

T8-8 2 Walter And I'd like to see where its referenced to where
A-6
Betway the data records are being kept in your Information Repository in computer form. Do you even have one, or is this kept in somebody's desk, third drawer down next to the garbage can? These are the concerns I would like to see INEL succeed and has to be dealtÄÄthese problems have to be dealt with.

T9-1 32 Kent I support any effort in site remediation at any
A-17
Martin facility in the United States. And I'm very please to see that Idaho has taken the time and effort, because it's very, very difficult to do all this. And I command all of your on your effort to take on this monumental task. So, I support you one hundred percent.

T10-1 27 Chuck I'm not convinced that the total mass volumes that
A-15
Broscious you all are using as your base for what was disclosed of there is accurate. And in terms of the ramifications, if that number is not correct and how that would impact your risk ranges and whatnot is significant. And I would like to see some documentation on what you base those figures on, you known, to assure me that you're working from numbers that are pretty solid.

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Code	Response Number	Commenter	Comment	Page Number
T10-2	28	Chuck	In terms of maintaining institutional control for 100	A-16
		Broscious	years, I think it's important to stop and think about what was going on in 1894. This was decades before even the automobile. This was before paved highways and this was during the time when people road the trains around, a lot of them were wood fired. So, in terms of projecting, you know, another hundred years out there and making assumptions that there's going to be something that	

we call the United States of America is being very presumptuous. And I think we need to be thinking about these things when we just lay these projections out there.

T10-3 15 Chuck Broscious And again, I do not have a lot of faith in your characterization of how fast contaminants move from the surface to the groundwater, because I've had too much documentation, other geologists, hydrologists, and in and out of Department of Energy, Atomic Energy Commission, Energy Resource and Development Agency. You know, it doesn'tÄÄyou know there's too much challenge in documentation. A-11

T11-1 26 Neil Farmer I see a few positive aspects and a few negative aspects. One positive comment that I'd like to make it towards people working on this problem, that at least we're coming to a conclusion for a remedial effort that isÄÄat least we aren't studying it to death as we are with the salmon issue. A-15

T11-2 27, 29 Neil Farmer Some of the negative parts of the presentation is of course some of the data given by computer programs as mentioned. I just go through with an assignment basically doing the exact same thing with a different program. And it is true, initial concentrations are extremely crucial, over what time period they are dumped into a pit, and the reactions with other chemicals. So thisÄÄand a lot of this is completely unknown. A-15, A-16

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Code	Response Number	Commenter	Comment	Page Number
T11-3	29	Neil Farmer	And that's not even to mention the hydrologic factors of the aquifer, namely effective porosity, spurcivity, a good many others, that most, even well experienced and seasoned hydrogeologists most of the time have to virtually pluck out of the air because there is no hard data for that. And those are crucial inputs into the computer programs which will dramatically affect program, garbage in	A-16

and garbage out.

T11-4 27 Neil What I'm trying to say is the input data is in A-15
Farmer essence so hard to get a firm grasp on theÄÄit's very difficult to have much reliance on the output of the computer program. But that's not to say that there are completely inadequate. They're only as good as the input in, and that's personal experience and from conversations with seasoned hydrogeologists, I suppose namely on the University faculty.

T12-1 3 Joe I'd like to thank you for the opportunity at least to A-6
Lance hear more about what the problem is. Having worked the last 20 years or more in the Hagerman Valley with fisheries' people and irrigators and agriculturists, I understand the importance of this aquifer. I guess my only comment would be I appreciate the opportunity to hear it, and the opportunity to respond. I wish I'd knew more about it such as many of the people here, but I have learned. And I would like to apologize for the mistakes that my generation made by drilling holes into the aquifer, and maybe through some of this cleanup, this won't happen, but we at least left it to our kids to clean up. I appreciate the opportunity to be here.

W1-1 3 Walt Excellent communicationÄÄ[I] have seldom seen A-6
Hampson more accurate and thorough technical composition in a general publication.

W1-2 20 Walt [I] would like to see more in-depth analysis of the A-12
Hampson In Situ Bioremediation Alternative. It seems to have been passed off a little lightly as too difficult for this subsurface. However if not too difficultÄÄit would certainly be a much lower cost alternative.

W1-3 3 Walt Thanks for this opportunity to comment and good A-6
Hampson luck!

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Code	Response Number	Commenter	Comment	Page Number

W2-1 41 Phyllis We need to clean up the problems of the water
A-21
Jones regardless of cost and ASAP as a federal project
and maybe helped by the state.

W2-2 3 Phyllis Please keep us updated as to future information.
A-6
Jones Thanks.

W3-1 32 Rodger F. I support your recommended Alternative 2.
A-17
Colgan

W3-2 37 Rodger F. There should be limits for effective VVE operation,
A-19
Colgan not to remove contaminants to levels of detection
for sophisticated instrumentation.

W3-3 37 Rodger F. Activity should be initiated in the highest
A-19
Colgan concentration areas.

W3-4 18 Rodger F. I am not aware of what "hazard" exists in Texaco
A-11
Colgan Regal Oil and if VVE would work in its removal.

W3-5 21 Rodger F. The technology for VVE should be common,
A-13
Colgan simple, reasonably cost effective, and shared in
trade publications such as Environmental Protection
and T.N.E.J., etc.

W3-6 22 Rodger F. The implementation should begin as soon as
A-13
Colgan possible.

W4-1 32 Andy The outlined plans would appear to be reasonable.
A-17
Holderreed

W4-2 NC Andy Plans allow for more well drilling and testing to
Out-of-Scope/Not Responded To
Holderreed determine the extent of the remediation.

W4-3 22 Andy I think we must get on with efforts to mitigate
the A-13
Holderreed waste problems to head off worse problems ahead.

W5-1 23 Warren [If we were voting,] I would favor Alternative 0
and A-13
Barry simply monitor the material at a great saving in

cost
to all.

W5-2 32 Warren My second choice would be Alternative 2, VVE A-17
Barry Phase I. This should satisfy all reasonable objections and provide an acceptable solution.

W5-3 8 Warren My understanding the aquifer is comparable to a A-8
Barry huge lake without appreciable movement. Any infiltration would simply remain there and decompose.

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Code	Response Number	Commenter	Comment	Page Number
W6-1	30	Willard Adams	Alternatives for handling contaminants in the Vadose Zone under RWMC should not include Alternative 0 or 1. They do not cut it if one was to consider an earthquake that may shift the earth and/or open a direct path of flow to the Snake River Plain Aquifer.	A-17
W7-1	NC	R. Ham Hamilton	The last sentence of "Alternative 0: No Action" should be the last sentence of Remedial Action Objectives.	Out-of-Scope/Not Responded To
W7-2	NC	R. Ham Hamilton	Move the 4.1 million from page 11 to page 10.	Out-of-Scope/Not Responded To
W7-3	23	R. Ham Hamilton	"No Action" means to do nothing in good English.	A-14
W7-4	23	R. Ham Hamilton	After all your blatherÄÄleave everything be: Monitor once each 10 years with improved technology.	A-13
W8-1	6	Bruce L. Schmalz	What correlation exists, if any, between the transport model and that previously used for water (Schmalz and Polzer, Soil Science, vol. 108, no. 1,	A-7

			1969)?	
W8-2	4	Bruce L. Schmalz	What forces were considered in the model (e.g., gravity, capillary attraction, atmospheric pressure, etc.) and the physical phase of the contaminants (e.g., gaseous or liquid or both)?	A-7
W8-3	30	Bruce L. Schmalz	It is this commentator's intuitive opinion that the first alternative to given additional consideration, particularly in regard to the order of magnitude of the added cost of the preferred Alternative 2.	A-17
NC	NC	C. E. White, Jr.	I have read all of the data available on your proposed method of extraction have had some one-on-one discussions with Reuel Smith (among others) and . . .	Out-of-Scope/Not Responded To
W9-1	3, 32	C. E. White, Jr.	[I]T is my feeling that you have a workable and safe remediation procedure. Thanks for the opportunity to comment.	A-6, A-17
NC	NC	David II. Nedrud	In December of 1992, our company started a Vapor Extraction project for a Nevada engineering firm. The project involved a leaking UST with unleaded gasoline. From our air and water well monitoring, we have seen dramatic decreases in contamination levels in soils.	Out-of-Scope/Not Responded To

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Code	Response Number	Commenter	Comment	Page Number
W10-1	32	David H. Nedrud	No doubt in our minds that Vapor Extraction does work, is cost effective, and should be a viable option for some soil problems at the INEL.	A-17
NC	NC	David H. Nedrud	If we can be of any assistance, call our office anytime. (208) 232-2034 Idaho is our home. Please keep cleaning up the site! Thank you DOE/EPA.	Out-of-Scope/Not Responded To

W11-1	3	Stan Sorensen	No comments at this time, but would like to receive a copy of the Record of Decision and Responsiveness Summary.	A-6
W12-1	32	Robert Gates	Your efforts have convinced me that you are doing the right thing to protect the people and the environment. Keep up the good work.	A-17
W13-1	5	Allen Merritt	Have you allowed for uncertainty?	A-7
W13-2	38	Allen Merritt	Incorporate some flexibility as this plan will almost certainly have to be monitored at least slightly as the effort proceeds.	A-20
W14-1	32	Robert M. Lugar	In general, I agree with preferred remedial action alternative presented in this proposed plan.	A-17
W14-2	33	Robert M. Lugar	Vapor vacuum extraction has been definitely shown to be effective at removing vapor-phase VOCs from the subsurface environment beneath the RWMC and is a fairly mature remediation technology (fairly high reliability of performance). Catalytic oxidation is a logical choice for destruction of the VOCs once removed from the subsurface . . .	A-18
W14-3	35	Robert M. Lugar	[T]here are presently commercially available trailer-mounted units which should be the most cost effective option (versus in-house design and construction).	A-19

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Code	Response Number	Commenter	Comment	Page Number
W14-4	36	Robert M.	On page 12, it states that "it is expected that no	

A-19

Lugar residual treatment wastes would be generated under Alternative 2. . . ." Keep in mind that eventually the catalyst will require either replacement or regeneration, and the associated catalyst waste disposal/replacement or regeneration costs. In addition, under catalytic oxidation, you will likely end up with a relatively small amount of hydrochloric acid (HCL) and/or a chloride salt, depending on the particular catalytic process used. There may also be small amounts of particulate matter collected by cyclone separator and/or HEPA filters upstream of VOC treatment component.

W14-5 12 Robert M. Has any consideration been given to the effect of
A-10

Lugar "drying out" (removing moisture) of the vadose zone as a result of the flow of large volumes of air through it. For example, will this phenomenon occur, and if so, to what extent, and will it have a positive or negative influence on VOC fate and transport in the subsurface environment? This does not effect the basic selection of the preferred alternative; however, it should be considered for future phase implementation and modeling.

W14-6 25 Robert M. I suggest that throughout all the phases, the
A-14

Lugar number of extraction and monitoring wells be minimized to the extent possible. Although present day well construction techniques should protect the subsurface from inadvertently acting as conduits for contaminant transport to the deeper regions, any penetrations in the SDA are potential conduits.

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Code	Response Number	Commenter	Comment	Page Number
W14-7	13, 22	Robert M. Lugar	I suggest the agencies (DOE, IDHW, and EPA) consider restarting the existing VVE system at RWMC as soon as possible instead of leaving it idle until the additional five Phase I extraction/monitoring wells are installed and VVE systems for these wells are operational. At an estimated VOC extraction rate (based on the	A-10, A-13

treatability study) of 1.754 pounds of VOCs/hour, 90% system availability, and a Phase I startup date of April 1995, approximately 13,832 pounds of VOCs can be removed from the SDA subsurface BEFORE the Phase I alternative is initiated if the existing system is restarted! The remedial objective is to remove subsurface VOCs to below cleanup goals . . . and we presently do not have a reliable prediction of how long this will take (from page 17 of the Proposed Plan), so why not get on with it as soon as possible rather than wait for a whole new set of paperwork, design reviews, safety analysis and reviews, etc. for the Phase I systems?

The existing VVE system has proven itself to be safe and effective; all the necessary operating procedures, safety reviews, and monitoring procedures are in place, and trained personnel are available to operate the system. The disposal of the spent carbon adsorbers used on this system should not be an issue, since precedent has been set by the recent DOE-HQ approval of off-site disposal (at a licensed disposal facility) of spent adsorbers generated during the treatability study. Although we know now that carbon adsorption is not necessarily the optimum technology to treat the extracted VOC vapors from the RWMC, it is a widely accepted and utilized VOC vapor treatment method, and perfectly suitable until the Phase I wells/systems are operational.

A tremendous amount of money has been invested in this existing system (especially if one includes the 1989/1990 tests and 1993 treatability tests), and we have only recovered an estimated 4,473 pounds of VOCs to date with it! Why not let it provide a better return on our tax dollar investment?

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Code	Response Number	Commenter	Comment	Page Number
W14-8	26	Robert M. Lugar	On page 17 it is stated that "the complexities of the subsurface environment and uncertainty associated with the modeling, make if difficult to predict how many wells will eventually be needed, how long it	A-15

would take to achieve cleanup goals, and at what point the agencies could safety turn off the system." In light of this, I suggest the agencies consider expanding the benefit of the existing and future vapor vacuum extraction systems beyond regulatory driven risk reduction and remediation, and allow INEL, university, industry, and regulatory partners to use the VVE extraction and monitoring system(s) as a research "platform" to develop and test new technologies for subsurface characterization and modeling, vapor vacuum extraction and vapor treatment. Applied research and development activities using the platform would help us better understand the complexities of the subsurface, help us optimize the VVE process and be candidates for subsequent technology transfer to the private sector. Applied research and development activities associated with the concept would directly support the Department of Energy's the EPA's efforts to expand the development of environmental technologies, as directed by President Clinton's Environmental Technology Initiative and EPA's Technology Innovation Strategy (the former initiative specifically proposes to use the national laboratories as testing and evaluation centers in support of site characterization technology and use federal facility sites for full scale demonstrations of innovative remediation technologies). This platform would also support increased interaction between local universities, particularly in the geosciences and environmental engineering disciplines, and broaden our knowledge of VOC fate and transport in the vadose zone overlying the Snake River Plain aquifer.

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Code	Response Number	Commenter	Comment	Page Number
W14-9	21	Robert M. Lugar	Our subsurface vapor contaminant problem at RWMC is not unique; many other DOE sites (e.g., Hanford, DOD sites) and even USDA grain storage sites have discovered similar subsurface VOC contaminant plumes requiring VVE techniques to remove and treat the vapors. An	A-13

INEL VVE and VOC treatment research program could not only help find the optimum treatment technology for DOE sites, but also assist others to develop, test, and supply emerging vapor removal and treatment technologies. VOC emission abatement, control, and treatment is the most rapidly growing component of the U.S. air pollution control industry. Many of the new emission control requirements of the recently reauthorized Clean Air Act are aimed specifically at controlling VOC vapor emissions from a variety of industry categories. Certain operations at DOE facilities will be impacted by these new VOC emission requirements. These regulatory drivers have created market pull for new and innovative VOC treatment technologies. Already the list of emerging technologies for VOC treatment is growing faster than any other pollution control area. Emerging vapor treatment technologies include catalytic oxidation, thermal oxidation, biological treatment, cryogenic techniques, solar oxidation, and electron beam destruction. On page 12 of this Proposed Plan it states". . . biological and ultraviolet treatment would require further development in order to be a viable vapor treatment option for the large scale application. . . ." Why not let scientists and engineers from INEL/university/industry collaborate on this problem and use a sidestream of one of the extraction wells to address this technology development need?

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Code	Response Number	Commenter	Comment	Page Number
W14-1	14, 21	Robert M. Lugar	The advantages of using the OCVZ as a basis for conducting subsurface, VVE and VOC treatment research is that the vapor plume is fairly well characterized, maintains a relatively stable concentration and composition, and will be continually monitored during the duration of VVE operations. Extracted vapor could be made available for bench or pilot scale treatment studies using a sidestream from the extraction well. The effects of natural barometric "pumping" could be studied, enhanced subsurface vapor tracer studies	A-10, A-13
0				

could be performed, and advanced subsurface contaminant fate and transport models could be calibrated against the monitored plume behavior.

W14-1 21 Robert M. Lugar The INEL has a noteworthy experience and capabilities base in this area (e.g., the design, testing, and optimization of the existing VVE system at RWMC), cadre of subsurface modeling experts, the joint INEL/industry development of the BioCube (a biological VOC treatment technology), contaminant monitoring experts, engineering expertise, and state-of-the-art vapor analytical capabilities. In order for the INEL to survive and flourish into the next century, we must be attuned to opportunities to expand our knowledge base and develop new technologies. The OCVZ work performed so far has laid the foundation to build upon, and I would hope the agencies might recognize that the project has the potential to be much more than just a remediation project. A-13

W15-1 1 John R. Horan The process of public input after the three agencies have met in secret to select the preferred alternate is seriously flawed. It's a farce to even consider that public comment can change a predetermined plan. A review of your CERCLA history in Idaho shows it has never been done. Community involvement and public comment, in its present form, only wastes additional taxpayer dollars which should be used on real risks rather than hypothetical potential risks of a low order. A-6

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DURING THE 31 MARCH-30 APRIL 1994 COMMENT PERIOD

Code	Response Number	Commenter	Comment	Page Number
W15-2	9	John R. Horan	Note that the main vapor plume has diffused about 100 feet over about 20 years. No mention has been made of a driving force that is expected to continue this expansion. I would expect the rate to decrease to zero as evidenced by 1960 field experiments.	A-8
W15-3	10	John R.	All wells as well (no pun intended) as ground	

A-9
Horan surfaces breath during atmosphere pressure changes. Have any measurable organic contaminants been detected by air sampling at the SDA? This would be real data as compared to your use of an estimated hazard to hypothetical workers.

W15-4 11 John R. How long has ID been monitoring the vadose
A-9
Horan zone? What changes in the rate of vapor expansion were noted during the 1993 extraction?

W15-5 41 John R. No business enterprise would recommend the
A-21
Horan spending of 13-67 million dollars to possibly remove what has been conservatively overestimated as a marginally potential health problem with no noncarcinogenic health effects and acceptable carcinogenic risks for the public.

W15-6 NC John R. Note that every phase in this long sentence is taken
Out-of-Scope/Not Responded To
Horan directly, but out of original context, from your March 1994 statement.

W15-7 39 John R. No place have you indicated with amount or
A-20
Horan percentage of the offending vapor you expect to remove or is even a goal of the program "Believing you will remove the most significant concentration" is inadequate.

W15-8 7 John R. What is the degree of conservation introduction in
A-8
Horan your risk analysis? 10, 100 or 10,000? The public should not have to search through pages 6-60 in the RI report for this vital information.

W15-9 23 John R. While it won't matter, my health and technical
A-13
Horan choice is Alternative 0.

W15-1 43 John R. Inadequate justification has been made to
A-22
0 Horan accelerate this applied experiment over a 2-year period.

Code	Response Number	Commenter	Comment	Page Number
W15-1	26	John R. Horan	As a developmental research project you might be able to make a case to use existing equipment on other wells in sequence. You have not considered this lower keyed approach.	A-15
W15-1	41	John R. Horan	As a taxpayer I would prefer to see my money spent on saving lives (e.g., Boron Neutron Capture Therapy).	A-21
W15-1	NC	John R. Horan	I cannot understand how you can get engineers and scientists to work on this type of pork barrel project which is basically unprofessional and unethical.	Out-of-Scope/Not Responded To
W16-1	32	George Leedom	From the presentation I heard at Moscow, Idaho, on April 21, 1994, I feel there is a potential problem and the action you propose of venting and destroying the contaminant appears to be very logical and thought out. I fully agree with your clean up proposal and the sooner the better.	A-17
W16-2	31	George Leedom	I realize there is no getting to zero contamination at any practical cost and there is really no need to. Carbon tetrachloride, trichloroethylene, tetrachloroethylene, and I, II-trichloroethylene contaminants have been with us for years and haven't shown been toxic at low levels.	A-17
W16-3	3, 32	George Leedom	Therefore, I feel that getting contaminants down to a reasonable level (minor risk) at reasonable cost is the best alternative. I feel that you have chosen the reasonable alternative. Thank you very much.	A-6, A-17

Appendix C

Idaho National Engineering Laboratory
Administrative Record File Index of the
RWMC Vadose Zone Organics RI/FS Operable Unit 7-08
10/20/94

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR3.1 SAMPLING AND ANALYSIS PLAN

Document #: EGG-WM-10175, Vol. 1
Title: Sampling and Analysis Plan for the Organic Contamination in the Vadose Zone
Author: Anderson, I.R.
Recipient: N/A
Date: 06/01/92

Document #: EGG-WM-10175, Vol. 2
Title: Sampling and Analysis Plan for the Organic Contamination in the Vadose Zone
Author: Anderson, I.R.
Recipient: N/A
Date: 06/01/92

ADMINISTRATIVE RECORD VOLUME II

AR3.3 WORK PLAN

Document #: ERD-025-92
Title: Organic Contamination in the Vadose Zone Remedial Investigation/Feasibility Study Work Plan
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 02/27/92

Document #: EGG-WM-10049
Title: Final Work Plan for the Organic Contamination in the Vadose Zone
Author: Chatwin, T. D.
Recipient: N/A
Date: 06/01/92

RWMC VADOSE ZONE ORGANICS RI/FS OU 7-08 10/20/94

FILE NUMBER

AR3.4 REMEDIAL INVESTIGATION

Document # ER-VVED-076
Title: Long Term Testing at OCVZ (OU-8), Possible Origin of Chloroform at the

RWMC
Author: Downs, W. C.
Recipient: ARDC
Date: 05/04/94

AR3.10 SCOPE OF WORK

Document #: EGG-ERD-10376, Rev. 7
Title: Scope Of Work for Organic Contamination in the Vadose Zone Remedial Investigation/Feasibility Study
Author: Matthern, G. E.
Recipient: N/A
Date: 06/01/92

AR3.12 RI/FS REPORTS

Document #: EGG-ER-10684, Vol. 1
Title: Remedial Investigation/Feasibility Study Report For The Organic Contamination in the Vadose ZoneÄÄOperable Unit 7-08 Volume I: Remedial Investigation
Author: Duncan, F. L.
Recipient: N/A
Date: 12/01/93

ADMINISTRATIVE RECORD VOLUME III

Document #: EGG-ER-10684, Vol. 2
Title: RI/FS Report For The Organic Contamination in the Vadose ZoneÄÄ Operable Unit 7-08 Volume II: Remedial Investigation Appendices
Author: Duncan, F. L.
Recipient: N/A
Date: 12/01/93

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

Document #: EGG-ER-10684, Vol. 3
Title: RI/FS Report For The Organic Contaminants in the Vadose ZoneÄÄ Operable Unit 7-08 Volume II: Feasibility Study
Author: Hamel, C. M.
Recipient: N/A
Date: 12/01/93

Document #: OPE-ER-70-94
Title: Transmittal of Final Inserts for the OCVZ Final RI/FS
Author: Green, L.

Recipient: Pierre, W.; Nygard, D.
Date: 03/24/94

AR3.17 RI/BRA REPORTS

Document #: AM/ERWM-ERD-092-92
Title: Organic Contamination in the Vadose Zone Remedial Investigation/Feasibility Study
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 10/09/92

Document #: AM/ERWM-ERD-017-93
Title: Transmittal of Draft Organic Contamination in the Vadose Zone Remedial Investigation and Baseline Risk Assessment Report
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 03/03/93

FILE NUMBER

AR3.18 ENVIRONMENTAL ASSESSMENT

Document #: 5620
Title: NEPAÄÄEnvironmental Assessment of Remediation of Organic Contamination in the Vadose Zone at the INEL
Author: DOE-ID
Recipient: Administrative Record
Date: 02/25/94

AR3.19 FINDING OF NO SIGNIFICANT IMPACT

Document #: 5619
Title: Draft Finding of No Significant Impact for the Remediation of the Organic Contamination in the Vadose Zone
Author: DOE-ID
Recipient: N/A
Date: 02/01/93

AR3.20 TREATABILITY STUDY

Document #: AM/ERWM-ERD-085-92
Title: Vapor Vacuum Extraction Treatability Study at the RWMC
Author: Macdonald, D. W.
Recipient: Nygard, D.
Date: 09/11/92

Document #: EGG-WM-10132
Title: Final Work Plan for the OCVZ OU 7-08 Pilot Scale Treatability Study

Author: Herd, M.
Recipient: N/A
Date: 03/01/94

Document #: OPE-ER-69-94
Title: Transmittal of the Draft Treatability Study Report for OCVZ (OU-7-08)
Author: Green, L. A.
Recipient: Pierre, W.; Nygard, D.
Date: 03/25/94

FILE NUMBER

AR4.3 PROPOSED PLAN

Document #: 5642
Title: Proposed Plan for Organic Contamination in the Vadose Zone
Author: INEL Community Relations
Recipient: N/A
Date: 03/01/94

Document #: 5672
Title: Transmittal of the Proposed Plan for Organic Contamination in the Vadose Zone, Idaho National Engineering Laboratory
Author: Robison, S. A.
Recipient: Burns, T. F.
Date: 02/18/94

AR5.1 RECORD OF DECISION

Document #: OPE-ER-152-94
Title: Transmittal of the Draft Record of Decision for Organic Contamination in the Vadose Zone, RWMC, INEL
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 07/11/94

Document #: 5761
Title: Record of Decision for Organic Contamination in the Vadose Zone, RWMC, INEL
Author: DOE-ID, EPA, IDHW
Recipient: N/A
Date: 11/08/94

AR7.8 OFFSITE WASTE SHIPMENTS

Document #: 5609
Title: Approval of an EG&G Idaho Waste Shipment
Author: Lytle, J. E.
Recipient: Burns, T. F.

Date: 11/22/93

FILE NUMBER

AR7.9 SECRETARIAL POLICY

Document #: OPE-ER1-056-94
Title: Changes in the Environmental Restoration (ER) Program Due To The Secretarial Policy on the National Environmental Policy Act (NEPA)
Author: Green, L. A.
Recipient: Addresses
Date: 07/13/94

AR10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 5703
Title: Public Meeting Transcripts for the Organic Contamination in the Vadose Zone (OCVZ)
Author: Ecology and Environment, Inc.
Recipient: N/A
Date: 05/24/94

This document can be found in the INEL OU 8-07 Administrative Record Binder

AR10.6 PRESS RELEASES

Document #: 5640
Title: DOE Seeks Public Comment on Organic Contamination in the Vadose Zone
Author: N/A
Recipient: N/A
Date: 03/01/94

AR12.1 EPA COMMENTS

Document #: 5358
Title: Comments for Draft Work Plan for Organic Contamination in the Vadose Zone Remedial Investigation/Feasibility Study, Operable Unit 7-8, December 1991
Author: Pierre, W.
Recipient: Lyle, J. L.
Date: 02/26/92

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

Document #: 5674
Title: INEL RWMCÄÄDraft Final Work Plan for the Organic Contamination in the Vadose Zone, Operable Unit 7-08 Focused Remedial Investigation/ Feasibility Study, Dated May 1992
Author: Nearman, M. J.
Recipient: Macdonald, D.
Date: 05/21/92

Document #: 5357
Title: INEL WAG 7ÄÄDraft RI Report for the Organic Contamination in the Vadose Zone (OU 7-08), February 1993
Author: Nearman, M. J.
Recipient: Macdonald, D.
Date: 04/29/93

Document #: 5613
Title: EPA Comments on the Draft RI/FS Report for the Organic Contamination in the Vadose Zone OU 7-08, 3 volumes, dated August 1993
Author: Nearman, M. J.
Recipient: Macdonald, D.
Date: 11/04/93

Document #: 5628
Title: EPA Comments: INEL OU 7-08 Draft Final RI/FS Report
Author: Jones, E.
Recipient: Green, L.
Date: 02/14/94

Document #: 5707
Title: EPA Concurs: Preliminary Design Summary Report for OCVZ, RWMC, INEL
Author: Pierre, W.
Recipient: Green, L.
Date: 05/18/94

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

Document #: 5765
Title: EPA Comments on the Record of Decision for the OCVZ
Author: Wilkening, R. M.
Recipient: Green, L.
Date: 08/22/94

AR12.2 IDHW COMMENTS

Document #: 5675
Title: Technical Review Comments for Draft Final Focused RI/FS Work Plan for Organic Contamination in the Vadose Zone

Author: Nygard, D.
Recipient: Lyle, J. L.
Date: 05/22/92

Document #: 5696
Title: Review of DOE-ID Letter Dated 09/11/92 Providing Air Emissions Information for Meeting the Substantive Requirements of Idaho's Air Quality Regulations, VVE Treatability Study at the RWMC
Author: Nygard, D.
Recipient: Lyle, J. L.
Date: 10/16/92

Document #: 5355
Title: Review of EG&G Letter Dated November 9, 1992 Providing Air Emissions Information for the Pilot Scale Treatability Study, Operable Unit (OU 7-08) at the RWMC
Author: Nygard, D.
Recipient: Lyle, J. L.
Date: 11/30/92

Document #: 5356
Title: Review Comments for Draft RI Record for the Organic Contamination in the Vadose Zone, (EGG-ER-10684)
Author: Nygard, D.
Recipient: Macdonald, D.
Date: 04/21/93

FILE NUMBER

AR12.2 IDHW COMMENTS (continued)

Document #: 5571
Title: Technical Review Comments for the Draft Remedial Investigation / Feasibility Study Report for the Organic Contamination in the Vadose Zone Operable Unit 7-08
Author: Koch, D. F.
Recipient: Williams, A. C.
Date: 11/03/93

Document #: 5708
Title: Confirmation of OCVZ Well Installation Modification
Author: Koch, D.
Recipient: Green, L.
Date: 05/16/94

Document #: 5766
Title: IDHW Review of the Record of DecisionÄÄDeclaration of OCVZÄÄOPE-ER-152-94
Author: Koch, D.
Recipient: Green, L.

Date: 08/26/94

AR12.3 DOE RESPONSE TO COMMENTS

Document #: ERD1-081-92
Title: Scope for Organic Contamination in the Vadose Zone Remedial Investigation/Feasibility Study
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 03/27/92

Document #: 5588
Title: Resolution on the Comments for the Draft Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993
Author: EG&G Idaho, Inc.
Recipient: IDHW
Date: 02/01/93

FILE NUMBER

AR12.3 DOE RESPONSE TO COMMENTS (continued)

Document #: OPE-ER-004-94
Title: DOE Response to IDHW and EPA Comments on the Draft RI/FS for Organic Contamination in the Vadose Zone OU 7-08
Author: Green, L.
Recipient: Pierre, W.; Nygard, D.
Date: 01/13/94

Document #: OPE-ER-267-94
Title: DOE Response to IDHW and EPA Comments on the Draft Record of Decision (ROD) for Organic Contamination in the Vadose Zone (OCVZ) OU 7-08 at the RWMC, INEL
Author: Green, L.
Recipient: Pierre, W.; Nygard, D.
Date: 09/30/94

AR12.4 REQUEST FOR EXTENSION

Document #: ERD1-118-92
Title: Extension Of Comment Period For Organic Contamination in the Vadose Zone (OCVZ) Remedial Investigation/Feasibility Study
Author: Lyle, J. L.
Recipient: Pierre, W.; Nygard, D.
Date: 03/27/92

This Administrative Record Index is complete.

DOE-ID WAG Manager Date

LITCO WAG Manager Date

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD) - Explanation of Significant Differences (ESD):

ROD Date: 01/09/1995
Operable Unit: 22
ROD ID: EPA/ESD/R10-95/119

Text: Full-text ROD document follows on next page.

Text:

Explanation of Significant Difference

Power Burst Faciiity Corrosive Waste Sump and
Evaporation Pond Record of Decision

at the Idaho National Engineering Laboratory
Idaho Falls, Idaho

Signature sheet for the foregoing Explanation of Significant Difference for Operable Unit 5-13 interim action at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare. The Operable Unit 5-13 interim action consists of cleanup of the Power Burst Facility Evaporation Pond, Corrosive Waste Sump, and discharge pipe at the Idaho National Engineering Laboratory.

_____ _____

John M. Wilcynski
Manager
Department of Energy Idaho Operations Office

Date:

Explanation of Significant Difference for the Power Burst Facility

Corrosive Waste Sump and Evaporation Pond Record of Decision

at the Idaho National Engineering Laboratory

1. Introduction

This document presents an Explanation of Significant Difference (ESD) from the Record of Decision (ROD) for the Power Burst Facility Corrosive Waste Sump and Evaporation Pond Interim Action, which was signed by the United States Department of Energy, the United States Environmental Protection Agency, and the Idaho Department of Health and Welfare on September 30, 1992. This ROD was signed pursuant to the Comprehensive Environmental Rcsponse, Compensation, and Liability Act (CERCLA) and the December 1991 Federal Facility Agreement and Consent Order (FFA/CO) entered into by the United States Department of Energy, United States Environmental Protection Agency and the Idaho Department of Health and Welfare.

Site Name and Location:

Power Burst Facility Corrosive Waste Sump and Evaporation Pond
Waste Area Group 5, Operable Unit 13

Idaho National Engineering Laboratory

The lead agency for this action is the United States Department of Energy Idaho Operations Office (DOE-ID). The United States Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare (IDHW) both concur with, and approve the need for, this significant change to the selected remedy. The three agencies participated jointly in the decision and preparation of this document.

This ESD, prepared in accordance with Section 117(c) of CERCLA and 40 CFR 300 435(c)(2)(i), is necessary to address needed modifications to the selected remedy identified in the Power Burst Facility (PBF) Corrosive Waste Sump and Evaporation Pond ROD as modified by a previous ESD dated May 1994; and is being implemented for the following reasons:

- Recent sampling data indicated that the wastes found in the Corrosive Waste Sump did not pass the Toxic Characteristic Leaching Procedure (TCLP) criteria for chromium and would have to be stabilized prior to disposal at the RWMC.

- Due to the waste not meeting the disposal criteria, and the need for stabiliation, the costs for completing this Interim Action are estimated to exceed the costs included in the ROD by more than 50%.

This and other relevant documents will become part of the Administrative Record file pursuant to Section 300.825(a)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Copies of this ESD and the Administrative Record are available to the public in the following regional INEL Information Repasitories:

DOE Reading Room	INEL Pocatello Office	INEL Twin Falls Office
INEL Technical Library	1651 Al Ricken Drive	233 Second Street North
1176 Science Center Drive	Pocatello, Idaho	Suite B
Idaho Falls, Idaho		Twin Falls, Idaho
INEL Boise Office	University of Idaho Library	Shoshone-Bannock Library
816 West Bannock	U of I campus	HRDC Building
Suite 360	Moscow, Idaho	Bannock & Pima Streets
Boise, Idaho		Fort Hall, Idaho

II. Site History, Contamination Problems, and Selected Remedy

The Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls,in southeastern Idaho and encompasses approximately 890 square miles of semi-arid high desert, partially overlying the Snake River Plain Aquifer. The Power Burst Facility is situated in the southeast portion of the INEL (see Figure 1). The area of focus is the corrosive waste sump and adjacent evaporation pond.

The PBF Corrosive Waste Sump is a concrete structure that was used during the neutralization of reactor secondary coolant water prior to discharge to the PBF evaporation pond. The sump measures 11 feet on each side and extends to a depth of 21 feet. The walls are 12 inch thick reinforced concrete and the base measures 15 inches thick. Discharge to the evaporation pond is through a single walled pipeline.

The evaporation pond is a lined, bermed surface impoundment, spanning 140 feet on each side. The pond was constructed in 1978 by berming native soils to 4 1/2 feet and lining the interior with Hypalon. The liner was then covered with approximately 6 inches of sand for protection. This sand has become contaminated due to the discharge of secondary cooling water containing chromium and cesium-137.

Due to the presence of chromium-contaminated dust, the decision to remediate the evaporation pond and sump was made and presented to the public in a proposed plan. The preferred alternative was the removal of areas of high chromium contamination based on the cesium/chromium correlation (high cesium concentrations were identified in the same areas as the high chromium concentrations in the sediments) that was previously identified. A grout material would be manufactured from sediments and injected into void spaces in existing certified low level waste containers scheduled for disposal in the RWMC.

Following review of public comments, the preferred alternative listed in the proposed plan was deemed by the agencies to be the most premicable. The selected remedy was presented by the DOE in a ROD and approved by the EPA, with IDHW concurrence. Following signing of the ROD, design of the remedial action commenced. The Remedial Design/lmplementing Remedial Action Work Plan is filed in the Administrative Record in the binder for Operable Unit 5-13.

An ESD was signed by all three agencies in May 1994 defining significant changes to the selected remedy as outlined in the ROD. The areas to be cleaned up, the cleanup levels, and the disposal of the contaminated sediments within the RWMC was to be completed as provided in the ROD. However, that component of the remedy that deals with preparing the sediments for disposal in the low-level waste containers was modified for the reasons discussed below.

Sediment samples collected from the pond in December 1992 for a treatability study to be used in the grout design provided the following significant information.

The previously identified corrdation between the concentrations of cesium-137 and chromium was found to be invalid

Testing of the unstabilized pond sediment samples was done using the Toxicity Characteristic Leaching Procedure TCLP). This confirmed that the sediments will meet the RWMC waste acceptance criteria without stabilization prior to disposal.

Because the correlation between cesium and chromium was not demonstrated during the

analysis of the treatability study samples, the plan to identify "hotspots" for cleanup using a hand-held radiation detector would not be effective. Sampling of the entire pond on a 20-foot square grid was substituted for the originally planned survey. Results from this sampling effort indicated that approximately 170 cubic yards of sediments would be generated by the cleanup, rather than the 100 cubic yards estimated in the proposed plan and ROD. The treatability study results show that grouting 170 cubic yards of sediments would create a total volume of approximately 240 cubic yards of grout.

Concurrent with the treatability study, the remediation contractor initiated efforts to identify and coordinate delivery of waste containers destined for the RWMC which had sufficient void space for the projected volume of grouted sediments. This resulted in the identification of three additional issues:

Due to implementation of waste minimization at the INEL, most waste containers had only minimal amounts of void space available for grouting.

Most waste containers with significant void space are dose to their weight limit, and cannot accept significant amounts of the dense grout material. Delaying the project pending availability of sufficient containers with both the weight capacity and enough void space to accept 240 cubic yards of grouted sediments would have significantly extended the project completion date.

More detailed contaminant characterization of waste container contents would be needed to document worker safety and health protection. This could result in additional worker exposure, additional costs, and schedule delays.

In view of all the issues identified above, the three agencies agreed that a modification to the selected remedy was needed. Empty waste containers were used for disposal of the sediments if sufficient partially filled containers requinng only minimal further characterization of the contents are not available. Containers will be filled directly with the contaminated sediments, sealed and placed in the RWMC. Without grouting the sediments, the remedy remains protecive of human health and the environment because: 1) it reduces the potenial for exposure via the inhalation and direct radiation pathways, as identified in the ROD; 9) the treatability study confirmed that the ungrouted sediments meet the RWMC waste acceptance criteria, and; 3) institutional and administrative controls for a low-level waste disposal facility are presently in place at the RWMC.

III. Description of Significant Differences and Basis

The cleanup of the PBF Evaporation Pond has been completed in accordance with the plan identified in the ROD and previous ESD. However, that component of the remedy that deals with disposal of the sump sludge will be modified for the reasons outlined in section I of this ESD and further discussed below.

Sludge samples were collected from the sump in December 1994 for waste characterization

and disposal purposes. Testing of the sump sludge was done using the Toxicity Characteristic Leaching Procedure (TCLP). This test showed that the sludge does not meet the RWMC waste acceptance criteria. As a result of this new information the following changes are necessary:

The sludge will be removed, dewatered and stored at a permitted mixed waste storage facility (MWSF) pending determination of final disposition.

The sludge will then be either stabilized and disposed of at the RWMC or in accordance with the EPA's off site rule for the Treatment Storage and Disposal Facilities.

The modified remedy will have an impact on the cost and schedule of the project as well, due to the need to stabilize the sludge if it is to be disposed of at the RWMC. Additionally, a treatability study may have to be performed in order to determine the appropriate grouted matrix that will meet the RWMC waste acceptance criteria. Current estimates indicate that the project will exceed the estimated cost included in the ROD by more than 50%.

The Draft Final Remedial Action Report will address all aspects of the Remedial Action up to and including placement of the sludge into the MWSF. This report will be delivered to the State of Idaho and the EPA on February 17, 1995. An addendum to the Remedial Action Report win be prepared to address final disposition of the materials.

IV. Affirmation of the Statutory Determination

The revised remedy continues to utilize permanent solutions and treatment technologies to the extent practicable for the site. The original action identified for treatment and disposal of this waste (as outlined in Section 9.1 of the ROD) will be followed for the PBF Corrosive Waste Sump sludge. This includes removal of the sludge from the sump, decontamination of the sump, treatment of the sludge by grouting, if feasible based on treatability studies, and disposal at the RWMC or in accordance with the off-site rule.

Considering the new information that has developed, DOE, EPA, and IDHW all believe that the remedy remains protective of human health and the environment, complies with Federal and State requirements that have been identified as relevant and appropriate to this interim remedial action, and is cost effective.

V. Public Participation Activities

This ESD has been published and a notice placed in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Southern Idaho Press (Burley), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and Daily News

(Moscow). This ESD and the contents of the Administrative Record are available for public review. In addition to the Administrative Record on file for the Record of Decision, the Adrainistrative Record for this amion includes a copy of this ESD, Remedial Design/Implementing Remedial Action Work Plan (RD/RAWP) and supporting infommation (refer to binder for

Operable Unit 5-13). Although modified from the previous ESD, the remedy, as modified by this ESD, does not represent a fundamental change in scope or purpose of this action. Thus, a formal comment period will not be conducted.

Consistent with NCP Section 300.435(c)(2)(i), this ESD has been placed into the previously listed INEL Information Repositories, after the publication of a notice in the following papers:

Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Southern Idaho Press (Burley), Idaho Statesman (Boise), Lewiston Morning Tribune (Lewiston), and Daily News (Moscow)

The public is encouraged to review this ESD and other relevant documentation in the Administrative Record and provide comments to any of the agencies involved. Additional information may be requested within 14 days of the notice of issuance for this ESD by contacting:

Reuel Smith
INEL Community Relations Plan Office
P.O. Box 2047
Idaho Falls, Idaho 83403-2047
(208) 526-6864

<IMG SRC 1095119>

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD) - Explanation of Significant Differences (ESD):

ROD Date: 01/18/1995
Operable Unit: 18
ROD ID: EPA/ESD/R10-95/118

Text: Full-text ROD document follows on next page.

Text:

EXPLANATION OF SIGNIFICANT DIFFERENCES FOR THE PIT 9 INTERIM ACTION RECORD OF DECISION AT THE RADIOACTIVE WASTE MANAGEMENT COMPLEX

IDAHO NATIONAL ENGINEERING LABORATORY

I. INTRODUCITION

This document is an Explanation of Significant Differences (ESD) from the Record of Decision (ROD) for the Pit 9 Interim Action, signed by the United States Department of Energy, United States Environmental Protection Agency, and State of Idaho Department of Health and Welfare (the Agencies), effective October 1, 1993, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan. This ESD is also prepared in accordance with the terms of the Federal Facility Agreement and Consent Order.

Site Name and Location

Pit 9, Subsurface Disposal Area, Radioactive Waste Management Complex
Waste Area Group 7, Operable Unit 7-10
Idaho National Engineering Laboratory (INEL)

The lead agency for this action is the United States Department of Energy Idaho Operations Office (DOE-ID). The United States Environmental Protection Agency and the State of Idaho Department of Health and Welfare (IDHW) both concur with, and approve the need for, this significant change to the selected remedy. The Agencies participated jointly in preparing this document.

Need and Purpose for an Explanation of Significant Differences

This ESD was prepared in accordance with Section 117(c) of the CERCLA, and 40 CFR 300.435(c)(2)(i) which requires that an ESD be published "when the differences in the remedial or enforcement action, settlement, or consent decree significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost. "Accordingly, this explanation addresses cost estimates that increased significantly for the selected remedy identified in the Pit 9 ROD and is implemented to: Present revised project cost estimates, including additional costs identified in the firm fixed-price subcontract for the operations and maintenance and capital cost elements.

A detailed comparison of the current cost estimate information with that presented in the

ROD is presented in Section III.

This and other relevant documents will become part of the Administrative Record file pursuant to 40 CFR 300.825(a)(2). Copies of this ESD and the Pit 9 Administrative Record are available to the public in the INEL Information Repository sections of the libraries and offices listed on the last page of this Explanation of Significant Differences.

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II. SITE HISTORY, CONTAMINATION PROBLEMS, AND SELECTED REMEDY

The INEL is located 32 miles west of Idaho Falls in southeastern Idaho and encompasses approximately 890 square miles of semi-arid desert overlying the Snake River Plain Aquifer. The Subsurface Disposal Area is located at the Radioactive Waste Management Complex, which is located in the southwest portion of INEL (see Figure 1). The area of focus is Pit 9 which is located in the northeast corner of the Subsurface Disposal Area. Pit 9 is designated as Operable Unit 7-10 and is scheduled as an interim action in the Action Plan of the Federal Facility Agreement and Consent Order.

Pit 9 was operated as a waste disposal pit from November, 1967 to June, 1969. It was used to dispose of approximately 110,000 cubic feet (3,114.8 cubic meters) of transuranic waste (as defined in 1969, > 10 nCi/g) from the Rocky Flats Plant and additional low-level wastes (as defined in 1969 ó 10 nCi/g) from waste generators located at the INEL. The total volume of the pit is approximately 250,000 cubic feet (7,079.2 cubic meters) of overburden, 150,000 cubic feet (4,247.5 cubic meters) of packaged waste, and 350,000 cubic feet (9,910.9 cubic meters) of soil between and below the buried waste. Most of the transuranic waste consists of drums of sludge (contaminated with a mixture of transuranic waste and organic solvents), drums of assorted solid waste, and cardboard boxes containing empty contaminated drums.

The National Contingency Plan expresses a preference for early response action where such action will expedite completion of total site cleanup. The Federal Facility Agreement and Consent Order incorporates that preference. The Pit 9 Interim Action is intended to remove the source of contamination to a level that is protective of human health and the environment, to expedite overall cleanup at the Radioactive Waste Management Complex, and to reduce risks associated with potential migration of hazardous substances to the Snake River Plain Aquifer. The cleanup will also provide information regarding technologies potentially applicable to remediation of similar waste types at the

Radioactive Waste Management Complex.

Two proposed plans for remediating Pit 9 were presented to the public: the first in December of 1991 and the second in October of 1992. The Revised Proposed Plan contained details of processes that could be used in association with the preferred altenative that the public had requested during public meetings for the first Proposed Plan. The Agencies' preferred altenative was physical separation/chemicalextraction/stabilization of contaminants in Pit 9. The preferred alternative will stabilize contaminants after physical separation and chemical extraction to minimize migration of contaminants and to achieve reduction in waste volume and risk.

Following review of public comments, the preferred altenative described in the two proposed plans was selected by the Agencies. The selected remedy was documented in the Pit 9 ROD which was signed by the Department of Energy, the Environmental Protection Agency, and the State of Idaho Department of Health and Welfare on October 1, 1993.

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Under the selected remedy of physical separation/chemical extraction/stabilization, Pit 9 will be remotely excavated in a double-contained structure built over the pit. Contaminated materials requiring treatment will be physically separated into waste streams. Waste streams, such as contaminated soil, will be separated from waste containers disposed in the pit, and then each waste stream will be placed in the appropriate waste processing units. Additional physical separation will occur using mechanical methods such as flotation, gravity concentration, sedimentation, and filtration to separate mixtures of solids and contaminants. In addition, chemical extraction processes will be used to remove contaminants. The objective of the separation technology will be to remove organic contaminants and concentrate radioactive contaminants and heavy metals to reduce the volume of waste requiring disposal. The selected remedy also includes a stabilization process using thermal treatment. Detailed information concerning the selected remedy can be found in the ROD for Pit 9.

Because some aspects of the remedial technologies had not been proven on radioactively contaminated hazardous waste sites like Pit 9, implementation of the preferred remedial alternative is contingent on successful demonstration that the cleanup criteria and other performance objectives could be met in Proof-of-Process and Limited Production Test phases. The Proof-of-Process

Tests were completed by two subcontractor teams, Lockheed Environmental Systems and Technologies Company (LESAT) and Waste Management Environmental Services (WMES), in December, 1993.

Based on the Proof-of-Process Tests and a competitive bidding process, LESAT was selected by an EG&G Idaho Source Evaluation Board to remediate Pit 9. The preliminary (30%) design process has been recently completed, and the remainder of the remedial design activity is scheduled to be completed by March, 1996. The Limited Production Test is currently scheduled to be started in August, 1996.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES AND BASIS

Remediation of Pit 9 will be completed using the preferred alternative described in the ROD. The overall waste management approach to be used by LESAT is also consistent with that presented in the ROD. The significant change that necessitated preparation of this ESD relates exclusively to unanticipated cost increases. The costs in the negotiated fixed-price subcontract significantly exceeded estimated project costs presented in the ROD. Because the magnitude of the change exceeds that typically expected for CERCLA actions, the Agencies prepared this ESD as notification of the change.

Table 1 presents the preliminary estimated costs as presented in the Pit 9 ROD along with revised costs which are based on current information. Since this Pit 9 operation is a first of a kind facility and operation, much uncertainty existed when the initial estimate was prepared. The Pit 9 ROD cost estimates did not include allowances for project management, contingency, profit, or escalation and underestimated the capital as well as operation and maintenance costs.

The revised costs presented in Table 1 reflect the final contract price for the proof of process test phase and the actual contract price established in the firm fixed-price contract with LESAT resulting from the competitive procurement process for the cleanup. The $185.6 million subtotal in Table 1 for Interim Activity includes $178.6 million for fixed-price subcontract costs for the subcontractor to

install and operate the Pit 9 facility, as well as approximately $7.0 million for preliminary design and safety analysis activities previously conducted by both subcontractors. The estimate for long term storage and offsite disposal has not changed.

The firm fixed price contract established the cost to the Government for the total retrieval and

treatment of the Pit 9 waste. An advantage of the fixed-price subcontracting approach being implemented for the Pit 9 project is that the S178.6 million subcontract cost can only change if major project assumptions change. The contract also detailed the price of the major activities to be performed under the contract such as design, nuclear safety analysis and facility startup, equipment and facilities, unit pricing for material processed, decontamination and decommissioning costs, and profit. Significant differences existed between the original ROD estimates and the contract price in most cases.

The fixed price contract included a 15% profit which amounted to a total of $23.3 million. This profit is included in the revised cost numbers discussed below and included in Table 1 for the capital and operations and maintenance costs. The profit was evenly applied to all capital and operations and maintenance costs although no profit will actually be paid until successful completion of the limited production test. Since there was no allowance for profit in the original estimate, this represents a significant fraction of the change in cost. Because it is a fixed-price contract, the allowances for contingency and escalation included in the contract price by LESAT are unknown. These may represent a significant increase over the ROD cost estimate. Any allowances for contingency and escalation would have been included within the contract price for each specific activity (e.g., design, equipment). The contingency allowance is believed to be significant because this is a first-of-a-kind facility and because of the unknowns associated with the pit inventories and retrieval and treatment system performance. Design and operational costs of prototype activities like Pit 9 are typically much higher than the cost of proven technologies and systems.

For operations and maintenance costs, the ROD estimate was $29.1 million while the contract price was $76.1 million. The ROD estimate was based on treatment of 150,000 cubic feet of material (at a cost of $22.1 million), while the contract price is based on treating 250,000 cubic feet of material (at a cost of $64.8 million). It should be noted that the 250,000 cubic feet of material requiring treatment identified in the contract is considered a maximum. If the quantity differs from 250,000 cubic feet, the cost of the remediation may decrease or increase accordingly. The ROD estimate was also based on the removal of 270,000 cubic feet of the soil cover and material not requiring treatment (at a cost of $60,000), while the contract price is based on 500,000 cubic feet of this material (at a cost of $5.6 million). The contract price includes sampling, analysis and handling of this material while the ROD estimate assumed this material was clean and no analysis or additional handling would be required. The ROD estimate assumed the facility would be required to operate 5 days a

week (40 hours/week) for a year period to complete the LPT and full scale remediation while the fixed price contract is based on a 24 hour per day, five day per week operation for 16 months to complete LPT and full scale remediation. This difference in operating strategy, although not quantified, is expected to contribute significantly to the cost increase. Facility decontamination and removal costs were estimated in the ROD to be approximately $6.9 million while the contract price is $4.8 million. The ROD estimate also did not include some miscellaneous costs under the operations and maintenance category which the contract included at a price of approximately $900,000.

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For capital costs, the estimate in the ROD was $20.7 million while the revised cost amount was $109.5 million. Under this category, the estimate for design was $3.4 million while the design costs to date plus the contract price is $56.8 million. This extremely large discrepancy is attributed primarily to funding two design teams at a cost of $7 million until a contract selection was made and the final contract price ($49.8 million) which included costs for off site full scale test facilities to provide design data and to be used in the real time resolution of operational issues in an uncontaminated environment during the Pit 9 project. Under the original project estimate and assumptions, the need for offsite test facilities was not envisioned, therefore there was no cost allowance for offsite test facilities in the estimate. The remaining capital costs associated with buildings and equipment was estimated at $17.3 million for the ROD while the contract price was $52.7 million. This cost difference is believed to be influenced primarily by the complexity of integrating the various facilities and components, a more extensive use of remotely operated systems, and more rigorous containment structures than was envisioned in the ROD estimate.

In summary, building design and construction required considerable modification from the original ROD estimate. In particular, storage requirements for chemicals used in the process, physical separation equipment, control requirements for the plasma-arc furnace, chemical extraction processing systems, air emissions controls, and engineering requirements for the containment structure have been considerably refined from the original estimates which were based on conceptual design information; therefore, costs are now better defined.

Table 1. Interim Action cost estimate (millions of dollars).

Description	ROD Costsa	Revised Cost
Proof-of-Process Test		

Subtotal	$16.0	$ 16.4b
Interim Activity		
Capital	20.7	109.5
Operations and Maintenance	29.1	76.1
Subtotal	49.8	185.6
Long-Term Storage and Off-Site Disposal		
Subtotal	62.0	62.0
Total	127.8	264.0

a. ROD costs rounded to nearest one-tenth of a million dollars
b. Actual costs for Proof-of-Process Tests

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IV. AFFIRMATION OF THE STATUTORY DETERMINATION

As presented in the ROD, each alternative evaluated (in situ-vitrification, ex-situ vitrification; the selected remedy; and complete removal, storage, and off-site disposal) would provide adequate overall protection of human health and the environment by minimizing potential contaminant migration from Pit 9. The alternatives would also comply with the Applicable or Relevant and Appropriate Requirements of Federal and State laws and regulations identified in the ROD. The following discussion affirms that the selected remedy continues to provide the best balance of trade-offs in terms of long-term effectiveness, reducing toxicity, mobility and volume of the contaminants, implementability, short-term effectiveness, and cost.

The selected remedy, as well as the ex-situ vitrification alternative presented in the ROD, both use a stabilization component to immobilize the contaminants, thereby achieving some degree of long-term effectiveness. The selected remedy provides a greater degree of reduction of waste volume before stabilization via the physical/chemical treatment process so that the amount of waste requiring monitoring during storage and ultimately requiring disposal will be greatly reduced. The reduced volume of waste requiring long-term monitoring, storage, and disposal increases the overall long-term effectiveness of the selected alternative in comparison to ex-situ vitrification and the complete removal, storage, and off-site disposal option.

At the time of the ROD, the early developmental stage of the in-situ vitrification process limited the ability of the Agencies to determine the efficiency and long-term effectiveness of the process on the heterogeneous wastes found in Pit 9. Continuing uncertainties associated with the effectiveness of in-

situ vitrification include its effectiveness on heterogeneous materials such as those in Pit 9 and the ability to confirm complete vitrification/stabilization of the pit contents. The soil at the RWMC lacks some of the glass-forming materials such as silica and aluminum oxide that are necessary for efficient vitrification. It may be difficult to control subsurface and surface migration of the vaporized volatile organics that are present in significant amounts in Pit 9 wastes. In addition, the presence of a large volume of metallic objects within the pit may result in arcing between the electrodes and in incomplete vitrification. It is presently estimated that the in-situ vitrification alternative requires several more years of development before being available for use in an application such as the Pit 9 Interim Action.

The selected remedy remains superior to all alternatives evaluated with respect to implementability and/or volume reduction; therefore, the ability to achieve ROD remedial action objectives is best for the selected remedy.

The selected remedy would provide overall effectiveness proportional to its costs. The Agencies have concluded that the relative cost comparisons are basically unchanged from that presented in the ROD. Considering the revised cost estimates, the Agencies believe that the selected remedy remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. In addition, the selected remedy meets the statutory requirements to use permanent solutions and treatment technologies to the maximum extent possible. The Agencies prefer a potential permanent solution whenever possible and, in the case of Pit 9, the goal is to meet the objectives of an interim action and provide a potentially permanent treatment solution.

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V. PUBLIC PARTICIPATION ACTIVITIES

A notice publishing the availability of this ESD has been placed in the Post Register - Idaho Falls, Idaho State Journal - Pocatello, Times-News - Twin Falls, Southern Idaho Press - Burley, Idaho Statesman - Boise, Lewiston Morning Tribune - Lewiston, and Daily News - Moscow. Consistent with Section 300.435(c)(2)(i) of the National Contingency Plan, this ESD has been placed in the Administrative Record Section of the INEL Information Repositories listed below upon publication of the Notice of Availability. A postcard announcing the availability of this ESD was sent to the INEL mailing list participants. This ESD and the contents of the Pit 9 Administrative Record are available

for public review. In addition to the Administrative Record on file for the ROD, the Administrative Record for this action includes a copy of this ESD and relevant newspaper notices associated with the explanation (refer to the binder for OU 7-10). Additional supporting information on current Pit 9 project activities is included in the INEL Information Repositories.

The revised cost of the selected remedy does not represent a fundamental change from that contained in the ROD, and therefore, a formal comment period is not required. Additional information or briefings maybe requested by contacting the office listed below or calling the toll-free number for the INEL at (800) 708-2680:

Reuel Smith
INEL Community Relations Plan Office
P.O. Box 2047
Idaho Falls, Idaho 83403-2047
(208) 526-6864

LIBRARIES AND OFFICES CONTAINIING INFORMATION REPOSITORIES

DOE Reading Room INEL Technical Library 1776 Science Center Drive Idaho Falls, Idaho	INEL Pocatello Office 1651 Al Ricken Drive Pocatello, Idaho	INEL Twin Falls Office 233 Second Street North, Suite B Twin Falls, Idaho
INEL Boise Office 816 West Bannock Suite 360 Boise, Idaho	University of Idaho Library U of I Campus Moscow, Idaho	Shoshone-Bannock Library HRDC Building Bannock and Pima Streets Fort Hall, Idaho

January 18, 1995

<IMG SRC 1095118A>

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 08/18/1995
Operable Unit: 01
ROD ID: EPA/ROD/R10-95/120

Media: Groundwater

Contaminant: Trichloroethene, tetrachoroethene, 1,2-dichloroethene, tritium, str uranium

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Laboratory (INEL) is an 890 square-mile Federal facility operated by the US Department of Energy (DOE). The facility is located on the northern edge of the Eastern Snake River Plain. INEL employs approximately 11,700 people. The land at the INEL currently is used for nuclear research and development and waste management. The developed area within the INEL is surrounded by a buffer zone used for cattle and sheep grazing. The Test Area North (TAN) complex is located approximately 50 miles northwest of Idaho falls in the northern portion of the INEL and extends over an area of approximately 12 square miles. The Technical Support Facility (TSF) is centrally located within TAN and consists of several experimental and support facilities used for conducting research and development activities on reactor performance. Operations at TAN were initiated in the early 1950s to support the US Air Force aircraft nuclear propulsion (ANP) project. The objectives of the ANP project were to develop and test various designs for nuclear-powered engines and fuels for use on aircraft.

Four facilities were built at TAN including the TSF, Initial Engine Test (IET), Low Power Test Facility/ Experimental Beryllium Oxide Reactor, and Loss-of-Fluid Test (LOFT).

The remedy for OU 1-07B is intended to reduce the potential risk to human health by reducing groundwater contamination and preventing the ingestion of contaminated groundwater by future residents at this site. The principal source of groundwater contamination at TAN is the TSF-05 Injection Well located in the southeast corner of TSF. The TSF-05 Injection Well was used from 1953 to 1972 to dispose of TAN liquid wastes into the fractured basalt of the Snake River Plain Aquifer. These wastes included organic, inorganic, and low-level radioactive wastewaters added to industrial and sanitary wastewater. Activities generating these wastes included efforts to develop a nuclear-powered aircraft and tests simulating accidents involving the loss of coolant from nuclear reactors. Releases to TAN groundwater were first identified in 1987 when low levels of the organic compounds trichloroethene (TCE) and tetrachloroethene (PCE) were detected in the production wells that supply drinking water to TSF.

The INEL was listed on the National Priorities List (NPL) on November 21, 1989. As a result of this listing, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent Order in December 1991. This established a procedural framework for agency coordination and a schedule for all cleanup activities conducted at the INEL.

Remedy: The remedy for OU 1-07B addresses the groundwater beneath TAN that has, or is expected to have, concentrations of TCE above safe levels. The remedy is groundwater plume extraction and treatment of a heavily TCE-contaminated plume and hydraulic containment of the TSF-05 Injection Well hotspot with above ground treatment. Cleanup will occur in three phases followed by institutional controls and groundwater monitoring.

Text: Full-text ROD document follows on next page.

August 4, 1995

<IMG SRC 1095120> <IMG SRC 1095120A> <IMG SRC 1095120B> <IMG SRC 1095120C>

Record of Decision

Declaration for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites Final Remedial Action

<IMG SRC 1095120D>

Operable Unit 1-07B
Waste Area Group 1
Idaho National Engineering Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Technical Support Facility Injection Well (TSF-05) and
Surrounding Groundwater Contamination (TSF-23)ÄÄOperable Unit (OU) 1-07B
Test Area North (TAN) Miscellaneous No Action Sites OUs 1-01, 1-02, 1-06, and 1-09
Waste Area Group 1
Idaho National Engineering Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

This decision document presents the selected final remedial action for OU 1-07B [the Technical Support Facility (TSF) Injection Well and Surrounding Groundwater Contamination] at the Idaho National Engineering Laboratory (INEL). Also included are a group of miscellaneous sites at TAN that were evaluated under the Track 1 process and found to require no action. These actions were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Super Amendments and Reauthorization Act and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These decisions are based on information in the Administrative Record for the site.

The lead agency for this decision is the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) approves of this decision and along with the Idaho Department of Health and Welfare (IDHW) has participated in the evaluation of final remedial action alternatives. The IDHW concurs with the selected remedy.

Assessment of the Sites

Actual or threatened releases of hazardous substances from OU 1-07B, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to human health and welfare or the environment from future use of water taken from the TSF-05 Injection Well or from new drinking water wells placed within the plume where drinking water standards are exceeded.

The DOE has determined that no action is necessary for the TAN miscellaneous sites, which include portions of OUs 1-01, 1-02, 1-06, and 1-09. The sites in these four OUs have been categorized into underground storage tanks, potential soil contamination sites, and wastewater disposal sites. This decision is based on the results of Track 1 investigations that indicated these sites do not pose an unacceptable risk to human health. The EPA approves the DOE decision, and the IDHW concurs.

Description of the Selected Remedy

The OU 1-07B remedy presented in this ROD is intended to reduce potential risk to human health by reducing grondwater contamination and preventing the ingestion of contaminated groundwater by future residents at this site. The contaminants identified at concentrations above risk-based levels in the groundwater are organic compounds trichloroethene (TCE), cis- and trans-1,2-dichloroethene (DCE), and tetrachloroethene (PCE), and radionuclides strontium-90, tritium, cesium-137, and uranium-234. Operable Unit 1-07B is defined as that part of the groundwater

beneath TAN that has, or is expected to have, concentrations of TCE above the Safe

Drinking Water maximum contaminant level (MCL) of 5 æg/L. Trichloroethene is being used as the indicator constituent for defining the groundwater plume because it is the most widely distributed contaminant of concern (COC) in the TAN groundwater. The selected remedial action for OU 1-07B is groundwater plume extraction and treatment of the greater than 25 æg/L TCE plume and hydraulic containment of the TSF-05 Injection Well hotspot with aboveground treatment. The reasonable timeframe for restoration of the aquifer to drinking water standards should not exceed 100 years. The TSF-05 Injection Well hotspot is the subsurface area in the immediate vicinity of the injection well containing the highest concentrations of dissolved contaminants as well as undissolved residual contaminants. The selected remedial action will be conducted in three phases:

Phase AÄÄRemove as much of the secondary source as possible from the vicinity of the TSF-05 Injection Well by physically and hydraulically stressing the well. The treatment system shall be designed such that concentrations of volatile organic compounds (VOCs) in the effluent are below MCLs before reinjection into the hotspot. All attempts will be made to operate this process as a hydraulically contained system. The air pollution control device will be operated in compliance with applicable or relevant and appropriate requirements (ARARs). Continue surging and stressing the well for 15 months unless Phase B is ready to begin before this date.

Phase BÄÄPrevent to maximum extent practicable, migration of contaminated groundwater beyond the hotspot at levels above MCLs, or for those contaminants for which an MCL does not exist, the contaminant concentration will be such that the total excess cancer risk posed by release of contaminated groundwater will be within the acceptable range of 10-4 to 10-6. For aboveground treatment processes using reinjection of treated effluent, treatment shall, at a minimum, be sufficient to reduce the VOC concentration

to below MCLs. Volatile organic compounds discharged to the atmosphere from Groundwater Treatment Facility (GWTF) operations will not exceed calculated emission rates.

Phase CÄÄCapture and/or treat a sufficient portion of the dissolved phase plume beyond the hotspot to provide for aquifer cleanup within 100 years of the date of ROD signature. For aboveground treatment processes using reinjection of treated effluent, treatment shall be designed to reduce the VOC concentration to below MCLs. If an MCL does not exist, the contaminant concentration will be such that the total excess cancer risk posed by the groundwater will be within the acceptable range of 10-4 to 10-6. Volatile organic compounds discharged to the atmosphere from GWTF operations will not exceed calculated emission rates.

Institutional controls and groundwater monitoringÄÄInstitutional controls shall be implemented to protect current and future users from health risks associated with ingestion of groundwater containing COC concentrations greater than MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs. Institutional controls shall be maintained until COC concentrations fall below MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs.

The purpose of Phase B is to remove, treat, or contain the contaminants to prevent continued downgradient migration from the source area. Knowledge gained during implementation of both Phase A and B will be used to determine the feasibility of removing, treating, or containing the source area to MCLs or other risk-based standards. If cleanup of contaminants in the source area does not appear technically practicable, a Technical Impracticability Wavier (TIW) will be pursued for the source area. If a TIW is granted, an alternative remedial strategy to prevent migration of

contaminants beyond the source area will be necessary. The actions required in this ROD are not inconsistent with foreseeable alternative remedial strategies.

Statutory Determination

The selected remedy for OU 1-07B is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that reduce toxicity, mobility, or volume as a principal element.

This action involves the injection to the aquifer of fluids with contaminant concentrations above MCLs which may contain radionuclides. Because this remedy will result in hazardous substances remaining onsite above Federal drinking water standards, a review will be conducted within 5 years of commencing the remedial action, in accordance with Section 121(c) of CERCLA to ensure the remedy continues to provide adequate protection of human health and the environment.

No further remedial actions are necessary for the portions of OUs 1-01, 1-02, 1-06, and 1-09 included in this ROD to ensure protection of human health and the environment. A statutory 5-year review will not be required, in accordance with Section 121(c) of CERCLA, because hazardous substances do not remain on these sites.

Signature sheet for the foregoing Record of Decision for the final remedial action for Operable Unit 1-07B [Technical Support Facility (TSF)-05 Injection Well and Surrounding Groundwater Contamination (TSF-23)] and Miscellaneous No Action Sites (Operable Units 1-01, 1-02, 1-06, and 1-09) at the Test Area North at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with

concurrence by the Idaho Department of Health and Welfare.

_____ _____

John Wilcynski Date
Manager,
Department of Energy Idaho Operations Office

Signature sheet for the foregoing Record of Decision for the final remedial action for Operable Unit 1-07B [Technical Support Facility (TSF)-05 Injection Well and Surrounding Groundwater Contamination (TSF-23)] and Miscellaneous No Action Sites (Operable Units 1-01, 1-02, 1-06, and 1-09) at the Test Area North at the Idaho National Engineering Laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

_____ _____

Chuck Clarke Date
Regional Administrator, Region 10
Environmental Protection Agency

Signature sheet for the foregoing Record of Decision for the final remedial action for Operable Unit 1-07B [Technical Support Facility (TSF)-05 Injection Well and Surrounding Groundwater Contamination (TSF-23)] and Miscellaneous No Action Sites (Operable Units 1-01, 1-02, 1-06, and 1-09) at the Test Area North at the Idaho National Engineering laboratory between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

_____ _____

Wallace N. Cory
Administrator
Division of Environmental Quality
Idaho Department of Health and Welfare

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ACRONYMS and ABBREVIATIONS

AAC	acceptable air concentration for noncarcinogens
AACC	acceptable air concentrations for carcinogens
ANP	Aircraft Nuclear Propulsion
ARARs	applicable or relevant and appropriate requirements
BLM	Bureau of Land Management
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area

CFR	Code of Federal Regulations
COC	contaminant of concern
COCA	Consent Order and Compliance Agreement
CTF	Containment Test Facility
DCE	1,2-dichloroethene
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FET	final engine test
FFA/CO	Federal Facility Agreement and Consent Order
FS	feasibility study
gpm	gallons per minute
GWTF	Groundwater Treatment Facility
HQ	hazard quotient
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IET	Initial Engine Test
INEL	Idaho National Engineering Laboratory
LDR	land disposal restriction
LOFT	Loss-of-Fluid Test
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operation and maintenance
OU	operable unit
PCE	tetrachloroethene
pCi/L	picocuries per liter
ppm	parts per million
ppmw	parts per million by weight
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
SMC	Specific Manufacturing Capability
TAN	Test Area North
TCE	trichloroethene (also known as trichloroethylene)
TIW	Technical Impracticability Waiver
TSF	Technical Support Facility
VOC	volatile organic compound

WAG Waste Area Group
WRRTF Water Reactor Research Test Facility

OPERABLE UNIT 1-07B

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is a 2,305 kmý (890 miý) Federal facility operated by the U.S. Department of Energy (DOE) and is located on the northern edge of the Eastern Snake River Plain. Approximately 11,700 people are employed by the INEL. The nearest offsite populations are in the cities of Terreton and Mud Lake [19 km (12 mi) east]; Arco [35 km (22 mi) west]; Blackfoot [61 km (38 mi) southeast]; Idaho Falls [79 km (49 mi) east]; and Pocatello [108 km (67 mi) southeast].

The Test Area North (TAN) complex is located approximately 80 km (50 mi) northwest of Idaho Falls in the northern portion of the INEL and extends over an area of approximately 30 kmý (12 miý) (Figure 1-1). The Technical Support Facility (TSF) is centrally located within TAN and consists of several experimental and support facilities that are for conducting research and development activities on reactor performance. The TSF covers an area of approximately 460 x 670 m (1,500 x 2,200 ft) and is surrounded by a security fence. The TSF-05 Injection Well is located in the southwest corner of TSF (Figure 1-2). Three other major test facilities are located near TSF and are considered part of TAN. These facilities are the Specific Manufacturing Capability (SMC)/ Containment Test Facility (CTE) (formerly the Loss-of-Fluid Test (LOFT), Facility, the Initial Engine Test (IET) Facility, and the Water Reactor Research Test Facility (WRRTF), (Figure 1-2).

Current land use at the INEL is primarily nuclear research and development and waste management. Surrounding areas are managed by the Bureau of Land Managenent for

multipurpose use. The developed area within the INEL is surrounded by a 1,295 kmý (500 miý) buffer zone used for cattle and sheep grazing.

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 23 cm (9.1 in.) per year, with estimated evapotranspiration of 15 to 23 cm (6 to 9 in.) per year. The Big Lost River and Birch Creek are the only natural surface water features present near TAN. TAN is located between the terminus of the Big Lost River and the terminus of Birch Creek. Because of irrigation and hydropower diversions and infiltration losses, stream flows in the Big Lost River and Birch Creek are typically depleted before reaching the INEL. Surface water can occur at TAN during and following periods of heavy rainfall and snowmelt, which generally takes place between January and April. However, the presence of diversion systems, and playas located at the terminal points of the Big Lost River and Birch Creek, typically prevent surface water from reaching TAN.

Twenty distinctive vegetative cover types have been identified at the INEL. Big sagebrush is the dominant species on the INEL. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Several bird species at the INEL that warrant special concern because of sensitivity to disturbance or their threatened status. These species include the ferruginous hawk (Buteo regalis), bald eagle (Haliaeetus leucocephalus), long-billed curlew (Numenius americanus), and the loggerhead shrike (Lanius ludovicianus). In addition, the Townsend's big-eared bat (Plecotus townsendii), and pygmy rabbit (Brachylagus idahoensis) are listed by the U.S. Fish and Wildlife Service as candidate species for consideration as threatened or endangered species. The ringneck snake, whose occurrence is considered to be INEL-wide, is listed by the Idaho Department of Fish and Game as a Category C sensitive species.

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2. SITE HISTORY AND ENFORCEMENT ACTIONS

2.1 Site History

Operations at TAN were initiated in the early 1950s to support the U.S. Air Force aircraft nuclear propulsion (ANP) project. The objectives of the ANP project were to develop and test various designs for nuclear-powered engines and fuels for use on aircraft. Four facilities were built at TAN including the TSF, IET, Low Power Test Facility/Experimental Beryllium Oxide Reactor (now WRRTF), and LOFT (now the SMC/CTF).

The principal source of groundwater contamination at TAN is the TSF-05 Injection Well located in the southwest corner of TSF (see Figure 1-2). The TSF-05 Injection Well was used from 1953 to 1972 to dispose of TAN liquid wastes into the fractured basalt of the Snake River Plain Aquifer. These wastes included organic, inorganic, and low-level radioactive wastewaters added to industrial and sanitary wastewater. Activities generating these wastes included efforts to develop a nuclear-powered aircraft and tests simulating accidents involving the loss of coolant from nuclear reactors.

Releases to TAN groundwater were first identified in 1987 when low levels of the organic compounds trichloroethene (TCE) and tetrachloroethene (PCE) were detected in the production wells that supply drinking water to TSF. To mitigate potential risks to personnel at TAN, an air sparging system was installed on the drinking water supply system. Subsequent sampling of TAN

aquifer monitoring wells confirmed the presence of organic compounds TCE, PCE, and 1,2-dichloroethene (DCE), and the radionuclides tritium (H-3), strontium-90 (Sr-90), cesium-137 (Cs-137), and uranium-234 (U-234) as contaminants above risk-based concentrations. Only organic compounds that are removed by the air sparging system have been consistently detected in the production wells at levels exceeding Federal drinking water standards. Strontium-90 has been detected above drinking water standards in production wells on two occasions; however, these data are suspect because subsequent sampling has not found elevated Sr-90 levels.

In 1990, an initial effort removed process sludge from the bottom 17 m (55 ft) of the TSF-05 Injection Well. Analytical results showed that the sludge contained high levels of organic contaminants (2% TCE) and radionuclides.

2.2 Enforcement

The TSF-05 Injection Well and the groundwater contamination at TAN were first identified and evaluated in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action Requirements of the July 1987 Consent Order and Compliance Agreement (COCA) signed by DOE, the U.S. Enviromental Protection Agency (EPA), and the U.S. Geological Survey. The COCA required DOE to conduct an initial assessment and screening of all solid waste and/or hazardous waste disposal units at the INEL, which resulted in the RCRA Corrective Action Program being implemented for the TAN groundwater.

On July 14, 1989, the INEL was proposed for listing on the National Priorities List (54 Federal Register 29820). The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 40 Code of Federal Regulations (CFR) 300.425(b)(3), as amended by the Superfund Amendments and Reauthorization Act of 1986. The final ruling listing the INEL on the National Priorities List was published on November 21, 1989 (54 Federal Register 44184).

As a result of the INEL being listed on the National Priorities List, DOE, EPA,

and the Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent Order (FFA/CO), pursuant to CERCLA, in December 1991. The FFA/CO superseded the COCA and established a procedural framework for a agency coordination and a schedule for all CERCLA activities conducted at the INEL.

At the TAN groundwater release site, pursuant to the FFA/CO Action Plan, DOE implemented an Interim Action and a remedial investigation (RI)/feasibility study (FS) to characterize the extent of contamination, to estimate human health and environmental risks, and to evaluate potential response actions. The Interim Action and RI/FS, designated as Operable Unit (OU) 1-07A and 1-07B, respectively, are parallel but separate actions.

In September 1992 the Interim Action Record of Decision (ROD) was signed. The objectives of the Interim Action were to reduce contaminant levels near the TSF-05 Injection Well and in the surrounding groundwater, and to measure aquifer parameters based on data from groundwater extraction and new monitoring wells. The major components of the OU 1-07A Interim Action included

- Extracting contaminated groundwater from TSF-05 Injection Well and nearby groundwater monitoring wells capable of capturing contaminated groundwater.

- Installing an onsite Groundwater Treatment Facility (GWTF) to reduce contaminants of concern (COCs) in the extracted groundwater to prescribed performance standards. The selected treatment was air stripping, carbon adsorption, and ion exchange.

- Installing two groundwater monitoring wells within the contaminant plume to monitor the effectiveness of the Interim Action. These wells can also be used as extraction wells to expedite the removal of contaminated groundwater.

- Monitoring the groundwater contaminant plume and the extraction/treatment system during

groundwater extraction activities to track effectiveness of the system and ensure performance standards are achieved.

Modifying the existing TAN disposal pond to receive the treated groundwater and ensure discharge water quality does not further degrade the underlying Snake River Plain Aquifer above maximum contaminant levels (MCLs). The pond was modified by constructing a berm to separate the western one-third of the pond from the remaining two-thirds. Treated groundwater from Interim Action activities was discharged to the western one-third.

Implementing administrative and institutional controls to supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.

The purpose of this ROD is to document the final remedial action for OU 1-07B.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA Sections 113(k)(2)(B)(i-v) and 117, community interviews were conducted with local officials, community residents, and public interest groups to solicit concerns and information needs and to learn how and when citizens would like to be involved in the CERCLA process. The information gathered during the community interviews and other relevant information provided the basis for development of the INEL-wide Community Relations Plan. This INEL-wide Community Relations Plan will continue to be implemented during this final response action to reflect the decisionmaking process under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300) and to ensure that appropriate public participation continues under the FFA/CO.

The presence of organic compounds in the groundwater at the TAN was first announced in a news release issued in November 1987. A second news release issued in September 1988 announced both the provision of an alternative source of drinking water for workers at TAN and the

scheduled installation of an air sparging system to remove volatile organic (VOCs) from the drinking water supply.

In accordance with CERCLA Sections 113(k)(2)(B)(i-v) and 117, the public was given the opportunity to participate in the remedy selection process.

The Notice of Availability for the proposed plan was published in April 1994 in the following newspaper: The Post Register (Idaho Falls), The Idaho State Journal (Pocatello), Twin Falls Times News (Twin Falls), Idaho Statesman (Boise), The Lewiston Morning Tribune, (Lewiston) Idaho Free Press (Nampa), South Idaho Press (Burley), and Moscow-Pullman Daily News (Moscow).

These advertisements identified public meeting locations and times. Personal phone calls were made to inform individuals and groups about the comment opportunity. The public was provided with copies of the proposed plan via a "Dear Citizen" letter transmitted to 5,600 groups and individuals on the mailing list.

The public comment period was scheduled from May 18 to June 18, 1994. Three public meetings were held on June 6, 8, and 9, 1994, in Idaho Falls, Boise, and Moscow. Representatives from the DOE, EPA, and IDHW were present at the public meetings in Idaho Falls and Boise to discuss the proposed plan, answer questions, and receive both written and oral public comments. Representatives from the DOE and IDHW were present at the public meetings in Moscow. For one half-hour before each meeting, representatives from the agencies were also available for informal discussions with the interested public. A court reporter was present at each meeting to record, verbatim, the proceedings. Copies of the transcripts from the public meetings are available for public review in the Information Repositories (which are located at the public libraries in Boise, Twin Falls, Pocatello, and Idaho Falls and the University of Idaho Library in Moscow) as part of the Administrative Record for this final response action.

A Responsiveness Summary has been prepared to address public comments as part of this ROD. All verbal comments given at the public meetings and all submitted written comments are repeated, verbatim, in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

A fact sheet was sent to the public in January 1995 to provide citizens with updated information on the TSF-05 Interim Action and subsequent impacts to the preferred alternative selected for OU 1-07B.

In accordance with CERCLA Section 113(k)(1), an Administrative Record was established to provide the basis for selection of the remedial action. The Administrative Record is available for public review at the DOE Public Reading Room located at the INEL Technical Library in Idaho Falls. Copies of the Administrative Record are available for public review at the public libraries at Boise, Idaho Falls, Pocatello, Twin Falls, and the University of Idaho Library in Moscow.

Persons on the mailing list will receive a notice of availability stating the signed ROD is available. Copies of the ROD and the Responsiveness Summary will be placed in the Administrative Record and in the information repositories, and will be provided to the public upon request.

4. SCOPE AND ROLE OF OPERABLE UNIT

To better manage the investigations needed to determine appropriate remedial actions, the INEL has been divided into 10 Waste Area Groups (WAGs). Within each WAG, known or suspected areas of contamination are assigned to an OU as a means of controlling investigation and cleanup activity. This strategy allows the EPA, IDHW, and DOE to focus available cleanup resources on those areas that could potentially pose a risk to human health and the environment. The TAN complex, designated as WAG 1, consists of 11 OUs. The Interim Action has been designated OU 1-07A. The groundwater in the immediate vicinity of TAN, which has TCE concentrations greater than the MCL of 5 micrograms per liter (æg/L), has been designated OU 1-07B.

Sufficient characterization data are available to identify OU 1-07B as a potential risk to human health and the environment because of the excess presence of organic contaminants including TCE, PCE, and DCE and several radionuclides including Sr-90, Cs-137, U-234, and H-3 in the groundwater underlying TAN. This final response action is intended to ensure that offsite populations and potential future onsite residents will not be at risk.

5. SUMMARY OF SITE CHARACTERISTICS

5.1 Geology

The subsurface geology of TAN is characterized by basalt flows with sedimentary interbeds, overlain by fine-grained sediments. Geologic descriptions from wells drilled in the TAN area indicate that the basalt is highly variable, from dense to highly vesicular basalt and from massive to highly fractured basalt. Individual flow units have a median thickness of approximately 4.5 m (15 ft). The sedimentary interbeds at TAN have a median thickness of approximately 1.2 m (4 ft) and are thinner than interbeds found elsewhere on the INEL.

There are two main interbeds in the TAN area. The P-Q and Q-R interbeds both consist of clay or silt. Because interbed sediments at TAN are comprised mostly of fine-grained materials with low permeabilities and high absorption capacities, their presence within the basalt section is important with respect to retarding contaminant migration.

The P-Q interbed, located approximately 61 m (200 ft) below land surface (bls) near the TSF-05 Injection Well, has been encountered in only about 50% of the wells drilled deep enough at TAN to show the interbed; therefore, it appears to be laterally discontinuous. The range of thickness of the P-Q interbed (when present) appears to be approximately 1 to 4 m (3 to 14 ft).

The Q-R interbed, located at approximately 134 m (440 ft) bls near the TSF-05 Injection Well, is considered laterally continous throughout the TAN region. This is supported by (a) geological data obtain during borehole drilling, (b) basalt flow age dates from above and below the interbed, and (c) hydraulic head measurements collected from wells during both sampling and TAN production well pumping. Ten wells have been drilled deep enough to encounter the Q-R interbed at TAN. In all 10 cases, the interbed was encountered. Basalt flows above and below the interbed show a large age difference. The 1.3-million year hiatus between basalt flows could have provided sufficient time for a relatively thick, laterally continuous sedimentary interbed to be deposited. Borehole data indicates that the total thickness of the Q-R interbed is approximately 12 m (40 ft). Hydraulic head data collected from wells completed both above and below the Q-R interbed also support the interpretation that the interbed is laterally continuous at TAN. Water level measurements were collected during sampling and TAN production well pumping. During these events, hydraulic head changes were noted in wells completed above the Q-R interbed but not in adjacent wells completed below the interbed. The geological and hydrological data collected thus far suggest that the Q-R interbed is continuous and impedes the vertical movement of water and contaminants in the aquifer.

5.2 Hyrdology

The Snake River Plain Aquifer, one of the largest and most productive groundwater resources in the United States, underlies the INEL. The aquifer is listed as a Class I aquifer, and EPA has designated it as a sole source aquifer. The Snake River Plain Aquifer is defined as the series of saturated basalt flows and interlayered pyroclastic and sedimentary materials underlying the eastern Snake River Plain. The aquifer is approximately 325 km (200 mi) long, 65 to 95 km (40 to 60 mi)

wide, and covers an area of approximately 25,000 kmý (9,600 miý). As much as 2.5 x 1012 m3 (2 billion acre ft) of water may be stored in the aquiferÄÄapproximately 6.2 x 1011 m3

(500 million acre ft) of which are recoverable. The aquifer discharges approximately 8.8 x 109 m3 (7.1 million acre ft) of water annually to springs and rivers.

The regional flow of the Snake River Plain Aquifer is to the south-southwest; locally, the direction of groundwater flow is affected by recharge from rivers, surface water spreading areas, pumping of the aquifer, and heterogeneities in the aquifer. Figure 5-1 is a regional water table map of the TAN area showing the inferred direction of groundwater flow. The hydraulic gradient for the regional aquifer in the vicinity of TAN is about 0.2 m/km (1 ft/mi). A major feature that should be noted in Figure 5-1 is that the regional water-table gradient is very flat in the TAN area, which could be the result of high transmissivity. Under the conditions of a flat water-table gradient, the influence of the production wells on the contaminant source (TSF-05 Injection Well) is strong and may cause major flow disruptions or times of flow reversal within the aquifer in the vicinity of TAN. The average depth to water at TAN is approximately 61 m (200 ft).

There are five production wells at TAN that provide groundwater for drinking, industrial, and other facility uses (e.g., lawn watering, fire protection). Two wells [final engine test (FET)-1 and FET-2] are located near LOFT, west of the TSF, and are outside of the OU 1-07B groundwater contaminant plume. The production wells TAN-1 and TAN-2 are located on the north side of TSF and supply water for operations at TSF. Low levels (1-8 æg/L) of TCE have been detected in wells TAN-1 and TAN-2. The fifth production well (ANP-8) is located at WRRTF, southeast of TSF.

Low levels of volatile organics have also been detected in this well.

5.3 Nature and Extent of Contamination

Information from characterization activities at TAN suggests that potential airborne, surficial, and vadose zone sources of contamination to the groundwater are probably insignificant contributors to the groundwater contamination at TAN. Of the potential surface and vadose zone sources that could have been expected to have received TCE and related volatile organics, an evaluation of waste generation and disposal practices, and environmental characterization data showed no contamination and no sign of contaminant migration that could be related to the TAN groundwater contamination. The only other possible sources of groundwater contamination are three injection wells. These injection wells include the WRRTF-05 Injection Well, the IET-06 Injection Well, and the TSF-05 Injection Well. These three possible sources have been investigated, and the available evidence suggests that the TSP-05 Injection Well is the source of contamination to the groundwater at TAN. A detailed evaluation of these and other potential sources of contamination can be found in the RI report Remedial Investigation Final Report with Addenda for the Test Area North Groundwater Operable Unit 1-07B at thc ldaho National Engineering Laboratory, Volume 1, EGG-ER-10643, January 1994, which is located in the Administrative Record.

The TSF-05 Injection Well was drilled in 1953 to a depth of 93 m (310 ft) to dispose of liquid effluent generated from the ANP project. The TSF-05 Injection Well has a 30-cm (12-in.) diameter casing to 93 m (310 ft) and is perforated from 55 to 74 m (180 to 244 ft) and 82 to 93 m (269 to 305 ft) bls. The depth to groundwater is about 63 m (206 ft) bls. The well was last used as a disposal site in September 1972, after which wastewaters were diverted to the TAN disposal pond.

Discharges to the well included organic sludges, treated sanitary sewage, process wastewaters, and low-level radioactive waste streams. Historical records provide little definitive information on the

types and volumes of organic wastes disposal via the injection well. It is estimated that as little as 1,325 L (350 gal) and as much as 97,161 L (25,670 gal) of TCE were disposod in the well during its period of operation. An evaluation of the solvent usage at TAN concluded that the waste discharged

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to the aquifer through the injection well was not a listed hazardous waste because the organic chemicals in the waste were not used as solvents and disposal practices were not documented.

On the basis of results from groundwater quality analyses from the injection well, as well as analytical and radiological analysis of sediment/sludge removed from the well in 1990, the TSF-05 Injection Well is considered the major source of groundwater contamination at TAN. Since 1988, TCE and other VOCs and radionuclides have been detected as a result of several sampling efforts by the U.S. Geological Survey and DOE. Groundwater quality data from sampling events performed between 1988 and 1991 showed TCE concentrations at the TSF-05 wellhead from 4,100 to 28,000 æg/L.

New groundwater monitoring wells were installed, and new and existing wells were sampled as part of the RI conducted in 1992. As a result of this investigative effort, the horizontal and vertical extent of groundwater contamination was delineated. Extensive drilling, aquifer testing, and sampling suggests that the majority of contamination is limited to the uppermost portion of the aquifer underlying TAN, and that the Q-R interbed represents a hydrologic barrier that separates the upper aquifer above the Q-R interbed from lower aquifers and influences the migration and distribution of contaminants. Two groundwater monitoring wells were installed below the Q-R interbed as part of the 1992 RI. One well is located within the TSF, approximately halfway between the

TSF-05 Injection Well and the TAN production wells. The second well is located approximately halfway between the TSF and the WRRTF. Only low concentrations (less than MCLs) of VOCs were measured below the Q-R interbed. Trichloroethene concentrations in groundwater samples collected from the TSF-05 Injection Well during the 1992 RI ranged from 4,100 to 8,300 æg/L.

Estimates of the amount of TCE dissolved in the groundwater account for only a small amount of the TCE potentially disposed to the TSF-05 Injection Well. This and other evidence (e.g., groundwater concentrations of TCE at the injection well) suggest that a secondary or residual source of undissolved contaminants is very likely present in the vicinity of the TSF-05 Injection Well. In this document, the term secondary source is used to indicate the presence of one or all of the following: (a) sludge-entrained TCE, (b) water-sludge-TCE emulsions, and/or (c) free nonaqueous phase liquids or small pools (residual saturation) in dead-end fractures or on basalt flowtops. The TSF-05 hotspot is defined as including the secondary source and highly contaminated groundwater (i.e., with TCE concentrations greater than 5,000 æg/L) in the immediate viciniy of the TSF-05 Injection Well. Evidence does not support the existence of a free phase dense nonaqueous phase liquid.

Table 5-1 shows the concentration ranges of the COCs for OU 1-07B based on 1992 RI groundwater sampling, and Figures 5-2, 5-3, and 5-4 show the distribution of TCE, DCE, and H-3 within the groundwater at TAN. Distribution maps were not included for PCE, Cs-137, Sr-90, and U-234 because the distribution of these contaminants is mainly limited to the area in the immediate vicinity of the TSF-05 Injection Well. A full description of contaminant concentrations in aquifer monitoring wells and the contaminant distributions can be found in the RI report.

Analytical results from groundwater samples collected from the Interim Action monitoring wells TAN-25 and TAN-26 [7.6 and 15.2 m (25 and 50 ft) from TSF-05, respectively] and the TSE-05 Injection Well in June 1993 (Table 5-2) showed TCE (290-17,000 æg/L), DCE (180-9,300 æg/L), Cs-137 [less than the detection limit-2,030 picocuries per liter (pCi/L)], U-234 (17

pCi/L),
and Sr-90
(8.2-630 pCi/L), and PCE (5-39 æg/L). In general, analytical results from the June 1993
sampling
event are similar to those found during the 1992 RI (Table 5-1) for the TSF-05 Injection
Well.

Table 5-1. Contaminants of concern and range of concentrations in the Test Area North groundwater.a

Chemical	TAN monitoring wells	TAN production wells	TSF-05 Injection Well	MCLb
Organic compounds (æg/L)				
PCE	<1-71	<1-3	<500c	5
TCE	<1-1,400	<1-16	4,100-8,300	5
cis-1,2-DCE	<1-38	<1	5,600-5,800	70
trans-1,2-DCE	<1-7	<1	3,200-3,400	100
Radionuclides (pCi/L)				
Sr-90	<1-470	<1-4	610-640	8
H-3	<500-9,800	420	14,700-15,800	20,000
Cs-137	<30-32	<30	1,940-2,240	119
U-234	<1	<1	5-7	30

a. Concentration ranges were derived from 1992 RI analytical results; < indicates less than
detection limit.

b. MCL = maximum contaminant level per Federal drinking water standards. The proposed MCL for U-234 is
for the
U-234, -235, and -238 series. The proposed MCL for Cs-137 is derived from a

corresponding 4 mrem/yr effective dose equivalent to the public, assuming lifetime intake of 2 L/day of water.

c. A dilution factor of 500 was used during sample analysis, raising the detection limit for PCE to 500 æg/L. More recent sampling (June 1993) used a lower detection limit (see Table 5-2).

Table 5-2. Results of June 1993 sampling of TSF-05 Injection Well and Interim Action Wells TAN-25 and TAN-26.

Chemical	TSF-05 Injection Well	TAN-25 Monitoring Well	TAN-26 Monitoring Well	MCLa
Organic Compounds (æg/L)				
PCE	20-22	39	5J-15J	5
TCE	5,900-11,000Jb	17,000	290-670	5
Total DCE	6, -00-9,300J	4,800	180-340	70
Radionuclides (pCi/L)				
Sr-90	520-630	380	8.2-8.6	8
H-3	18,700-18,800	14,200	4,700-4,800	20,000
Cs-137	2,010-2,030	147	<30c	119
U-234	17	10	2.3-3.4	30

a. MCL = maximum contaminant level per Federal drinking water standards. The proposed MCL for U-234 is for the U-234, -235, and -238 series. The proposed MCL for Cs-137 is derived from a corresponding 4 mrem/yr effective dose equivalent to the public, assuming lifetime intake of 2 L/day of water.

b. The "J" validation flag indicates that the analyte was positively identified in the sample, but the associated value is only an estimate of the amount actually present in the environmental sample.

c. < indicates less than detection limit.

Table 5-3. Validated results from March and June 1994 quarterly sampling and analysis showing the range of contaminant concentrations.a

Contaminant	TSF-05 Injection Well	TAN-25 Monitoring Well	TAN-26 Monitoring Well	MCLb
Organic Compounds (æg/L)				
PCE	110	<200c	14-19	5
TCE	12,000-32,000	5,900-9,300	710-1,000	5
cis-1,2-DCE	3,200-7,500	890-3,500	230-420	70
trans-1,2-DCE	1,300-3,900	450-2,000	17-33	100
Oil and grease (mg/L)	<5-10	<5-7.1	<5-46.3d	None
Radionuclides				
Strontium-90c	530-1,880	380-440	2-4	8
Tritium	14,900-15,300	7,500-10,000	3,500-3,700	20,000
Uranium-234	5.2-7.7	7	1.7	30
Uranium-235	<0.2	-	-	30
Uranium-238	<0.1-0.43	0.64	1.4	30

Americium-241/ Plutonium-238	<0.2	<0.2	<0.2	None
Plutonium-239/240	<0.2	<0.2	<0.2	None
Cesium-137	1,600-2,150	90-300	<30	119
Cobalt-60	23	<20	<20	100f

a. Key: ÄÄ = not sampled; < indicates less than detection limit.

b. MCL = maximum contaminant level per Federal drinking water standards. The proposed MCL for U-234 is for the U-234, -235, and -238 series. The proposed MCL for Cs-137 is derived from a corresponding 4 mrem/yr effective dose equivalent to the public, assuming lifetime intake of 2 L/day of water.

c. Dilution factors of 1,000 and 200 were used during the March and June sample analysis, respectively. These dilution factors raised the detection limit for PCE to 1,000 æg/L for the March 1994 analysis and 200 æg/L for the June 1994 analysis.

d. A duplicate sample of the 46.3 was taken, which was <5 mg/L.

e. Range includes only unfiltered Sr-90 samples.

f. EPA (1977), Primary Drinking Water Standard.

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<IMG SRC 1095120J>

Analytical results from groundwater samples collected for the first and second quarters of 1994

for TAN-25, TAN-26, and the TSF-05 Injection Well during the OU 1-07A Interim Action are presented in Table 5-3. Upon comparison of contaminant concentrations detected in wells TSF-05, TAN-25, and TAN-26, it is apparent that the 1992 RI, June 1993, and quarterly Interim Action results are generally consistent. However, it should be noted that contaminant concentrations detected during the Interim Action have varied depending on pumping rate.

6. SUMMARY OF SITE RISKS

A baseline risk assessment was conducted to evaluate the potential adverse health effects for both a current and future land use scenario to human and nonhuman receptors associated with exposure to chemical and radioactive substances detected in the TAN groundwater. The baseline risk assessment consists of a human health risk assessment and an ecological assessment.

6.1 Human Health Risk

6.1.1 Contaminants of Concern

In order to focus the risk assessment on COCs, the groundwater quality data collected during the RI were evaluated against analytical methods, quantitation limits, qualified and coded data, sample blank contamination, natural backgroud elements, essential nutrients, and risk-based concentrations in a systematic manner according to guidance from both EPA and EPA Region 10.

The COCs and their concentration ranges for the groundwater sampled in the immediate vicinity of the TSF-05 Injection Well and the groundwater plume are listed in Table 5-1. The COCs list for the TAN groundwater plume include TCE, PCE, cis- and trans-1,2-DCE, Sr-90, and H-3. The same COCs were identified for the TSF-05 Injection Well with the addition of the radionuclides Cs-137 and U-234. Although U-234 and H-3 do not exceed the MCLs, these contaminants exceed the 10-6 risk-based concentration for groundwater ingestion. Tetrachloroethene was not detected above the detection limit of 500 æ/L in the TSF-05 Injection Well during 1992 sampling. However, it is considered a COC based on 1989 and 1993 data. The 1993 sampling showed PCE at a concentration

of 20-22 æg/L in the TSF-05 Injection Well. Therefore, the final COC list includes TCE, PCE, cis-1,2-DCE, trans-1,2-DCE, H-3, Sr-90, U-234, and Cs-137 (see Table 5-1). Any additional contaminants detected during the OU 1-07B Remedial Action will be evaluated by the agencies for inclusion as COCs.

6.1.2 Exposure Assessment

The exposure assessment is used to estimate the type and magnitude of exposure to the COCs identified for the TAN groundwater and the TSF-05 Injection Well. The exposure assessment involves identifying potentially exposed populations and exposure pathways, estimating exposure concentrations (based on environmental monitoring data and fate and transport modeling), and estimating the contaminant intakes for exposure pathways. The result of the exposure assessment estimates the pathway-specific intakes for both current and future exposures for the identified COCs. The potentially exposed populations identified for this risk assessment include site workers and future residents that may inhabit the site if DOE decides to relinquish control of the site.

Current access to the TAN groundwater is limited to production wells (TAN-1, TAN-2, ANP-8, FET-1, and FET-2), which bring the groundwater to the surface for drinking water and other uses such as lawn watering and industrial use. Untreated groundwater is not released to any natural surface water body in the study area and is not available for direct uptake by plants or animals; therefore, these pathways are not evaluated in the current industrial use scenario. The current land use scenario evaluates the industrial use of groundwater from the production wells. Drinking water at TAN is obtained exclusively from bottled water or the TAN production well. Treatment using an air sparger before use reduces contaminant concentrations below Federal drinking water standards for the TAN production wells. However, for this risk assessment it was assumed that the air sparger was not

present.

The future residential use scenario assumes three different time periods of institutional control. The assumed institutional control periods will last until the years 2024, 2040, or 2094 and are based on different expected lengths of time for programs at TAN to be operational, in addition to time to perform decontamination and decommissioning of the facilities in compliance with 10 CFR 61. The future residential use scenario consists of two different future land use cases. Case 1 is the use of the groundwater from the predicted average concentration for the contaminant plume. Case 2 considered the TSF-05 Injection Well as a potential future production well for residents. Although this is an unlikely scenario, it provides an upper bound for potential risks to residents should they be exposed to groundwater from this well. A summary of the TAN groundwater risk assessment exposure pathways is presented in Table 6-1.

Table 6-1. Test Area North groundwater exposure pathways.

Potentially exposed population	Exposure scenario	Potential exposure pathway
Current land use		
Industrial Workers	Use of untreated groundwater from production wells as potable water	Ingestion of water
	Use of untreated groundwater from production wells for showering	Inhalation of volatiles
Future land use		
Residential Case 1	Use of groundwater from predicted contaminant plume as potable water	Ingestion of water
	Use of groundwater from predicted contaminant plume for showering	Inhalation of volatiles
	Crops contaminated from irrigating with predicted contaminant plume	Consumption of crops

	groundwater	
Residential Case 2	Use of groundwater TSF-05 Injection Well as potable water	Ingestion of water
	Use of groundwater from TSF-05 Injection Well for showering	Inhalation of volatiles
	Crops contaminated from irrigating with TSF-05 Injection Well groundwater	Consumption of crops

Exposure scenarios evaluated in the risk assessment considered industrial and residential long-term (chronic) exposures for the following pathways: (a) ingestion of groundwater, (b) inhalation of volatiles while showering, and (c) ingestion of food crops (for residents only). Chronic exposures evaluated assume contaminant exposures to workers over a 25-year period and to residents living in the study area over a 30-year period. Industrial and residential reasonable maximum exposure factors were used in the risk assessment; a table of the reasonable maximum exposure factors used in the risk assessment can be found in Table 7-8 of the RI report.

6.1.3 Risk Characterization

Risk characterization integrates the results of the exposure assessment and the toxicity assessment in an estimate of risk to humans from the exposure to site contaminants. Noncarcinogenic effects are characterized by comparing projected intakes of substances to toxicity values. The carcinogenic effects or probability an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response relationships. As discussed in the NCP, noncarcinogenic risk is compared to a hazard quotient (HQ) of one, with an HQ of less than one indicating it is unlikely even for sensitive subpopulations to experience adverse health

effects. An HQ (the ratio of the level of exposure to an acceptable level) greater than 1.0 indicates that the exposure level may exceed the protective level for that particular chemical. If the HQs for individual chemicals are less than 1.0 but the sum of the HQs for all substances in an exposure medium (i.e., the hazard index) is greater than 1.0, there may be a concern for potential health effects. The acceptable risk range for carcinogenic risk, according to the NCP, is 10-4 to 10-6. A cancer risk level of 1 x 10-4 (1 in 10,000) means that one additional person out of ten thousand is at risk of developing cancer if the site is not cleaned up.

The Integrated Risk Information System database and Health Effects Assessment Summary Tables provided the toxicity values used in the risk assessment for the COCs.

The carcinogenic risks from the potential exposure pathways evaluated for the current industrial use of groundwater from the TAN production wells are summarized in Table 6-2. The total carcinogenic risks from ingesting TAN groundwater range from 6 x 10-7 to 8 x 10-7. The total carcinogenic risks from inhaling volatiles while showering is 4 x 10-8. These results indicate the potential carcinogenic risk to the INEL workers from water pumped from the TAN production wells is less than the acceptable risk range of 10-4 to 10-6. Table 6-2 also summarizes the chronic hazard index estimates for the potential exposure pathways evaluated for the organic COCs for the current industrial use of groundwater from the TAN production wells. The total hazard index for toxic effects from ingesting contaminated groundwater is 0.003. This value is less than 1.0, indicating it is unlikely workers will experience adverse health effects. Therefore, both carcinogenic and noncarcinogenic risk to industrial workers from TAN groundwater is minimal under the current industrial use scenario.

A summary of the cancer risk estimates for exposure to organic contaminants and radionuclides under the future residential use scenarios Case 1 and Case 2 are shown in Table 6-2.

Total cancer risk estimates for exposure under the future residential use scenario Case 1 are all within or below the target risks range of 10-4 to 10-6. Estimates of total cancer risk from the ingestion of contaminated groundwater under the future residential use scenario Case 2 are greater than the acceptable target risk range. The noncarcinogenic HQs for exposure under the future residential use scenarios Case 1 and Case 2 are shown in Table 6-2. The total HQs for exposure under future residential use Case 1 are all less than one. In Case 2, exposure to TSF-05 Injection Well water, the HQs for organic contaminants are above one.

Table 6-2. Summary of risk for Test Area North groundwater.

Scenario	Carcinogenic Risk[a]	Hazard Index[b]
Current industrial scenario (production wells)		
Organic chemical water ingestion	8 in 10,000,000 (8 x 10-7)	0.003
Radioactive water ingestion	6 in 10,000,000 (6 x 10-7)	NA[c]
Inhalation of volatiles	4 in 100,000,000 (4 x 10-8)	NA
Total risk	1 in 1,000,000 (1 x 10-6)	0.003
Future residential exposure to groundwater plume (Case 1)		
Organic chemical water ingestion	1 in 100,000 (1 x 10-5)	0.8
Radioactive water ingestion	4 in 1,000,000 (4 x 10-6)	NA
Inhalation of volatiles	7 in 10,000,000	

NA
(7 x 10-7)

Organic chemical crop ingestion 3 in 1,000,000
0.1
(3 x 10-6)

Radioactive crop ingestion 1 in 100,000
NA
(1 x 10-5)

Total risk 3 in 100,000 0.9
(3 x 10-5)

Future residential exposure to TSF-05 groundwater (Case 2)

Organic chemical water ingestion 1 x 1,000
20.5
(1 x 10-3)

Radioactive water ingestion 5 in 10,000
NA
(5 x 10-4)

Inhalation of volatiles 5 in 100,000
NA
(5 x 10-5)

Organic chemical crop ingestion 2 in 10,000
2
(2 x 10-4)

Radioactive crop ingestion 5 in 10,000
NA
(5 x 10-)

Total risk 2 in 1,000 23
(2 x 10-3)

a. The NCP defines acceptable carcinogenic risk as <1 additional incidence of cancer in
10,000 to
1,000,000 or 10-4 to
10-6.

b. A hazard greater than 1.0 indicates that there may be concern for noncarcinogenic
effects.

c. NA = not applicable.

In summary, the risk characterization indicates there is concern for potential

health risks to future residents exposed to the contaminants found in groundwater pumped from the TSF-05 Injection Well and immediate vicinity. The primary risk driver is the ingestion of groundwater contaminated with TCE.

6.1.4 Uncertainty

Stanard EPA methodologies in risk assessment were employed to evaluate the risk to human health from COCs in the groundwater at TAN. Risk assessment methodologies represent an inexact science, and a number of uncertainties are associated with their application. Factors contributing to uncertainty and limitations in the exposure assessment primarily relate to estimating contaminant concentrations in the study area, modeling groundwater contaminant fate and transport, estimating human exposure, and accounting for toxic effects from long-term exposure to these contaminants.

Uncertainty associated with sampling and analysis includes inherent variability in the analysis of samples, representativeness of samples, sampling error, and heterogeneity of the sample matrix. Sources of uncertainty in the contaminant fate and transport modeling include initial assumptions concerning the volume and concentration of the contaminant source, dispersivity and sorption coefficients, and aquifer physical parameters. A constant source for the contaminants based on 1992 measurements in the TSF-05 Injection Well was assumed for the fate and transport modeling. This assumption overestimates future contaminant concentrations, which results in upper bound or worst case risk estimates.

Estimates of exposure from contaminated media rely on assumptions that also contribute to the uncertainties associated with risk assessment. The current industrial exposure estimates are based on 25-year exposure to constant concentrations of contaminated water, at levels currently found in the TAN production wells. Because an air sparging system for treating the water has been installed at TAN, workers are not exposed to contaminated water. The future resident exposure estimates are

based on a 30-year exposure to contaminated groundwater at constant concentrations. Because a constant source of contamination was assumed for the injection well, exposure estimates likely overestimate risks. The assumed exposure of future TAN residents to the existing high concentrations of contaminants found in the TSF-05 Injection Well (Case 2) results in an unacceptable risk according to the ranges listed in the NCP.

There are many uncertainties and unknowns associated with the toxic effects of the COCs for this risk assessment. They include extrapolation from high to low doses and from animals to humans; species differences in uptake, metabolism, organ distribution, and target site susceptibility; and human population variability with respect to diet, environment, activity patterns, and cultural factors.

6.2 Ecological Risk Assessment

The objective of the ecological risk assessment was to determine whether COCs found in the TAN groundwater result in an adverse ecological impact. The ecological assessment was a qualitative/semiquantitative appraisal of the actual potential effects of the TAN groundwater on plants and animals (ecological receptors) other than people and domesticated animals. The scope of this study was limited to the TAN groudwater and the TSF-05 Injection Well as the sources of contamination, as identified in the human health assessment. Ecological risk will be reevaluated during the WAG-1 comprehensive RI/FS (OU 1-10), and a more detailed ecological risk assessment will be performed under the WAG 10 INEL Site-wide RI/FS.

6.2.1 Current Exposure

On the basis of the ecological risk assessment presented in the TAN groundwater RI report, pathways available for the exposure of ecological receptors are limited. Wells within the contaminated zone are used for sampling purposes, and when these wells were sampled,

contaminated water was treated at the existing Interim Action treatment facility before disposal. Water from the TAN production wells is closely monitored for contaminants, and an air sparger system has been installed for the drinking water supply. Therefore, there is no current exposure of ecological receptors to the contaminated groundwater at TAN.

6.2.2 Future Exposure

Ecological receptors would be exposed primarily through irrigation of crops if TAN groundwater is used for this purpose in the future. Contaminants would be deposited on surfaces and soil, where they could be adsorbed onto plant surfaces, absorbed into the plant, or taken up from the soil through the roots. Herbivores could be exposed by ingesting plant material, soil, or water; dermal contact from contaminated plant surfaces and soil; and to a lesser degree, inhalation of resuspended contaminated particulates. Contaminants can be absorbed into the body after being inhaled or swallowed. Insectivorous animals would be similarly exposed by ingesting contaminated insects. Widely ranging herbivores, such as pronghorn antelope, elk, and sage grouse, could transport contaminants a considerable distance because of seasonal migrations. Carnivores could be exposed by ingesting contaminated water or prey, dermal contact, and inhalation. Top-level carnivores are important because they bioaccumulate contaminants by way of prey consumption, carrion consumption, or fecal consumption.

A simplified exposure scenario was evaluated in the risk assessment for an herbivorous rodent. As described above for ecological receptors, exposure would result from ingesting plant material, soil, or water from the use of contaminated groundwater for irrigation. In general, the calculations showed that the radiological doses in the future would be insignificant compared to background doses, except in the case of Sr-90. There is a possibility that Sr-90 could pose adverse effects.

However, the nature of these effects cannot be fully evaluated at this level of analysis. Given the uncertainty in extrapolating data from laboratory studies to wild populations, it appears exposure to COCs would be sufficiently low, and no adverse effects would be expected in rodents occupying the irrigated cropland. Exposure to contaminants by higher level organisms (predators) would also be expected to be low. Additionally, contaminant intake by predators would likely be attenuated by ingestion of prey from outside the contaminated zone. The results of the ecological risk assessment indicate that risk to future ecological receptors would be low. In summary, no critical habitats are adversely affected by the TAN groundwater contamination and no endangered species or habitats of endangered species are adversely affected by the site contamination.

6.3 Impact of Interim Action Sampling Results on Risk Assessment

The fate and transport modeling and the risk assessment were based on the RI sampling results. As discussed in Section 5.3, contaminant concentrations are higher in wells TSF-05 and TAN-25 and lower in TAN-26 than assumed in the fate and transport modeling (Table 5-3). New fate and transport models were run to predict future plume concentrations using the new sampling data from the Interim Action. However, the specific carcinogenic risk and HQs for the COCs have not been calculated using the new data. While the higher contaminant concentrations could indicate risks to future receptors that are greater than previously estimated in the RI, the general conclusions of the risk assessment are still valid. Unacceptable risks would result from future residential use of contaminated groundwater from the vicinity of the TSF-05 Injection Well. Therefore, the new information does not change the recommended remedial strategy for the OU 1-07B groundwater, which is discussed in the following sections of this ROD.

7. DESCRIPTION OF ALTERNATIVES

Eight alternatives were assembled and screened in the TAN groundwater OU 1-07B FS. Two alternatives were dropped from further consideration during the FS screening because these alternatives were estimated to require more than 150 years for remediation. Two other FS alternatives are not discussed in this ROD because they focus on containment of the hotspot, which is also covered under the two remaining and more comprehensive alternatives. Summary descriptions of the four remaining alternatives for reducing contamination in TAN groundwater are presented below.

In the year since the Proposed Plan was issued, new information has been developed concerning the fate and transport of trichloroethene in the groundwater. The estimated groundwater velocity of the trichloroethene plume is the same as that of the uncontaminated groundwater, which is approximately 1 ft/day. The Interim Action conducted under the 1-07A ROD confirmed that sludge could be removed from the TSF-05 Injection Well but did not confirm the extent of sludge present in the vicinity of the injection well. As a result, sludge or secondary source may be difficult or impractical to remove. The alternative descriptions summarized below are based on those presented in the May 1994 Proposed Plan with the following exceptions:

The proposal to use surfactant has been removed because of the heterogeneity of the material disposed of in the TSF-05 Injection Well, the potential for mobilization of contaminants, and the potential noncontactability of the secondary source present within the hotspot.

Recent modeling has shown that after removal of the greater than 5,000 æg/L TCE plume, approximately 200 years would be required for natural dispersion to reduce the remaining plume to concentrations below MCLs.

The groundwater pumping rates estimated in the Proposed Plan are conservative by over one order of magnitude, thereby excessively inflating the costs for remediation.

Recent groundwater monitoring data indicates that the greater than 5,000 æg/L TCE contamination is within 200 ft of TSF-05. Therefore, there is no need to follow the approach described in the May 1994 Proposed Plan for remediation of the hotspot and the greater than 5,000 æg/L TCE plume.

7.1 Alternative 1: No Action

The NCP requires a No Action alternative to establish a baseline for comparison to alternatives that require action. Under this alternative, no attempt would be made to contain, treat in place, or extract and treat any contaminated groundwater within OU 1-07B. No institutional controls are assumed and the Interim Action (OU 1-07A) would not be continued. Groundwater modeling indicates that, with no action, the contaminant plume for volatile organics would continue to spread and that the radiological plume would eventually shrink as a result of decay. Groundwater monitoring would be implemented under the No Action alternative to detect changes in OU 1-07B that may lead to situations that would be considered immediately dangerous to the public or environment. Any situation of this sort, detected through monitoring, would require mitigative measures to be taken to minimize risk to public health and the environment.

7.2 Alternative 2: Limited Action Consisting of Institutional Controls

Under this alternative, no action would be taken to remediate contaminated groundwater and contaminant sources associated with OU 1-07B. Instead, the Limited Action alternative would implement institutional controls to protect current and future users from health risks associated with the groundwater contamination. Groundwater modeling indicates that, with no action, the

contaminant plume for VOCs would continue to spread and that the radiological plume would eventually shrink as a result of decay. Specific actions or controls could include groundwater monitoring, an alternative water supply, and/or access restrictions.

Groundwater monitoring would be conducted annually to monitor the distribution, migration, and fate of contaminants already in TAN groundwater. Groundwater monitoring would use the existing TAN groundwater monitoring wells for OU 1-07B, and analyses of groundwater samples would target the COCs. An alternative water supply well could be installed in an area that does not access the contaminated plume within the Snake River Plain Aquifer. The well would be capable of meeting the water supply needs of future residents at TAN after the institutional control period. Access restrictions would include land use notifications and fencing. Land use restrictions would include prohibiting the placement of wells within the contaminated plume and interfering with remedial activities. Fencing would enclose approximately 37 mý (400 ftý) around the immediate vicinity of the existing TSF-05 Injection Well.

7.3 Alternative 3: 5,000 micrograms per liter Trichloroethene Groundwater Plume Extraction Hotspot Containment and/or Removal with Aboveground Treatment

This alternative would involve (a) modification and operation of the existing extraction system and GWTF, (b) institutional controls and groundwater monitoring, (c) containment and/or removal with aboveground treatment of the highly contaminated groundwater and secondary source in the immediate vicinity of the TSF-05 Injection Well (the feasibility of hotspot remediation will be determined in a series of surge and stress tests), and (d) extraction and treatment of groundwater defined by the area of the aquifer with TCE concentrations greater than 5,000 æg/L.

This alternative would be performed in a phased approach. The existing extraction system and treatment facility would continue to be operated to support surge and stress of TSF-05 Injection Well to remove as much of the secondary source as practicable in conjunction with hydraulic containment of the hotspot. The initial phase of Alternative 3 would focus on secondary source removal through

surge and stress. The second phase would include installation of wells for implementation of hotspot hydraulic containment. Surge and stress may continue to augment hydraulic containment and will be evaluated for effectiveness prior to implementation as a long-term remedy.

Hotspot containment would involve installing one or more pumping wells to contain contaminants within the 5,000 æg/L plume for extraction of groundwater. Extracted groundwater would be treated for VOCs aboveground and reinjected back into the aquifer within the capture zone of the extraction well(s). The process would function as a hydraulically contained system, capturing groundwater, treating to remove the organic contaminants, and then returning the groundwater back to the aquifer within the capture zone of the extraction well(s). Effective containment of the secondary source and capture of the reinjected groundwater may reduce contaminant migration beyond the capture zone. Hydraulic containment reduces further aquifer degradation, and ex situ VOC removal facilitates overall improvement of aquifer water quality.

Aboveground organic compound removal would be accomplished by air stripping, followed by carbon adsorption as necessary to remove volatilized organic compounds from vapor off-gas generated during the stripping process. The off-gas treatment system will reduce emissions of volatilized organic compounds to acceptable atmospheric levels in compliance with applicable or relevant and appropriate requirements (ARARs). Radionuclide concentrations will be reduced by an ion exchange or equivalent process to the extent practicable as determined by the agencies. After treatment, process effluent containing radionuclide (e.g., Sr-90, Cs-137) concentrations above MCLs may be reinjected into the upgradient portion of the hotspot. Because there is no treatment for tritium, process effluent containing tritium will be reinjected.

Carbon adsorption and ion exchange technologies are considered representative of available process treatment options. Other process influent/effluent treatment options (e.g., UV-oxidation,

catalytic oxidation, etc.) were discussed in the Proposed Plan and will be considered as part of an engineering evaluation to be conducted prior to selection of the final remedial design. Because there is no treatment option for tritium, process effluent containing tritium will be reinjected.

The estimated costs given in the Proposed Plan are for a system operating at 1,000 gallons per minute (gpm) for 3 to 6 years at a cost of $25,800,000. Given the new information described above, the system costs based on a 30-year operation and maintenance (O&M) operating at less than 100 gpm is estimated at $23,657,000.

Under Alternative 3, no action other than Institutional Controls and Monitoring would be taken on the less than 5,000 æg/L component of the plume during implementation of the 1-07B remedial action. Instead, the site-wide RI/FS and subsequent ROD (OU 10-04) would include necessary remedial actions for that portion of the plume outside of the hydraulic containment area. If no remedial action were taken for the less than 5,000 æg/L plume, contaminated groundwater would continue to flow downgradient at an estimated rate of approximately 1 ft/day. Groundwater fate and transport modeling indicates aquifer dispersion would require approximately 200 years to reduce TCE contaminant levels to MCLs and the maximum extent of the plume would be approximately 15 miles south of TSF-05.

7.4 Alternative 4: 25 micrograms liter Trichloroethene Groundwater Plume Extraction; Hotspot Containment and/or Removal With Aboveground Treatment

Alternative 4 involves remediation of contaminated groundwater with TCE concentrations greater than 25 æg/L, as well as remediation of the secondary source at the TSF-05 Injection Well. Thus, Alternative 4 includes remedial activity described under Alternative 3 with additional remediation of the groundwater plume defined by the area of the aquifer that contains TCE concentrations over 25 æg/L. Therefore, Alternative 4 would require additional treatment capacity over and above that

proposed for Alternative 3. The remedial action described by Alternative 4 is designed to yield the maximum level of cleanup, and as such, corresponds to the largest volume of groundwater to be remediated.

Model simulations were performed in an effort to systematically determine the volume of TCE-contaminated groundwater requiring remediation. The simulation suggests that in order to achieve target MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without established MCLs, the secondary source of contamination around the TSF-05 Injection Well and groundwater contained in the greater than 25 æg/L TCE plume would require remediation. Following remediation of the greater than 25 æg/L TCE plume, modeling suggests that the less than 25 æg/L TCE plume will naturally degrade to MCLs within approximately 100 years. Revised groundwater modeling suggests that the treatment of the greater than 25 æg/L plume can be achieved at lower pumping rates than those assumed in the Proposed Plan.

Under Alternative 4, the hotspot would be contained and/or removed as described in Alternative 3 above and the less than 25 æg/L component of the plume would be allowed to undergo natural attenuation to acceptable concentration levels within an institutional control period of 100 years. Extraction and treatment of the dissolved phase groundwater plume would require a larger system than that proposed for Alternative 3. Extraction and treatment would be accomplished via three or more extraction wells and two or more injection wells. These wells would be located so as to intercept contaminated groundwater with concentrations greater than 25 æg/L, which is currently estimated to extend 1.5 miles downgradient of the TSF-05 Injection Well.

Leaching from the secondary source would be reduced by containment and/or source removal, and contaminants within the 25 to 5,000 æg/L TCE contaminated portion of the plume would be

drawn into the downgradient capture zone for VOC treatment to concentrations below MCLs. The pumping rate needed to maintain the downgradient capture zone will be estimated based on site-specific modeling conducted during remedial design and may be adjusted based on field data after pumping begins. The cost estimate is based on the assumption that treatment of one pore volume (resulting in a 30 year O&M period) will be sufficient to remove TCE from the dissolved phase groundwater plume.

Aboveground treatment of the dissolved phase plume would be performed by air stripping with vapor off-gas treatment if necessary. It is not expected that liquid effluent resulting from dissolved phase plume remediation would require treatment to remove Sr-90, Cs-137, or U-234 due to radioactive decay and adsorption of these containments within the hotspot.

The estimated costs given in the Proposed Plan are for a system operating at 10,000 gpm for 10 to 40 years at a cost of $94,600,000. Given the new information described above, the system costs based on a 30-year O&M operating at less than 1,000 gpm is estimated at $29,888,000. The time period required to operate the hotspot containment and/or removal system is estimated to be the same as that for Alternative 3.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The EPA has established nine criteria for the evaluation of remedial activities. The remedial alternatives were evaluated against the nine criteria, which are divided into three categories:

Threshold criteria (describes a level of performance)

- Overall protection of human health and the environment
- Compliance with ARARs

Balancing criteria (discusses technical advantages and disadvantages)

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

Modifying criteria (review and evaluation by other entities)

- State acceptance
- Community acceptance.

A summary of the comparative analysis of alternatives is presented in Table 8-1.

8.1 Threshold Criteria

8.1.1 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health and the environment because no action would be taken to address groundwater contamination and no controls would be implemented to prevent use of the groundwater. Alternative 2 would use institutional controls to protect human health and the environment until MCLs or 10-4 to 10-6 risk-based levels for contaminants without MCLs are achieved. Alternatives 3 and 4, combined with the use of institutional controls for those portions of the plume not under active remediation, are protective of human health and the environment.

Table 8-1. Comparative Analysis of Alternatives.

Alternative Evaluation Criterion	Alternative #1: No Action	Alternative #2: Limited Action	Alternative #3: 5,000 æg/L TCE Plume	Alternative #4: 25 æg/L TCE Plume
Protection of human health and the environment	Noa	Yes	Yes	Yes
Compliance with ARARs	NAb	Noý	Yesc	Yes
Long-term effectiveness			+	++
Reduction of toxicity, mobility, or volume through treatment			+	++

Short-term
effectiveness + ++

Implementability ++ +

Cost ++ +

State acceptance + ++

Community acceptance + +

a. Alternatives not meeting the threshold criteria were not evaluated further.

b. There is no ARAR analysis for the No Action alternative.

c. Assumes that additional remedial action will be taken in the INEL site-wide RI/FS.

+ Effectively meets criterion.

++ More effectively meets criterion.

8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

A detailed list of ARARs pertinent to OU 1-07B is provided in Section 10.2. The major ARAR is the Safe Drinking Water Act. For Alternative 1, No Action, there is no ARAR analysis. Alternative 2 would rely in part on natural processes to decrease contaminant concentrations in groundwater and drinking water standards would be exceeded beyond 100 years. Because Alternatives 1 and 2 do not satisfy the two threshold criteria, they will not be discussed further. Costs for Alternatives 1 and 2 are provided in Table 8-2.

New modeling data suggest that remediation defined by Alternative 3 would not achieve reduction of VOCs to meet drinking water standards in the less than 5,000 æg/L TCE component of the plume for approximately 200 years. It cannot be assumed that institutional controls would be maintained for this length of time. The reasonable timeframe for restoration of the aquifer to drinking water standards should not exceed 100 years, which is in keeping with current

land use assumptions for INEL. At the time of the Proposed Plan, it was believed that Alternative 3 would meet the 100-year remedial action objective (RAO). However, recent groundwater modeling has shown that after removal of the greater than 5,000 æg/L plume, approximately 200 years would be required for natural dispersion to reduce the remaining plume to concentrations below MCLs. Due to the 200 years required, Alternative 3 could only be implemented if further remediation of the less than 5,000 æg/L TCE part of the plume were included in the site-wide RI/FS. If additional remedial action is taken to reduce the restoration timeframe to 100 years or less, Alternative 3 would be in compliance with ARARs. Alternative 4 would treat the 25 to 5,000 æg/L TCE contaminated groundwater to levels such that drinking water standards would be met within 100 years. For either Alternative 3 or 4, the hotspot would need to be removed or contained to prevent continued leaching of the TCE contaminated secondary source. See Table 10-1 for summary of ARARs that apply to Alternative 3 and Alternative 4.

8.2 Primary Balancing Criteria

After evaluation of each alternative under the two threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Alternatives 3 and 4 were evaluated using each balancing criterion. The balancing criteria were used in refining the selection of the remedial alternative.

8.2.1 Long-Term Effectiveness and Permanence

Alternative 3 would have good long-term effectiveness and permanence for the hotspot. When combined with institutional controls, and assuming that additional remedial actions are taken to restore the aquifer to below MCLs within 100 years, this alternative will be effective at preventing exposure to unacceptable levels of contamination. Alternative 4 would have the best long-term

effectiveness and permanence because it is less dependent upon institutional controls and future undetermined remedial actions.

8.22 Reduction of Toxicity, Mobility, or Volume Through Treatment

Both Alternatives 3 and 4 would collect and treat COCs in the hotspot region, resulting in a volume and mobility reduction of TCE and other contaminants. Alternative 4 would address a much larger volume of contaminated groundwater than Alternative 3 and would prevent migration of a major component of the plume into previously uncontaminated groundwater.

Table 8-2. Estimated costs associated with remediation alternatives (present worth).

	Alternative			
Cost element	1	2	3	4
Construction	0	128,000	707,000	3,279,000
Operationsa	0	0	6,507,000	7,818,000
Waste handling	0	0	1,323,000	1,323,000
Treatabilityb	0	0	2,470,000	2,470,000
Monitoringc	2,688,000	2,688,000	1,971,000	1,971,000
Indirects	403,000	403,000	6,727,000	8,034,000
Contingency	597,000	621,000	3,952,000	4,993,000
Totald	3,688,000	3,840,000	23,657,000	29,888,000

a. The operations costs are based on a 30-year period of performance for remedial activity.

b. Treatability studies will be required for the contaminant recovery technologies being considered for

remediation of the TSF-05 Injection Well hotspot and the 25 to 5,000 æg/L dissolved phase plume. It is expected that the hotspot remediation will be the same regardless of whether it comes under Alternative 3 or Alternative 4.

c. Monitoring costs for Alternatives 1 and 2 are based on a 100-year institutional control period. Monitoring costs for Alternatives 3 and 4 are based on a 30-year remediation period.

d. The total costs are in present worth dollars at a 5% discount rate and are expected to be within -30 to +50% of the actual remediation costs. This is consistent with EPA guidelines for conceptual level cost estimating under CERCLA.

8.2.3 Short-Term Effectiveness

Alternatives 3 and 4 would not be expected to pose an unacceptable risk to workers or visitors during implementation. Appropriate air pollution control equipment would be used as necessary to ensure that air emissions do not pose an unacceptable human health risk. All potential impacts from construction and system operations will be readily controlled using standard engineering controls and practices. Alternative 4 is expected to achieve a greater degree of aquifer restoration in a shorter timeframe than Alternative 3 based on capture and treatment of TCE contaminated groundwater in the greater than 25 æg/L dissolved phase plume.

8.2.4 Implementability

Alternatives 3 and 4 require a phased approach to verify treatment performance and determine sizing criteria for the remedial design.

Alternative 4 would require a greater number of wells, additional treatment capacity, and disposal of a larger volume of residual waste, thus Alternative 4 has more technical administrative difficulties than Alternative 3.

8.2.5 Cost

A summary comparison of estimated costs for the four remediation alternatives is presented in Table 8-2 and a detailed summary of estimated costs for the selected alternative are presented in Table 8-3. These costs differ from those presented in the May 1994 Proposed Plan based on the new information identified in Section 7. The full costs for Alternative 3 are not known because the less than 5,000 æg/L TCE component of the plume would not be addressed until the site-wide RI/FS is written. During implementation of the 1-07B remedial action specified under Alternative 3, no action other than institutional controls and monitoring would be taken on the less than 5,000 æg/L component of the plume. Instead, the site-wide RI/FS and subsequent ROD (OU 10-04) would include necessary remedial actions for that portion of the plume outside of the hydraulic containment area.

The estimated $25,800,000 cost for Alternative 3 given in the Proposed Plan is for a treatment system operating at 1,000 gpm for 3 to 6 years. Given the new information described above, secondary source containment and/or removal is expected to be achieved with a treatment system operating at 100 gpm over a 30-year O&M period with an estimated cost of $23,657,000.

Table 8-3. Cost summary for the OU 1-07B selected alternative.

Activity	Construction ($)	Operations and maintenance ($)	Waste handling and disposal ($)	Indirects ($)	Contingencya ($)	Subtotal ($)
Phase A						
Remedial Design (RD)/ Remedial Action Scope and ROD revisions	NA	NA	NA	450,000	50,000	500,000
Phase B						

Continuing operations of 707,000 2,037,000 651,000 1,876,000 1,054,000 6,325,000
GWTF

Treatability studies/support NA 283,000 NA 1,588,000 929,000 2,800,000
activities

Bench-scale testing NA 694,000 NA NA NA 694,000

Pilot-scale testing 785,000 991,000 56,000 NA NA 1,832,000

Phase C

Final remediation
technology

Implementation and 2,572,000 5,498,000 616,000 4,120,000 2,960,000 15,766,000
operation

Monitoring

Monitoring 1,971,000 1,971,000

Total present value cost 4,064,000 11,474,000 1,323,000 8,034,000 4,993,000 29,888,000

a. Agency notification will be required prior to allocation of contigency, should funds in excess of 90% of the amounts specified for construction, operations, waste handling, or indirects be required to complete the activity.

The estimated $94,600,000 cost for Alternative 4 given in the Proposed Plan is for a treatment system operating at 10,000 gpm for 10 to 40 years. Given the new information presented in Section 7.4 above, secondary source containment and/or removal, and dissolved phase groundwater

treatment system operating at 1,000 gpm or less over a 30-year O&M period is estimated at $29,888,000.

8.3 Modifying Criteria

8.3.1 State Acceptance

This assessment criterion evaluates the technical and administrative issues and concerns that the IDHW may have regarding each alternative. The IDHW has been involved with the development and review of the proposed plan, ROD, and other project activities such as public meetings. The IDHW concurs with the selected remedy as discussed in Section 9.

8.3.2 Community Acceptance

The community acceptance criterion evaluates issues and concerns the public may have regarding each alternative described in the proposed plan and in the RI/FS. On the basis of verbal comments received during the public meetings held on June 6, 8, and 9, 1994, and written comments received during the comment period ending June 18, 1994, the community appears to accept the preferred remedial alternative. Specific responses and comments on the remedial alternatives can be found in the Responsiveness Summary appended to this document.

9. SELECTED REMEDY

9.1 Major Components of the Selected Remedy

After reviewing recent information provided by groundwater capture and treatment simulations and subsequently evaluating Alternatives 1 through 4 against the nine specific CERCLA criteria, the selected remedial action for OU 1-07B is Alternative 4: 25 micrograms per liter Trichloroethene Groundwater Plume Extraction; Hotspot Containment and/or Removal with Aboveground Treatment. Alternatives 1 and 2 were eliminated because they did not satisfy the threshold criteria. Alternative 3, the preferred alternative identified in the Proposed Plan, requires a commitment to perform necessary remedial actions on the less than 5,000 æg/L plume in a subsequent RI/FS. Also, in comparing Alternatives 3 and 4 in light of the new information, Alternative 4 better satisfies

the CERCLA evaluation criteria (Section 8). Groundwater modeling calculations show that containment and/or removal of the hotspot with subsequent treatment of the 25 to 5,000 æg/L component of the plume, would greatly reduce the extent of aquifer contamination and would reduce the time for restoration of the dissolved phase plume to drinking water standards. The operations and maintenance cost to implement Alternative 4 would be greater than Alternative 3, but the restoration timeframe would be accelerated.

Alternative 4 is planned to be conducted in three phases: Phase A will be completed m 1996 and serves as a transition from 1-07A to 1-07B activities. Phase B focuses on hydraulic containment and source removal via surge and stress from 1996 to 1998 (3-year duration). Phase B also includes Treatability studies to evaluate innovative technologies against the selected alternative. Bench-scale treatability studies will be conducted during 1996 and following evaluation of bench-scale results, pilot scale studies will be conducted during 1997 and 1998. Evaluation of emerging technologies and routine groundwater monitoring will be conducted concurrent with these activities. For cost estimating purposes, Phase C is assumed to be conducted from 1999 through 2025 (27 year duration). Phase C implements the long-term final remedial action, is expected to be completed in no more than 100 years, and will end when the NCP review process demonstrates that RAOs have been met.

Figure 9-1 is a schematic of the estimated sequence of activities for completion of the final remedial action. Alternative 4 is believed to provide a good balance of the evaluation criteria among the alternatives considered. The agencies determined that the preferred alternative will be

protective of human health and the environment, will comply with applicable Federal and State regulations, and will be cost effective.

9.1.1 Need for Treatability Studies

During the year following issuance of the Proposed Plan, groundwater monitoring data and refined fate and transport simulations have suggested that initial estimates for remedial action were overly conservative (e.g., groundwater pumping rates and size of associated treatment facilities). Further, new technologies have advanced that show great potential for treating the organic contamination in situ or reducing the toxicity of contaminants aboveground.

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The selected remedy of groundwater pumping, aboveground treatment (air stripping and off-gas treatment, or equivalent technology as necessary) and reinjection of treated groundwater should be effective in restoring much, if not all, of the aquifer to drinking water quality within 100 years. It may also be possible to reduce the overall remedial timeframe as well as capital and/or operating costs of the selected remedy through the use of innovative and new technologies. To provide an opportunity to evaluate the most promising new and innovative technologies, a phased approach will be implemented.

9.1.2 Description of Selected Remedy

Alternative 4 will be implemented in three phases:

Phase AÄÄTransition of 1-07A Interim Action to 1-07B Final Remedial Action

Phase BÄÄHotspot Containment and/or Removal with Treatability Studies

Phase CÄÄDissolved Phase Groundwater Treatment with Continuation of Hotspot Containment and/or Removal.

The overall approach for each of the three phases is summarized below:

9.1.2.1 Phase AÄÄTransition of OU 1-07A Interim Action to OU 1-07B Final Remedial Action. The OU 1-07A surge and stress pumping of the TSF-05 Injection Well will continue. This action will be done to remove secondary source material, pump and treat contaminated groundwater in the vicinity of TSF-05, and collect data on aquifer parameters to establish the potential for continued pumping of the hotspot for removal of the secondary source of TCE contamination. The transition may include installation of wells to support remedial activities. Phase A is directly associated with the OU 1-07A ROD, which will end with the signing of the OU 1-07B ROD. However, the OU 1-07A activity will be incorporated into OU 1-07B Phase B activities, as necessary, to meet the objectives of the OU 1-07B ROD.

Phase A will include operation of the existing GWTF to limit the migration of contaminants from the hotspot until Phase B is initiated. Activities associated with this task include (a) performing tests on filters, selected resins and other media (e.g., zeolites) to determine the practicability and cost-effectiveness of radionuclide removal from extracted groundwater; and (b) surging and stressing the TSF-05 well to remove as much secondary source as possible from the vicinity of the borehole and increase well efficiency.

The existing GWTF will be used to process groundwater extracted from within the greater than 5,000 æg/L TCE contaminated plume. Treated water will be reinjected within the extraction well capture zone, thus creating a hydraulically system of extraction, treatment, and reinjection. Hydraulic containment will enhance removal of contaminants in the vicinity of the well bore.

Prior to the agency decision on radionuclide performance standards, the GWTF will operate using the existing treatment system. Following a single pass through the treatment train, the effluent will be reinjected to the aquifer and may contain contaminants that exceed MCLs.

On the basis of current data, surging and stressing TFE-05 Injection Well will result in high organic and radionuclide influent concentrations. The extraction/treatment system will

be operated and/or modified to reduce effluent concentrations of volatile organic contaminants below MCLs.

Volatile organic compounds discharged to the atmosphere from GWTF operations will not exceed the calculated emission rate limits specified in Table 9-1. Radionuclide concentrations will be reduced by an ion exchange or equivalent process to the extent practicable as determined by the agencies. On the basis of a review of the Radionuclide Removal Studies Report (Phase A, activity "a") and a cost benefit analysis of the selected treatment system, the agencies will determine radionuclide reinjection performance standards. After treatment, Sr-90, Cs-137 and/or other radionuclides at concentrations above MCLs may be reinjected into the upgradient portion of the hotspot.

9.1.2.2 Phase BÄÄHotspot Containment and/or Removal and Treatability Studies. Hotspot containment and/or removal will involve implementing groundwater extraction in the hotspot area at a rate sufficient to create hydraulic containment of TCE and other contaminants within the greater than 5,000 æg/L plume. Surge and stress will continue during Phase B. Surge and stress data will be evaluated to determine whether the process is successful for removal of secondary source material. Treatability bench- and pilot-scale studies for promising remediation technologies will run concurrent with hotspot containment and/or removal over a 3-year period. At the end of this period, the treatability study results will be evaluated against the long-term remedy described below as Phase C.

Phase B can be considered an enhancement of the OU 1-07A Interim Action. Additional wells may be installed, as necessary, and will be operated within the greater than 5,000 æg/L TCE plume at a rate sufficient to create hydraulic containment and prevent contaminant migration.

Preliminary modeling suggests containment may be achieved with a 50 gpm pump rate; however, specific pumping rates, well depths, number of wells and well locations will be determined in the remedial design. Implementation of extraction, aboveground treatment, followed by reinjection will initiate hydraulic containment within 15 months of the signing of this ROD.

Table 9-1. Idaho Administrative Procedures Act (IDAPA) emission rate screening levels, air concentration screening levels, and calculated emission rate limits for OU 1-07B.

Contaminants of concern	IDAPA emission rate screening level (lb/hr)a,b	Air concentration screening level increments (æg/m3)	Calculated emission rate limit (lb/hr)
TCE	0.00051	0.077c	0.185
PCE	0.013	2.1c	5.05
DCE	52.7	39,500d	1,254

a. Emission screening levels for TCE, PCE, total 1,2,DCE are derived from IDAPA 16.01.01.585 and 16.01.01.586ÄÄToxic Air Pollutants Noncarcinogenic and Carcinogenic Increments apply to operation of the GWTF.

b. Air emission for organics will comply with the 95% removal or 3 lb/hr requirement of IDAPA 16.01.05.008 (40 CFR 264 Subpart AA).

c. Emission rate limits based on annual averages.

d. Emission rate limit based on 24 hr average.

The contaminated groundwater will be treated using basically the same treatment system designed for OU 1-07A. The system will consist of a multimedia filter and/or separator for nonaqueous phase liquids and suspended solids and an air stripper with air pollution controls as necessary (e.g., activated carbon or equivalent off-gas treatment technology). The air stripper will be

operated in compliance with State and Federal air and hazardous waste management requirements. A treatment system (e.g., ion exchange columns) will be used, as, practicable, to reduce radionuclide concentrations to performance standards established by the agencies.

On the basis of a review of the Radionuclide Removal Studies Report (Phase A, activity "a") and a cost benefit analysis of the selected treatment system, the agencies will determine radionuclide reinjection performance standards. Should the radionuclide testing prove ineffective at reducing radionuclide concentrations, process effluent containing radionuclides (e.g., Sr-90, Cs-137) above MCLs will be reinjected into the aquifer within the hydraulic containment zone to enhance flushing of contaminants within the hotspot. Although contaminant concentrations in reinjected groundwater may exceed drinking water standards, the selected remedy employs an extraction, treatment, and reinjection process that substantially improves aquifer water quality. Furthermore, institutional controls will ensure that contamination will not endanger present or future beneficial use.

Storage of hazardous or mixed waste generated from groundwater treatment constitutes permissible storage for the purpose of accumulating sufficient quantities to facilitate treatment and disposal. In the event that hazardous or mixed waste treatment residues are removed from storage for treatment/disposal at the INEL, LDR compliance may be addressed through the INEL Federal Facility Compliance Act Site Treatment Plan and Consent Order. If hazardous or mixed waste (activated carbon, sediments, or spent resins) generated by groundwater treatment is transported off the INEL, subsequent management will comply with EPA's "Off-Site Rule" (40 CFR 300.440). All purge water and unused and unaltered sample residue returned from analytical laboratories will be treated at a minimum to remove VOCs and reinjected. Characterization using analytical results and/or process knowledge/history will be performed on all treatment plant waste residuals to determine compliance with State and Federal hazardous waste management requirements. Periodic monitoring of

the
treatment system influent contaminated groundwater for selected organic COCs, and
effluent air and water from the air stripper and ion exchange column will be conducted at a
rate to be
determined by the agencies.

Treatability Study EvaluationÄÄPhase B includes several two-stage treatability studies to
determine whether a new and innovative technology may be more effective than the selected remedy.
The first stage will be bench-scale evaluations. The second stage or pilot-scale testing will
be
conducted if the bench-scale testing indicates the technology has potential for remediating
TAN
groundwater more effectively than the selected alternative. A Treatability Study Work Plan
will
describe the specific studies to be peformed, schedule for implementation, and reporting
format. The
Treatability Study Work Plan shall include a conceptual design and cost estimate for each
of the
techologies evaluated. As an ongoing effort, the agencies have evaluated a number of innovative
and emerging technologies. The results of this evaluation are contained in a technical report entitled,
Technical Memorandum for Waste Area Group 1, Operable Unit 1-07B, Alternatives Evaluation
(Draft), which is contained in the administrative record. The remedies identified as having
the
potential for reducing overall remediation timeframe and/or the potential for being more
effective than
the selected alternative are

In situ bioremediation of the hotspot and the 25 to 5,000 æg/l portion of the plume

Reductive iron dechlorination

In situ chemical oxidation of the hotspot

Natural attenuation

Monolithic confinement (grout curtain).

The timeframe for completion of the studies and submittal of the Treatability

Study Report is 36 months from the signing of this ROD. The pilot-scale studies will lead to a comparison of each technology against the two threshold criteria and five balancing criteria established in the NCP to determine whether any technology is more effective than the selected alternative.

The new and innovative technologies that will be evaluated in treatability studies, are described below.

In Situ BioremediationÄÄIn situ bioremediation is an innovative technology for destroying chlorinated contaminants dissolved in groundwater. Pilot-scale field tests of in situ bioremediation at other sites around the country have demonstrated promising results in recent years. Through this process, chlorinated contaminants are transformed by biological processes to lower toxicity end products. Generally, the microorganisms responsible for the transformations do not directly feed on the contaminant, but rather the transformations are brought about by cometabolic degradation. Cometabolic degradation involves interactions of the contaminants with enzymes produced by the microorganisms for other purposes. To achieve cometabolic degradation, other chemicals must be present to serve as nutrient sources for the microoganisms.

The benefit of in situ bioremediation is that VOCs are treated in the aquifer, thereby lessening or eliminating the need for conventional air strippers and air pollution control devices, and their associated long term maintenance costs. Although extraction wells are used, the extracted water is recycled and reinjected in separate wells as a component of the treatment systems.

Treatability testing is necessary to determine the effectiveness of active bioremediation under site conditions. Bench-scale testing is needed to characterize the presence of indigenous microorganisms that can transform TCE, select nutrients and optimize nutrient concentrations, determine a range of TCE concentrations over which bioremediation is most effective, and evaluate any

intermediate compounds that may be formed during bioremediation of TCE. If the bench-scale tests yield promising results, pilot scale testing will be required to determine and optimize nutrient delivery systems (e.g., well configurations and pumping rates).

Full scale implementation may involve development of an in situ bio-barrier transverse to the direction of groundwater flow. The bio-barrier would be created by installing a series of injection and extraction wells in an offset pattern across the plume. It is estimated that two injection wells and three extraction wells may be needed to effectively capture the width of the plume. The optimal location of the bio-barrier and recommended pumping rates, would be determined through the treatability study. An alternative to the bio-barrier concept may involve creating biologically active areas within selected areas of contamination using extraction wells to draw contaminated groundwater through these reactive zones. The treatability study will evaluate the most effective design of an in situ bioremediation system for both the hotspot and the 25 to 5,000 æg/L portion of the plume.

Reductive Iron DechlorinationÄÄCurrent studies indicate that zero-valent iron is highly effective in enhancing the rate of degradation of a wide range of chlorinated aliphatic compounds in aqueous solution. Because zero-valent iron is readily available at low cost and bench tests have proven its effectiveness, it is a good choice to degrade chlorinated aliphatic compounds such as the VOC COCs in the groundwater at TAN. Additionally, studies indicate that while degradation products are created by this process, they are also destroyed given adequate retention time. Also, laboratory tests indicate that this technology effectively reduces effluent contaminant concentrations

below analytical detection limits.

Radionuclides that are found in TAN groundwater are not expected to react with the iron filings. However, the strontium is expected to follow calcium in the water and if calcium precipitates, the strontium will remain with the calcium carbonate. This process and its potential to produce a secondary waste stream will be evaluated during the Treatability Study.

In Situ Chemical OxidationÄÄIn situ chemical oxidation is an experimental technology for degrading chlorinated solvents in groundwater. Laboratory tests and small-scale experiments have shown that the oxidant potassium permanganate is effective in degrading TCE and PCE to less toxic end products such as carbon dioxide, chlorine, chloride, and total manganese. This technology has promising potential for remediating source areas, where concentrations of TCE are highest and undissolved solvent may exist.

The potassium permanganate is injected into the aquifer and the oxidation reaction occurs in situ. Therefore the complexity of the required aboveground treatment components is greatly reduced compared with conventional pump and treat systems. The treatment process functions in a hydraulically contained system. Oxidant is injected into the source area and the treated groundwater is extractod at a downgradient well. The recovered water is tested for oxidation products and remaining solvent, augmented with more oxidant if needed, and then reinjected into the source area. A bench-scale study to evaluate this technology under site conditions would be conducted followed by a pilot field-scale demonstration to optimize remedial design.

Natural AttenuationÄÄThe effect of natural contaminant degradation processes may augment simple aquifer dispersion during natural attenuation of groundwater contaminants. However, site-specific information is lacking on the potential for biotic degradation, abiotic degradation or other natural attenuation processes that may affect the TCE contaminated plume. A Treatability Study will be performed to evaluate the rate and extent of natural TCE degradation. This will

involve collection and evaluation of available information on natural processes followed by a site-specific field test to determine degradation trends based on time and distance downgradient from the secondary source. The Treatability Study will evaluate degradation of TCE and all derivative products generated during natural degradation processes. The results of this study will be used to refine fate and transport simulation estimates of aquifer restoration timeframe and to assist in design of Phase C remedial action.

Monolithic ConfinementÄÄThe use of grout as a physical barrier to groundwater flow is a well established process. The determination of necessary well spacing and grout quantity will be evaluated under the Treatability Study. If the above treatability studies do not show promise, and the estimated timeframe for continued pumping and aboveground treatment appears indefinite, cost-effectiveness of this option versus long-term pumping and aboveground treatment will be evaluated.

9.1.2.3 Phase CÄÄDissolved Phase Groundwater Treatment with Continuation of Hotspot Containment and/or Removal. Dissolved phase groundwater treatment will involve the design of extractian wells, treatment systems, and reinjection wells approximately 3 years after signature of this ROD. Phase C remedial activity will be designed to capture the 25 to 5,000 æg/L portion of the plume, treat via air stripping, and reinject treated groundwater to enhance natural attenuation in the less than 25 æg/L plume. Hydraulic containment and/or removal initiated during Phase B at the hotspot will continue throughout Phase C. The Phase C pump and treat technology may be replaced by an innovative technology (described in Section 9.1.3) should the treatability studies indicate a viable replacement alternative.

Phase C begins on completion of the treatability studies and involves the

installation of extraction and injection wells so spaced as to intercept the greater than 25 æg/L TCE contaminated plume. Specific pumping rates, well depths, number of wells and well locations will be determined in the remedial design. Aboveground treatment will be similar to that described for Phase B (air stripping/sparging with off-gas treatment as necessary). Actual treatment system components will be determined as a part of remedial design. However, in consideration of approximate well locations within the dissolved phase plume, it is anticipated that the air stripping efficiency and need for air pollution control will be minimal to achieve groundwater volatile organic contaminant treatment to less than MCLs. There is no anticipated need for a radionuclide treatment system because radionuclides are detected only in the vicinity of the hotspot and have not migrated downgradient. However, based on monitoring data, agency review of the Radionuclide Removal Study Report, and determination of radionuclide reinjection performance standards, the design may consider installation of such equipment as a contingency. Periodic monitoring of the treatment system influent contaminated groundwater for selected organic and inorganic COCs, and of effluent air and water emissions from the air stripper will be conducted at a rate to be determined by the agencies. Phase C design will be initiated within six months of completion of the Treatability Study described in Phase B.

9.1.2.4 Institutional Controls and Groundwater MonitoringÄÄInstitutional controls will consist of engineering and administrative controls to protect current and future users from health risks associated with groundwater contamination by preventing ingestion of groundwater having contaminant concentrations of COCs exceeding MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs. Administrative controls shall include placing written notification of this remedial action in the facility land use master plan; the notification shall prohibit (1) installation of

any wells accessing the aquifer within the plume, and (2) engaging in any activities that would interfere with the remedial activity. A copy of the notification shall be given to the Bureau of Land Management (BLM), together with a request that a similar notification be placed n the BLM's property management records for this site. U.S. Department of Energy shall provide EPA and the State with written verification that notifications, including BLM notification, have been fully implemented.

Access to this portion of the contaminant plume will be institutionally controlled until MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs are achieved. Groundwater monitoring will be performed in accordance with monitoring plans developed as part of the Remedial Design/Remedial Action. The plans will consider RAOs and monitoring data will be used to track the greater than 5 æg/L TCE plume, document COC concentration charges over time, provide information on the attenuation rate of the plume, to evaluate attainment of RAOs. Additional details on institutional controls are provided in Section 7.2. Concentrations will be contoured on the basis of the most recent data and additional samples may be collected, as necessary to establish a baseline of contaminant concentrations prior to active remediation.

9.1.3 Selection of an Alternate Remedy to Potentially Replace Conventional Pump and Treat

In the event that one or more of the treatability studies are shown to reduce the overall remedial timeframe or signficantly reduce overall cost, the technology may be proposed as a replacement for the base case described as Phase C. If a technology is found to be more effective than continued long-term implementation of Phase C, the agencies shall, after appropriate public opportunity to review the basis for changing the selected technology, modify this ROD as appropriate and begin design implementation on the alternate remedy. This determination will be based on the

information provided in the Treatability Study Report, which will include a conceptual design and cost estimate for each of the technologies evaluated as well as a comparison of each technology against the two threshold criteria and five balancing criteria established in the NCP. However, in the event that an innovative technology is selected to replace the Alternative 4 Phase C remedy, the Phase B remedy shall continue to operate until such time as the innovative remedial action is operational and functional.

9.1.4 Agency Evaluation and Review of the Selected Remedy

The agencies will evaluate, at a minimum, and document the effectiveness of the selected remedy within 5 years and every 5 years thereafter through the standard CERCLA 5-year review process. This review does not preclude more frequent review by one or more of the agencies. Specifically, the agencies will use, but will not be limited to the following evaluation criteria in the reviews:

Determine whether the portion of the groundwater plume having TCE concentrations greater than 5,000 æg/L is effectively being contained, based on sampling results.

Determine whether the greater than 25 æg/L portion of groundwater TCE plume is attenuating as modeled if containment is effective.

Determine whether the groundwater restoration assumptions are still valid. These are, but are not limited to the assumptions that TCE is the major constituent defining the contaminant plume, land use is such that institutional controls are maintained throughout the restoration period whether or not DCE maintains ownership of the property. It is estimated that institutional controls will need to be maintained and monitored for 100 years.

Evaluate and use groundwater quality data and groundwater level measurements

routinely to determine treatment effectiveness and to provide indications of potential problems regarding groundwater treatment.

On the basis of the evaluation performed during the review, a decision will be made by the agencies to continue or discontinue the OU 1-07B remedial action. Similar evaluations will be performed for subsequent 5-year reviews. Other factors that will be taken into considered during the reviews include, but are not limited to

Acceptability of the residual risk levels achieved

Cost of continuing the action in comparison to incremental risk reduction expected

Changes in future land use or changes in the EPA groundwater protection strategy

Technical practicability of restoring the aquifer (e.g., ability to contain the portion of the plume leaving TCE concentrations greater than 5,000 æg/L, modifications that could expedite the cleanup in a cost effective manner).

9.2 Remedial Action Objectives

As part of the RI/FS process, RAOs were developed in accordance with the NCP and EPA guidance for conducting RI/FS investigations. The purpose of the objectives is to reduce the contamination in the groundwater at TAN to ensure that offsite populations are not at risk in the future and that the future residents would not be at risk from use of TAN groundwater if the TAN area were converted to the public domain at any time in the future. Remedial action objectives for the selected alternative are

Phase AÄÄRemove as much of the secondary source as possible from the vicinity of the TSF-05 Injection Well by physically and hydraulically stressing the well.

The treatment system shall be designed such that concentrations of VOCs in the effluent are below MCLs before reinjection into the hotspot. All attempts will be made to operate this process as a hydraulically contained system. The air pollution control device will be operated in compliance with ARARs. Continue surging and stressing the well for 15 months unless Phase B is ready to begin before this date.

Phase BÄÄPrevent, to the maximum extent practicable, migration of contaminated groundwater beyond the hotspot at levels above MCLs, or for those contaminants for which an MCL does not exist, the contaminant concentration will be such that the total excess cancer risk posed by release of contaminated groundwater will be within the acceptable range of 10-4 to 10-6. For aboveground treatment processes using reinjection of treated effluent, treatment shall, at a minimum, be sufficient to reduce the VOC concentration to below MCLs. Volatile organic compounds discharged to the atmosphere from GWTF operations will not exceed the calculated emission rate limits specified in Table 9-1.

Phase CÄÄCapture and treat a sufficient portion of the dissolved phase plume beyond the hotspot to provide for aquifer cleanup within 100 years of the date of ROD signature. For aboveground treatment processes using reinjection of treated effluent, treatment shall be designed to reduce the VOC concentration to below MCLs. If an MCL does not exist, the contaminant concentration will be such that the total excess cancer risk posed by the groundwater will be within the acceptable range of 10-4 to 10-6. Volatile organic compounds discharged to the atmosphere from GWTF operations will not exceed the calculated emission rate limits specified in Table 9-1.

Institutional controls and groundwater monitoringÄÄInstitutional controls shall be implemented to protect current and future users from health risks associated

with ingestion of groundwater containing COC concentrations greater than MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs. Institutional controls shall be maintained until COC concentrations fall below MCLs or 10-4 to 10-6 risk-based concentrations for contaminants without MCLs.

10. STATUTORY DETERMINATIONS

The selected remedy meets the statutory requirements of Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the NCP. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

10.1.1 Protection of Human Health

The selected remedy protects human health through aboveground treatment and reinjection of treated groundwater to restore much if not all of the affected aquifer to drinking water quality within 100 years. Removing contaminants will prevent further degradation of groundwater and will be protective of future use. Treated water will be reinjected into the aquifer and will meet appropriate performance standards as determined during design. Any short-term threats associated with the selected remedy will be addressed by engineering controls and standards health and safety practices.

10.1.2 Protection of the Environment

A qualitative/semiquantitative ecological risk assessment indicated that no exposure pathways for ecological receptors are present under current conditions. Potential future exposure could occur primarily through use of contaminated water for crop irrigation. A simplified exposure scenario was evaluated for an herbivorous rodent in this future scenario. The scenario indicated that radiological

doses from exposure to TAN groundwater used for crop irrigation would be insignificant in comparison to the radiological dose received from background sources. However, at the level of analysis performed in the risk assessment, the nature of potential adverse effects from Sr-90 cannot be fully evaluated. Furthermore, exposure to other COCs would be sufficiently low that no adverse effects would be expected in rodents occupying the irrigated cropland. Effects on organisms at higher trophic levels would also be expected to be insignificant.

Nevertheless, the selected remedy provides greater protection for ecological receptors in the future use scenario by reducing the levels of contaminants in water that might be used for irrigation in that scenario. Short-term effects on ecological receptors resulting from implementation of the selected remedy are also not expected to be significant. The selected remedy should not result in short-term adverse effects on the environment at TAN and will minimize adverse environmental effects that could occur as a result of future use of the TAN groundwater.

10.2 Compliance with ARARS

The selected remedy will comply with all Federal ARARs and promulgated State ARARs that are more stringent than Federal ARARs. A detailed list of ARARs for the selected alternative is shown in Table 10-1. A general description of the ARARs is summarized below in Section 10.2.1.a

10.2.1 Chemical-Specific ARARs

State of Idaho Toxic Air Pollutants, Noncarcinogenic and Carcinogenic Increments (IDAPA 16.01.01.585 and .01.586). These requirements involve demonstration of preconstruction compliance with Toxic Air Pollutants emission screening levels. If the emissions exceed the screening levels, then model results must show compliance with the acceptable air concentration limits for carcinogens (AACC) at the INEL boundary (chronic exposure) and acceptable air concentration (AAC) limits for

noncarcinogens at the public highway for a short term exposure. If model results indicate that the AACC or AAC will be exceeded, best available control technology must be applied at the source.

a. Citation of the Idaho Waste Management Regulations incorporate by reference the federal hazardous waste regulations.

Table 10-1. Summary of ARARs for Alternative 4.

ARAR type	Requirements	Citation
Action	Chemical	
Location		
	CAA and Idaho Air Regulations	
	Idaho Air Pollutants noncarcinogens	IDAPA 16.01.01.585
	Idaho Air Pollutants carcinogens	IDAPA 16.01.01.586
	NESHAPs - < 10 mrem/yr	40 CFR 61.92
	NESHAPs - monitoring	40 CFR 61.93
	ID Fugitive Dust	IDAPA 16.01.01.650 and .651
	RCRA and HWMA	
	Generator Standards	IDAPA 16.01.05.006
	Hazardous Waste Determination	40 CFR 262.11
	General Facility Standards	IDAPA 16.01.05.008
	General Waste Analysis	40 CFR 264.13
	Location Standards	40 CFR 264.18 (a) and (b)
	Preparedness and Prevention	40 CFR 264.31-.37
	Closure Performance Standard	40 CFR 264.111
	Disposal/Decontamination	40 CFR 264.114
	Use/Management of Containers	40 CFR 264 Subpart I

Tank Systems	40 CFR 264 Subpart J
Miscellaneous Units	40 CFR 264 Subpart X
Air Emission Standards for Process Vents	40 CFR 264 Subpart AA
Land Disposal Restrictions	IDAPA 16.01.05.011
RCRA	Section 3020
UIC	
Idaho Results for the Construction and Use of Injection Wells	IDAPA 37.03.03
ID Public Drinking Water	
MCLs (numerical standards only)	IDAPA 16.01.08.050.02 and .05
Secondary MCLs (numerical standards only)	IDAPA 16.01.08.400.03
National Historic Preservation Act	
Assessing information needs	36 CFR 800.4(a)(1)(i),(iii)(a)(2)
Locating Historic Properties	36 CFR 800.4(b)
TBCs	
Radiation Protection of the Public and the Environment	DOE Order 5400.5
Fire Protection	DOE Order 5480.7A
Radioactive Waste Management	DOE Order 5820.2A

National Emission Standards for Hazardous Air Pollutants (40 CFR 61.92) regulating emissions of radionuclides from DOE facilities. Emissions of radionuclides other than radon to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr.

Safe Drinking Water Act, Underground Injection Control Program as incorporated into Idaho Rules and Regulations for the Construction and Use of Injection Wells

(IDAPA 37.03.03), and Section 3020 of RCRA. The UIC regulation establishes standards for the quality of fluids discharged to Class V injection wells.

In addition, Section 3020 of RCRA allows reinjection of groundwater containing hazardous constituents above regulatory limits into the aquifer from which it was withdrawn and treated as part of a CERCLA response action if the water quality has been substantially improved, and if the remedy will be protective of human health and the environment upon completion of the response action. The selected remedy employs extraction, treatment, and reinjection of process effluent, which substantially improves the condition of the aquifer and meets the substantive intent of the UIC and RCRA regulations.

State of Idaho Drinking Water Standards (IDAPA 16.01.08.050.02, .05, and 16.01.08.400.03). These standards establish primary and secondary drinking water standards, referred to in this document as MCLs.

10.2.2 Action-Specific ARARs

National Emission Standards for Hazardous Air Pollutants emission monitoring and test procedures (40 CFR 61.93). An operator of a source with radioactive (tritium) emissions under 0.1 mrem/yr is required to perform periodic confirmatory measurements to confirm low emissions.

State of Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.650 to .651) specifies that all reasonable precautions be taken to prevent the generation of fugitive dust.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, IDAPA 16.01.05.006, Hazardous Waste Determination (40 CFR 262.11) specifies substantive standards for the determination and classification of hazardous wastes.

State of Idaho Standards for Owners and Operators of Hazardous Waste

Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, General Waste Analysis (40 CFR 264.13) contains substantive requirements for analysis of hazardous waste.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, Preparedness and Prevention
(40 CFR 264.31-.37) contains substantive standards which apply to the design, operation,
and maintenance for treatment and storage facilities involving hazardous wastes.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, Closure Performance (40 CFR 264.111) and Disposal or Decontamination (40 CFR 264.114) contain

substantive requirements for post operation closure and post closure of treatment and
storage facilities involving hazardous wastes. These standards are relevant and
appropriate for treatment process systems for extracted groundwater and sludge because it
has been determined that the contaminated plume does not contain RCRA listed waste.
These standards are applicable for the storage facility involving RCRA characteristic
waste from the treatment of the extracted groundwater and sludge.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, Use and Management of Containers (40 CFR 264 Subpart I) contains substantive standards regarding hazardous
waste container management and inspections for treatment and storage facilities involving
hazardous wastes.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, Tank Systems (40 CFR 264
Subpart J) contains substantive standards dealing with design, leak control, inspections,
and operating requirements for tank systems containing or processing hazardous waste.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, IDAPA 16.01.05.008, Miscellaneous Units (40 CFR 264 Subpart X) contains substantive requirements for miscellaneous treatment units that may be incorporated into future hazardous waste treatment designs based on process technology requirements resulting from treatability studies.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, IDAPA 16.01.05.008, Air Emission Standards for Process Vents (40 CFR 264 Subpart AA). This regulation requires, when influent total organic concentrations are greater than 10 ppmw, that total organic emissions from all facility process vents be below 3 lb/hr or reduction of total organic emissions by 95% by weight be maintained by use of a control device.

State of Idaho Land Disposal Restrictions, IDAPA 16.01.05.011. Hazardous waste generated from the treatment process are subject to the substantive requirements of land disposal restrictions (LDRs) in effect at the time of ROD signature. Land disposal restrictions do not apply to treated groundwater reinjected into the same aquifer. Storage of hazardous or mixed waste generated from groundwater treatment constitutes permissible storage for the purpose of accumulating sufficient quantities to facilitate treatment and disposal. In the event that hazardous or mixed waste treatment residues are removed from storage for treatment/disposal at the INEL, LDR compliance may be addressed through the INEL Federal Facility Compliance Act Site Treatment Plan and Consent Order.

Safe Drinking Water Act, Underground Injection Control Program as incorporated

into
Idaho Rules and Regulations for the Construction and Use of Injection Wells. IDAPA 37.03.03 establishes substantive monitoring requirements for Class V injection
wells.

10.2.3 Location-Specific ARARs

National Historic Preservation Act [36 CFR 800.4(a)(1)(i), (iii)(a)(2), and .4(b)] requires
assessing information needs and locating historic properties, and applies when locating
treatment systems outside the TAN facility fence.

State of Idaho Standards for Owners and Operators of Hazardous Waste Treatment,
Storage, and Disposal Facilities, IDAPA 16.01.05.008, General Facility Standards
[40 CFR 264.18, (a) and (b)] contain substantive design considerations for locating
hazardous waste treatment and storage facilities within a floodplain or seismic area.

10.2.4 Other Criteria, Advisories, or Guidance To-Be-Considered

To-be-considered, action-specific material is contained in DOE Orders 5400.5, "Radiation
Protection of the Public and the Environment, " 5480.7A, "Fire Protection" and 5480.2A,
"Radioactive Waste Management."

10.3 Cost Effectiveness

The selected remedy is cost effective and provides overall protection of human health and the
environment proportional to duration of the remedy.

10.4 Use of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Possible

U.S. Department of Energy, EPA, and IDHW have determined that the selected remedy
represents the maximum extent to which permanent solutions and treatment technologies can be used
in a cost-effective manner for this final remedial action. The agencies have determined that
this

selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; and cost, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance. The selected remedy for OU 1-07B is intended to help prevent further degradation of the groundwater by containing and treating the source and by extracting and treating the dissolved phase plume.

10.5 Preference for Treatment as a Principal Element

By treating the contaminated groundwater using one or more technologies, such as air stripping, carbon adsorption, or ion exchange, the selected remedy satisfies the statutory preference in which treatment, as a principal element, permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

In the year since the Proposed Plan was released to the public, additional groundwater sampling results and the development of new and innovative treatment technologies have allowed improvements to be made in the evaluation of alternatives and the site groundwater model. As a result of this, the model predicts that the dissolved portion of the TCE plume (25 to 5,000 æg/L) can be remediated in less time and expense than previously indicated. Specifically, Alternative 4 can now be implemented at a pumping rate and for a time period comparable with that presented for Alternative 3, which was the preferred alternative listed in the Proposed Plan. Remediation under Alternative 4 will be completed in less than 100 years and cost approximately $30 million.

In conjunction with Alternative 4, several innovative technologies, as described in Section 9, will be field tested to determine their applicability in treating the VOCs in the groundwater. If any of these alternate technologies prove more effective and represent a cost savings, the most cost-effective technology will be implemented. The selection of a substitute technology instead of the pump and treat technology described in this ROD would only be made after appropriate public evaluation of the benefits derived from changing the remedial action.

12. TEST AREA NORTH TRACK 1 NO ACTION SITES

The following sections of this ROD summarizes information on the group of no action sites at TAN agencies identified by the DOE, EPA, and IDHW as posing acceptable risk to human health.

The typical Superfund site is often an obvious disposal site that contains hazardous wastes that have leaked into underlying soils and groundwater. In these cases, the location and boundaries of areas of contaminant concentrations can be readily identified. Many sites at the INEL do not fit into this typical category. Instead, they fall into the category of historical sites that have low or unknown quantities of residual contamination. These sites are termed low probability hazardous sites. For typical low probability hazardous sites, either the location and quantities of hazardous substances disposed of or leaked are unknown or there is significant uncertainty in the actual conditions.

In accordance with the FFA/CO, the agencies have evaluated the potential for contamination at the low probability hazardous sites. The evaluation process involved collecting and interpreting existing data to determine whether the site posed an acceptable or unacceptable risk. The information was then assembled into a decision document that consisted of a series of questions, forms, tables, and a qualitative risk assessment. This screening approach provided for the efficient

use of available resources and for a rigorous process to evaluate the risks from these sites to determine whether additional investigation was required. This evaluation process was then used to determine whether (a) the site poses a clear risk that requires an Interim Action, (b) the site should be further investigated under CERCLA, (c) the site should be referred to another State or Federal program, or (d) the source does not appear to pose a risk to human health or the environment and therefore requires no action.

Over 40 sites at TAN fall into the category of low probability hazardous sites. Of these, the 30 sites discussed in the following sections have been evaluated and are proposed for No Action under CERCLA. The sites have been arranged into three groups: underground storage tanks, soil contamination sites, and wastewater disposal sites. The evaluation of all of these sites has included record reviews, document searches, employee interviews, site visits, field screening using portable field instruments, and/or soil sampling where appropriate. The evaluations indicate that these areas pose an acceptable risk to human health or the environment. A brief description and summary of each site is presented below.

12.1 Underground Storage Tanks

The following 18 former underground storage tank sites were evaluated as low probability hazardous sites. Except where noted, all of the tanks, their contents, and associated piping have been removed. All of the tank sites have been backfilled with new soil and restored for unrestricted use. In many cases, the tank and the associated piping have been recycled as scrap metal.

Several of the tank sites had petroleum-related organic contamination (i.e., benzene, toluene, ethylbenzene, and xylene) in the site soil below the excavation. In each case, a risk

evaluation determined that the residual soil concentration for these contaminants did not exceed the 10-6 (1 in 1,000,000) risk-based concentrations for the air volatilization, soil inhalation, soil ingestion, or groundwater ingestion exposure routes.

OU 1-02, IET-01 [Underground Storage Tank (TAN-318)]. IET-01 is a fonner 5,000-gallon gasoline tank installed in 1958 and last used in 1965. The tank contents were removed in September 1991. The tank and the associated piping were removed in August 1992.

There were no holes in either the tank or the associated piping, and no visually stained or discolored soil was observed in the tank excavation. Field screening during the tank removal and the results of soil analyses from the excavation detected no organic contamination.

OU 1-02, IET-05 [Underground Storage Tank (TAN-1714)]. IET-05 is a former 550-gallon underground tank used for storage of fire-fighting foam (a biodegradable and nonhazardous material only) from 1958 to 1961. The tank contents were sampled and analyzed for organic and inorganic conataminants. No contaminants were detected at levels that exceed the 10-6 risk-based concentrations. The storage tank and its associated piping were removed in 1990.

There were no holes in either the tank or the associated piping, and no visually stained or discolored soil was observed in the tank excavation. No soil samples were collected beneath the tank because the tank contents were determined to be nonhazardous and no releases from the tank were found during removal, based on visual observations and field screening.

OU 1-02, IET-09 [Underground Storage Tank (TAN-316)]. IET-09 is a former 550-gallon lube oil tank installed in 1958 and last used in 1960. Sample analyses of the tank contents detected typical petroleum constituents and elevated levels of barium. The tank contents were removed in September 1991 and disposed of as a hazardous waste. The tank and the associated piping were removed in October 1991.

There were no holes in either the tank or the associated piping, and no visually stained or discolored soil was observed in the tank excavation. No releases have ever been reported and none are known to have occurred. Field screening during he tank removal and the results of soil analyses from the excavation detected no organic or inorganic contamination.

OU 1-02, IET-10 [Diesel Fuel Underground Storage Tank (TAN-1712)]. IET-10 is a former 30,000-gallon underground tank used for storage of diesel fuel from 1957 to 1989. Removal of the storage tank, its contents, and the associated piping were completed in 1990. Two nearby tanks, their contents, and their associated piping were also removed in 1990. No holes were observed in the tank or the associated piping during excavation. The analytical results from soil samples taken from the tank excavation detected only 2.3 parts per million (ppm) of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that xylene concentrations in the soil would need to be 6,400 ppm to exceed an HQ of 1 for the soil ingestion, air volatization, air inhalation, or groundwater ingestion exposure routes.

OU 1-02, IET-10 [Heating Oil Underground Storage Tank (TAN-1713)]. IET-11 is a former 20,000 gallon underground tank used for storage of diesel fuel from 1957 to 1989. Removal of the

storage tank, its contents, and the associated piping were completed in 1990. Two nearby tanks, their contents, and their associated piping were also removed in 1990.

No holes were observed in the tank or the associated piping during the excavation. The analytical results from soil samples taken from the tank excavation detected only 0.08 ppm of toluene, 0.06 ppm of ethylbenzene, and 2.1 ppm of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of toluene, ethylbenzene, and xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that xylene concentrations in the soil would need to be 1,310 ppm, 1,810 ppm, and 7,320 ppm respectively to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

OU 1-02, LOFT-05 [Fuel Tanks (TAN-767 A and B)]. LOFT-05 is the site of two 35,000-gallon underground tanks used for storage of heating oil from the mid 1950s to 1991. The tank contents were removed in 1991. However, the tanks and associated piping remain in place pending future use.

All available drawings and documentation indicate that the tanks were designed and used for the storage of fuel oil only. Personnel interviews also support that the tanks were used only to store fuel oil for heating purposes. In addition, no releases have ever been recorded and none are known to have occurred.

OU 1-02, LOFT-06 [Tank east of TAN-631 (TAN-765)]. LOFT 06 is a former 2,000-gallon underground tank used from 1958 to 1963. The tank was designed to store waste jet fuel and diesel-contaminated wastewater. However, all available information indicates the tank was only used for diesel-contaminated wastewaters.

Available drawings and documentation indicate that the tank contents were removed about 1965 and the tank was filled with sand. The site is currently covered by an asphalt road and parking lot. No surface contamination was visible in a 1966 aerial photograph before the asphalt road was built. Geophysical surveys performed in 1990 and 1993 did not locate the tank. No releases have ever been recorded and none are known to have occurred during the tank's 5-year period of operation.

OU 1-02, LOFT-08 [Underground Storage Tank (TAN-764)]. LOFT-08 is a former 15,000-gallon

tank installed in 1958 and last used in 1963. Records indicate the tank was intended for storage of potentially radioactively contaminated petroleum jet fuel, but the project was cancelled in 1961 before the jet engines were tested. Therefore, the tanks were likely never used for their intended purpose. In January 1990, the LOFT-08 tank and the associated piping were removed.

No holes were observed in the tank, and field screening detected no organic contamination in the site soil. The analytical results from soil samples collected from the tank excavation detected only 2 ppm of toluene, 22 ppm of ethylbenzene, and 0.1 ppm of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of toluene and xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that toluene, ethylbenzene, and xylene concentrations in the soil would need to be 54,000, 27,000, and 540,000 ppm, respectively, to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

OU 1-01, TSF-01 [Underground Storage Tank (TAN-1702)]. TSF-01 is a former 3,000-gallon diesel fuel tank installed in 1953 and last used in 1985. A pipe leak in 1983 reportedly released approximately 500 gallons of diesel fuel into the surrounding soil. The pipe was replaced in 1983. The tank, its contents, and the associated piping were then removed in September 1991. No holes were observed in the tank or the associated new piping during the excavation. Approximately 73 m3 (96 yd3) of contaminated soil were removed from the site. The analytical results from soil samples collected from the excavation detected only 2 ppm of ethylbenzene and 9 ppm of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of ethylbenzene and xylene required at the site to pose an unacceptable risk. The risk

evaluation estimated that ethylbenzene and xylene concentrations in the soil would need to be 27,000 and 540,000 ppm, respectively, to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

OU 1-02, TSF-13 [Underground Storage Tank North of TAN-620 (TAN-1221)]. TSF-13 is a former 550-gallon gasoline tank. Records indicate the tank was installed in the early 1950s to supply a fire-pump engine. The tank and its contents were removed about 1980.

No releases have ever been recorded and none are known to have occurred during the tank's operation. Geophysical surveys performed in 1993 did not locate the tank. A soil boring, completed in 1993 at the former tank site, detected no organic vapors in the site soil. Also, no visually stained or discolored soil was observed in the boring.

OU 1-02, TSF-14 [Underground Storage Tank (TAN-777B)]. TSF-14 is a former 12,000-gallon tank used for the storage of heavy diesel fuel from 1954 to 1975. The tank, its contents, and the associated piping were removed in 1991.

No holes were observed in the tank or the associated piping. Some radioactive soils were present above the tank from another pipe and some diesel-contaminated soil was present below the fill pipe. All soil contamination was removed. The analytical results of soil samples from the excavation detected only 0.55 ppm of benzene, 0.77 ppm of toluene, 2.2 ppm of ethylbenzene, and 0.96 ppm of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of benzene, toluene, ethylbenzene, and xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that benzene concentrations in the soil would need to exceed 197 ppm to pose a 1 x 10-6 excess cancer risk to soil ingestion, air inhalation, air volatilization, or ingestion of

groundwater exposure routes and that toluene, ethylbenzene, and xylene concentrations in the soil would need to be 40,000, 2,000, and 4,000,000 ppm, respectively, to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

OU 1-02, TSF-15 [Underground Storage Tank (TAN-779)]. TSF-15 is a former 3,000-gallon fuel oil tank that contained diesel fuel. Records indicate the tank was installed in 1963 and last used in 1975. The tank, its contents, and the associated piping were removed in August 1990.

No holes were observed in the tank, and field screening detected no organic contamination in the site soil. No visually stained or discolored soil was observed in the tank excavation. The results from soil sample analyses show that no organic contaminants were present in the site soil.

OU 1-02, TSF-24 [Underground Storage Tank (TAN-775)]. TSF-24 is a former 10,000-gallon tank planned to store jet engine fuel between 1995 and 1960. The tank, associated piping, and some soil with detectable contamination were removed in September 1990.

No holes were observed in the tank, and field screening detected no organic contamination in the site soil around the tank piping. No visually stained or discolored soil was observed in the tank excavation. The results from soil sample analyses detected no organic contamination.

OU 1-02, TSF-32 [Underground Storage Tank (TAN-601S)]. TSF-32 is a former 170-gallon tank used to supply heating oil. Records indicate the tank was installed in the mid-1950s and last used in the late 1950s. The tank and associated piping are believed to have been removed sometime between the late 1950s and 1967.

The site is currently covered by an asphalt road and parking lot. Geophysical surveys performed in 1990 and 1991 did not locate the tank, which supports the assumption that the tank had been previously removed. No releases have ever been recorded and none are known to have occurred

during the tank's brief period of operation.

OU 1-02, TSF-33 [Underground Storage Tank (TAN-602E)]. TSF-33 is a former 10,000-gallon diesel fuel tank. Records indicate the tank was installed in 1959 and last used in 1960 when the ANP project was terminated. The tank, its contents, and the associated piping were removed in August 1990.

No holes were observed in the tank, and field screening detected no organic contamination in the site soil. No visually stained or discolored soil was observed in the tank excavation. The results from soil sample analyses detected no organic contamination.

OU 1-02, WRRTF-09 [Underground Storage Tank (TAN-788]. WRRTF-09 is a former 2,500-gallon diesel fuel tank used to supply an emergency generator. Records indicate the tank was installed in 1962 and last used in 1978. The tank, its contents, and the associated piping were removed in August 1990.

No holes were observed in the tank, and field screening detected no organic contamination in the tank excavation. No visually stained or discolored soil was observed in the tank excavation. The results from soil sample analyses detected no organic contamination.

OU 1-02, WRRTF-10 [Underground Storege Tank (TAN-644)]. WRRTF-10 is a former 550 gallon gasoline tank used to supply an emergency generator. Records indicate the tank was installed in 1955 asd last used in 1966. The tank, its contents, and the associated piping were removed in August 1990.

No holes were observed in the tank, and field screening detected no organic contamination in the site soil. No visually stained or discolored soil was observed in the tank excavation. The results from soil sample analyses detected no organic contamination.

OU 1-02, WRRTF-12 [Diesel Fuel Underground Storage Tank (TAN-1706)]. WRRTF-12 is a former 1,000 gallon diesel fuel tank used to supply an emergency generator. Records

indicate the tank was installed in the late 1950s and last used in 1975. The tank, its contents, the associated piping, and some contaminated soil around the tank were removed in August 1990.

No holes were observed in the tank, and field screening detected some organic contamination in the site soil around the tank piping. The analytical results from soil samples taken from the tank excavation detected 0.6 ppm of toluene, 0.8 ppm of ethylbenzene, and 7 ppm of xylene.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of toluene, ethylbenzene, and xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that toluene, ethylbenzene, and xylene concentrations in the soil would need to be 40,000, 2,000, and 4,000,000 ppm, respectively, to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

12.2 Potential Soil Contamination Sites

The following 9 low probability hazardous sites were classified as potential soil contamination sites. Many of these sites were only suspected of having received hazardous and/or radioactive waste during the initial site identification, and the subsequent evaluation process has determined that no such disposal activities had occurred. Other sites are known to have had some contamination present, and the subsequent evaluation process has either documented the removal of the contamination or determined that contaminant concentrations remaining at the specific site(s) are at levels that pose an acceptable risk to human health or the environment.

OU 1-06, LOFT-01 [Diesel Fue Spills (TAN-629)]. Loft-01 is the site of several diesel spills that occurred when a diesel tank overflowed during filling between 1982 and 1986. The fuel oil flowed into a culvert and pooled in a ditch. The contaminated soil in the ditch was excavated and removed in 1990.

Field screening and soil sampling detected only some petroleum-related organic contamination. The analytical results from soil samples detected 4.4 ppm of toluene, 2.8 ppm of ethylbenzene, and 9.3 ppm of xylene. No other hazardous or radioactive materials are known or suspected to be present.

A risk evaluation was done to determine the risk-based soil concentrations (backward calculations) of toluene, ethylbenzene, and xylene required at the site to pose an unacceptable risk. The risk evaluation estimated that toluene, ethylbenzene, and xylene concentrations in the soil would need to be 17,000, 8,380, and 116,000 ppm, respectively, to exceed an HQ of 1 for the soil ingestion, air volatilization, air inhalation, or groundwater ingestion exposure routes.

OU 1-01, LOFT-03 (Rubble Pit south of LOFT Disposal Pond). LOFT-03 was used on an irregular basis for surface disposal of construction debris such as concrete, metal, and wood from the late 1960s to the early 1970s. Most of the construction debris was removed in 1987 or 1988. The remaining debris was removed in 1991 and disposed of at the Central Facility Area (CFA) Landfill.

Hazardous or radioactive materials are not known or suspected to have been disposed of at LOFT-03. Field inspections of the site and field screening of the debris and soil during cleanup operations did not reveal any organic or radiological contamination.

OU 1-06, LOFT-10 [Sulfuric Acid Spill (TAN-771)]. LOFT-10 was a 200-gallon sulfuric acid spill that occurred in 1983. Approximately 0.4 m3 (0.5 yd3) of contaminated soil was excavated and disposed of at that time.

Site investigations and soil testing in 1991 showed that no acid remained in the shallow soil at this site. No visually stained or discolored soil was observed at the site. It is likely that the sulfuric acid was quickly neutralized by the naturally alkaline native site soil. Calculations show that only 0.5 m3 (0.65 yd3) of TAN soil would be required to neutralize 10-gallons of pure sulfuric acid.

Except for

the sulfuric acid spill, no other hazardous or radioactive materials are known or suspected to have been disposed of at LOFT-10.

OU 1-01, LOFT-11 (Cryogen Pits). LOFT-11 is the site of three former concrete pits that were constructed in 1963. The pits were intended for the disposal of liquid nitrogen that was to be used as a coolant during the Liquid Cooled Reactor Experiment. The experiment was cancelled in 1967 before the pits were ever used.

Available site engineering drawings and records document the planned use and subsequent backfilling of the pits. Hazardous or radioactive materials are not known or suspected to have been disposed of at LOFT-11. The site is currently covered by the concrete floor of Building TAN-629.

OU 1-01, LOFT-14 (Asbestos Pipe). LOFT-14 was an abandoned metal pipe covered with asbestos insulation lying exposed on the ground. In July 1991, all the asbestos was removed from the pipe, packaged, and disposed of at the Asbestos Area at the Central Facilities Area Landfill. The metal pipe and the underlying soil were also disposed of at the CFA Landfill.

Except for the asbestos insulation, no other hazardous or radioactive materials are known or suspected to be present at the LOFT-14 site. Field inspections confirmed that no free asbestos fibers were visible in the surface soils after the pipe was removed.

OU 1-01, LOFT-15 (LOFT Buried Asbestos Pit). LOFT-15 is the former site of a construction materials burn pit used from as early as 1957 to as late as 1979. The construction debris was most likely concrete, metal, and wood and was disposed of and burned on an irregular basis. The pit was abandoned in 1979 and was covered with 0.6 to 1.2 m (2 to 4 ft) of soil. Most of the debris

was removed in 1992 and was disposed of at the CFA Landfill.

Hazardous or radioactive materials are not known or suspected to have been disposed of at LOFT-15. Field inspections of the site and field screening of the debris and soil during cleanup operations did not reveal the presence of any organic or radiological contamination.

OU 1-01, TSF-04 (Gravel Pit/Acid Pit). TSF-04 is located in a former gravel pit used to dispose of construction debris such as concrete, metal, and wood from the 1950s to the mid 1970s. According to personnel interviews, the only hazardous material or waste disposed of in this area was one 55-gallon drum of sulfuric acid sometime between 1958 and 1959.

Although sampling was not conducted at TSF-04, a 1990 field inspection revealed no evidence of stressed vegetation or surface stains at the site. In addition, sulfuric acid would have been quickly neutralized by the naturally alkaline native soil. It has been calculated that only 0.49 m3 (0.65 yd3) of TAN soil would be required to neutralize 10 gallons of pure sulfuric acid. Any residual contaminants would have likely been removed by subsequent gravel quarrying activities. Except for the one drum of sulfuric acid, no other hazardous or radioactive materials are known or suspected to have been disposod of at TSF-04.

OU 1-02, TSF-25 [Underground Drain Sump East of TAN-609 (TAN-1737)]. TSF-25 is an unlined drain sump used to collect waste jet fuel and other products from static engine tests. Records indicate the sump was installed in 1955 to replace a tank that had been removed. The sump was abandoned in 1987 and the floor drain to the sump was filled with concrete.

Available drawings and information indicate the sump was used during the ANP project only to collect waste jet fuel from 1955 to 1961. Later use of the building did not require the use of the

sump. Therefore, except for jet fuel, no other hazardous or radioactive materials are known or suspected to have been disposed of at TSF-25. Organic vapors were detected in the soil adjacent to the sump; however, subsequent soil samples results detected no organic contamination. There is no planned future use for the sump.

OU 1-01, TSF-39 [Transite (Asbestos) Contamination]. TSF-39 is an area that contains small pieces of asbestos cement (transite) and is believed to be the result of the construction activities for LOFT. Field inspections have determined that the asbestos material is encapsulated in cement and is not likely to be released.

Hazardous or radioactive materials are not known or suspected to have been disposed of at TSF-39. Field inspections and field screening of the debris did not reveal the presence of any organic or radioactive contamination.

12.3 Waste Disposal Sites

The following three low probability hazardous sites are classified as wastewater disposal sites because they have been used to receive liquid waste discharges from the TAN area facilities. The subsequent valuation process has determined that none of the sites has received any hazardous or radioactive wastes and that any potential contaminants discharged to the sites have either been neutralized, biodegraded, or pose an acceptable risk to human health.

OU 1-09, WRRTF-02 [Two-Phase Pond (TAN-763)]. WRRTF-02 is an unlined surface water pond that had previously received waste from only the Two-Phase Loop experiments. This pond replaced the WRRTF-05 Injection Well that was abandoned in 1983. Waste from these experiments consisted of primarily steam condensate and process wastewater potentially containing demineralization or corrosion-inhibiting solutions.

No hazardous or radioactive contaminants are known to have been discharged to the pond. Review of

engineering drawings indicates a checkvalve in the steam system would prevent any potential contaminants from draining into the pond. Although no soil sampling was conducted, site inspections revealed no evidence of contamination, stained soil, or stressed vegetation. It is believed that any demineralization or corrosion-inhibiting solutions discharged to the pond would have been neutralized by the naturally alkaline native soils or biodegraded.

As stated above, the WRRTF-02 pond replaced the WRRTF-05 Injection Well in 1983. Processes that generated the wastes that were discharged to this pond are not known to have changed significantly since the WRRTF-05 Injection Well was put into use. Therefore, although the WRRTF-02 pond was not sampled, some qualitative information regarding potential contamination in the pond may be gleaned from the WRRTF-05 sampling results. The results from two rounds of groundwater monitoring samples collected in 1994 from the former WRRTF-05 Injection Well detected only Co-60 at concentrations greater than acceptable risk levels. The presence of Co-60 in the WRRTF-05 Injection Well is from a one-time release in the mid-1960s and not the result of routine disposal activities at the WRRTF.

OU 1-09, WRRTF-03 (Evaporation Pond). WRRTF-03 is an unlined evaporation pond used to dispose of process water and cooling water from 1983 to the present. This pond replaced the WRRTF-05 Injection Well that was abandoned in 1983. Waste from these experiments consisted of primarily steam condensate and process wastewater potentially containing demineralization or

corrosion-inhibiting solutions. Records indicate that minor amounts of sulfuric acid, sodium hydroxide, and hydrazine were disposed of in the pond.

No hazardous or radioactive materials are known to have been discharged to the pond. Although no soil sampling has been conducted, records from 1985 and 1986 indicate that only low concentrations of inorganic contaminants were discharged to the pond. In addition, site inspections

revealed no evidence of contamination, stained soil, or stressed vegetation. It is believed that any demineralization or corrosion-inhibiting solutions discharged to the pond would have been neutralized by the naturally alkaline native soils or biodegraded.

As stated above, the WRRTF-03 pond replaced the WRRTF-05 Injection Well in 1983. Processes that generated the wastes that were discharged to this pond are not known to have changed significantly since the WRRTF-05 Injection Well was put into use. Therefore, although the WRRTF-03 pond was not sampled, some qualitative information regarding potential contamination in the pond may be gleaned from the WRRTF-05 sampling results. The results from two rounds of groundwater monitoring samples collected in 1994 from the former WRRTF-05 Injection Well detected only Co-60 at concentrations greater than acceptable risk levels. The presence of Co-60 in the WRRTF-05 Injection Well is from a one-time release in the mid-1960s and not the result of routine disposal activities at the WRRTF.

OU 1-09, WRRTF-06 (Sewage Lagoon). WRRTF-06 is an unlined surface water pond that received nonhazardous sanitary and process wastes from 1984 to the present. This pond replaced the WRRTF-05 Injection Well that was abandoned in 1983. Waste from these experiments consisted of primarily steam condensate and process wastewater potentially containing demineralization or corrosion-inhibiting solutions. Records from 1982 to 1989 indicate that the sewage effluent to the WRRTF-05 Injection Well and WRRTF-06 pond contained only low concentrations of inorganic and organic compounds.

No hazardous materials are known to have been discharged to the pond. Although no soil sampling was conducted, site inspections revealed no evidence of contamination, stained soil, or stressed vegetation. It is believed that any demineralization or corrosion-inhibiting solutions discharged to the pond would bave been neutralized by the naturally alkaline native soils or biodegraded.

As stated above, the WRRTF-06 pond replaced the WRRTF-05 Injection Well in 1983. Processes that generated the wastes that were discharged to this pond are not known to have changed

significantly since the WRRTF-05 Injection Well was put into use. Therefore, although the WRRTF-06 pond was not sampled, some qualitative information regarding potential contamination in the pond may be gleaned from the WRRTF-05 sampling results. The results from two rounds of groundwater monitoring samples collected in 1994 from the former WRRTF-05 Injection Well detected only Co-60 at concentrations greater than acceptable risk levels. The presence of Co-60 in the WRRTF-05 Injection Well is from a one-time release in the mid-1960s and not result of routine disposal activities at the WRRTF.

12.4 Decision Summary for the No Action Sites

The DOE has determined that no further action is needed for the miscellaneous sites in OUs 1-01, 1-02, 1-06, and 1-09 described in Sections 12.1 through 12.3. On the basis of the Track-1 evaluations, it was determined that no significant sources of contamination exist at these sites. Consequently, it was decided that these sites pose no unacceptable risks to receptors, and therefore no remedial actions are necessary.

The EPA approves of these no action decisions, and the IDHW concurs. Both the EPA and the IDHW have been involved in the review of the Track-1 reports, the proposed plan, this ROD, and other project activities such as public meetings.

12.5 Documentation of Significant Changes

The Proposed Plan that was released for Public Comment in May 1994 identified 30 Track 1 sites for no further action. The Track 1 process used historical and process information to evaluate the risk posed by each site. During the public comment period, however, new site data for TSF-36 indicated that contamination existed at the site. As a result, DOE, in conjunction with the EPA and IDHW, decided to delete TSF-36 from the list of Track 1 no further action sites in the ROD. Cleanup activities have been initiated at the site to reduce the threat of contaminant migration and the risk to human health and the environment. TSF-36 will be included in the WAG 1 OU

Comprehensive RI/FS to evaluate the site conditions and make appropriate remedial recommendations.

APPENDIX A

Responsiveness Summary

APPENDIX A

Responsiveness Summary

OVERVIEW

Operable Unit (OU) 1-07B is located within Waste Area Group (WAG) 1 of the Test Area North (TAN) facility at the Idaho National Engineering Laboratory (INEL). As described in the Record of Decision (ROD), the unit comprises the Technical Support Facility (TSF) Injection Well (TSF-05) and the Surrounding Groundwater Contamination (TSF-23). Site evaluations of several No Action Sites (OUs 1-01, 1-02, 1-06, and 1-09) are also included in this ROD. A Proposed Plan was released May 1, 1994, setting forth the agencies' proposed alternative for remediating contamination a these units. A public comment period was held from May 18, 1994, to June 18, 1994, during which the public was asked to comment on the agencies' proposed treatment alternative for the OU 1-07B. The Proposed Plan for OU 1-07B recommended continuing use of the extraction and treatment system built for the interim action, implementing institutional controls and groundwater monitoring, extracting and treating all groundwater with trichloroethene (TCE) concentrations greater than 5,000 æg/L and implementing an enhanced extraction technology on hotspot contaminants in the vicinity of the TSF-05 injection well. The Proposed Plan for the remaining units recommended no action because evaluations conducted at the units indicated either that there was no evidence of contaminants at the site or that the low levels of contamination at the site did not pose an unacceptable risk to human health or the environment.

This Responsiveness Summary recaps and responds to significant comments received during the public comment period for this ROD. Generally, the comments received reflected a broad range of views. One person commenting on TSF-05 suggested an alternative which is now being considered by the agencies: because the only unacceptable risk to future populations was to potential future residents exposed to groundwater pumped directly from the TSF-05 Injection Well, the commentor advocated rendering this scenario impossible by filling the well with bentonite and capping the wellhead with concrete. The feasibility of a grouting option is being examined. A detailed discussion of this and other significant comments received during the public comment period on the Proposed Plan and the agencies' responses to them are contained below.

Background on Community Involvement

To initiate the TAN Groundwater Contamination and No Action Site investigations, public scoping meetings were held on February 4, 5, and 6, 1992, in Idaho Falls, Boise, and Burley, Idaho respectively. Approximately 35 people attended the meetings. These meetings were designed to involve the public early in the investigation to explain the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process; and to allow representives from the U.S. Department of Energy (DOE) and INEL to discuss the project, answer both written and oral questions, and receive ideas and suggestions from the public. The public comment period on the interim action was initially scheduled from January 13, 1992, to February 12, 1992. A request for extension of the public comment period was received and granted, extending the comment period to March 13, 1992. The scoping meetings and interim action Proposed Plan were announced via a fact sheet conveyed through a "Dear Citizen" letter mailed January 8, 1992, to a mailing list of 5,731 groups and individuals. On January 5, 1992, and again on January 30, 1992, DOE, Idaho Operations Office (DOE-ID) issued a news release announcing the Notice of Availability of the interim action Proposed Plan. The Notice of

Availability for the Proposed Plan was published January 5, 1992, in eight major Idaho newspapers: the Post Register in Idaho Falls, the Idaho State Journal in Pocatello, the South Idaho Press in Burley, the Times News in Twin Falls, the Idaho Statesman in Boise, the Idaho Press Tribune in Nampa, the Lewiston Morning Tribune in Lewiston, and the Idahonian in Moscow. A similar newspaper advertisement was published January 30, 1992, reminding the public of the upcoming meetings and encouraging citizens to attend and provide oral or written comments.

The letter, the interim action Proposed Plan, and the news release gave notice to the public that the TSF Injection Well and Surrounding Groundwater Contamination documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, as well as in city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. The letter and release notified the public of the various ways in which they could participate in the investigations and decision-making process.

Personal telephone calls concerning the availability of TSF Injection Well and Surrounding Groundwater Contamination documents and public meetings were made to key individuals, environmental groups, and organizations by the INEL Outreach Office staff in Pocatello, Twin Falls, and Boise. Calls were also made to community leaders in Idaho Falls and Moscow by INEL Community Relations Program staff in Idaho Falls and Boise.

During the meetings that followed, representatives from DOE-ID and INEL discussed the project, answered questions, and received public comments. Forms for written comments were distributed at the meetings and the audience was encouraged to comment on the project. Comments received during the public scoping period on the interim action Proposed Plan were evaluated and considered as part of the Remedial Investigation (RI)/Feasibility Study (FS) process.

Regular reports concerning the status of the TSF Injection Well and Surrounding Groundwater Contamination project were included in the INEL Reporter and mailed to individuals who attended the meetings or who were on the INEL mailing list. Reports appeared in the

March, June, and October 1993 issues of the INEL Reporter.

When the RI/FS was complete, a Notice of Availability for the TSF Injection Well and Surrounding Groundwater Contamination and No Action Sites Proposed Plan was published in April 1994 in the Post Register (Idaho Falls), the Idaho State Journal (Pocatello), the South Idaho Press (Burley), the Times News (Twin Falls), the Idaho Statesman (Boise), the Lewiston Morning Tribue (Lewiston), the Idaho Free Press (Nampa), and The Daily News (Moscow). A second advertisement was placed in the same newspapers several days before each open house or meeting to remind citizens of the opportunity to attend the meetings and provide oral or written comments. Radio stations in Idaho Falls, Blackfoot, Pocatello, Burley, and Twin Falls ran advertisements during the three days before the open houses at the Pine Ridge Mall in Pocatello and the INEL office in Twin Falls.

The Proposod Plan for the ROD of the TSF Injection Well and Surrounding Groundwater Contamination and No Action Sites was mailed May 1, 1994, to the 5,600 groups and individuals on the mailing list. Copies of the Proposed Plan and the entire Administrative Record are available to the public in six regional INEL information repositories: the INEL Technical Library in Idaho Falls; INEL offices in Idaho Falls, Pocatello, Twin Falls, and Boise, the University of Idaho Library in Moscow; and the Shoshone-Bannock Library in Fort Hall, The original documents composing the Administrative Record are located at the INEL Technical Library; copies of the originals are located in the five other repositories.

The public comment period on the Proposed Plan for the TSF Injection Well and Surrounding Groundwater Contamination and No Action Sites was held from May 18, 1994, to June 18, 1994. No requests for extensions were received. Prior to the release of the Proposed Plan, a teleconference was held among the League of Women Voters of Moscow, the Environmental Defense Institute, DOE-ID, U.S. Environmental Protection Agency (EPA), and Idaho Department of Health and Welfare (IDHW). The participants discussed INEL

environmental restoration issues and the TSF Injection Well and Surrounding Groundwater Contamination and No Action Sites. The format of the teleconference allowed the Moscow residents to ask questions and receive answers from the agency personnel about these issues.

Public meetings were held June 6, 8, and 9, 1994, in Idaho Falls, Boise, and Moscow, respectively. Approximately 35 people attended the three meetings. Representatives from DOE-ID, EPA Region X, and IDHW were present at the public meetings in Idaho Falls and Boise to discuss the project, answer questions, and receive public comments. Members of DOE-ID and IDHW were present at the public meetings in Moscow. For one half-hour before each meeting representatives from the agencies were available for informal discussions with the interested public. The meetings were conducted in two sections: the first discussed the proposed remedial action alternative for the TSF Injection Well and Surrounding Groundwater Contamination; the second discussed the TAN No Action sites. These two sections of the meeting were further divided into informal question and answer periods, followed by formal comment periods. The entirety of each public meeting was recorded by a court reporter; transcripts of the meetings have been placed in the Administrative Record. A fact sheet was sent to the public in January 1995 to provide citizens with updated information on the TSF-05 Interim Action and subsequent impacts to the preferred alternative selected for OU 1-07B.

This Responsiveness Summary has been prepared as part of the ROD. All oral comments, as given at the public meetings, and all written comments are repeated verbatim in the Administrative Record for the ROD. Thirteen people submitted written comments on the TSF Injection Well and Surrounding Groundwater Contamination and No Action sites proposal and four people gave oral comments at the public meetings. To more fully respond to each issue raised in the comments, DOE divided the comments received into 77 separate comments. The comments received were coded to indicate which response in the Responsiveness Summary addresses the comment. It should be noted that in appropriate instances, the Responsiveness Summary groups similar comments, summarizes them, and provides a single response. The ROD presents the preferred alternative for the TSF Injection Well and Surrounding

Groundwater Contamination and No Action sites at the Radioactive Waste Management Complex (RWMC), selected in accordance with the CERCLA, as amended by the Superfund Amendments and Reauthorization Act and, to the extent praticable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this OU is based on information contained in the Administrative Record.

Summary of Comments Received and Agency Responses

Comments and questions raised during the public comment period on the TAN Groundwater and No Action Sites Proposed Plan are summarized below. Several questions were answered during the informal question-and-answer period during the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to the issues and concerns raised during that part of the public meeting. Complete transcripts of the meetings, including the agencies' responses to these informal questions are contained in the Administrative Record.

Comments and questions on a variety of subjects not specific to the TAN Groundwater and No Action Sites Proposed Plan were submitted during the public comment period. The agencies take public comments very seriously and have made every attempt to respond to all comments. Some comments, however, are beyond the scope of the TAN Groundwater and No Action Sites Proposed Plan (i.e., statements of distrust for the nuclear industry, restatements of parts of the Proposed Plan, questions on contaminants not present at the site). While these comments are summarized and grouped at the end of the Responsiveness Summary, the agenices have not attempted to respond to these out-of-scope comments. Additional information on these topics can be obtained from the INEL Public Affairs Office in Idaho Falls; the local INEL offices in Pocatello, Twin Falls, and Boise; and the Environmental Restoration Information Office in Moscow. Comments and questions regarding community participation were referred to the INEL Community Relations Coordinator and will be addressed during updates to the Community

Relations Plan. Formal comments and questions on the TAN Groundwater Contamination and No Action Sites Proposed Plan submitted during the public comment period are answered below.

COMMENTS PERTAINING TO TSF INJECTION WELL AND SURROUNDING GROUNDWATER CONTAMINATION (OU 1-07B)

Public Participation

1. Comment: Two commentors' complimented the agencies on the significant improvements in public literature being published in association with the remediation activities at the INEL. Further, they appreciated the more open way in which information is being provided by the agencies. (T3-1, T4-1)

   Response: The agencies appreciate the commentors' statements. The agencies are committed to providing open access to the decision-making process and to continuously improving the clarity of the documents produced as part of their Federal Facilities Agreement/Consent Order (FFA/CO).

2. Comment: One commentor asked to be provided with additional information about the proposed injection of treated groundwater to the aquifer. (W11-2)

   Response: The selected alternative involves reinjection of treated groundwater to the aquifer both in the dissolved phase plume and at the hotspot. In the plume, volatile organic compounds (VOCs) dissolved in groundwater will be treated to less than maximum contaminant levels (MCLs) or 10-4 to 10-6 risk-based concentrations and returned to the aquifer through a series of new injection wells. At the hotspot, groundwater treatment will occur in a zone of hydraulic containment. Contaminated groundwater will be extracted at TSF-05 or a nearby downgradient well, treated, and reinjected at the upgradient portion of the hotspot. The extracted water will be treated, at a minimum, to reduce VOC concentrations to less than MCLs or to within the acceptable risk range if MCLs do not exist. Radionuclides in the extracted water at the hotspot will be treated to less than MCLs, or risk based values, or to the extent practicable as determined by the agencies.

   In addition, treatability studies will be conducted on two innovative in situ treatment technologies: bioremediation and chemical oxidation. If treatability testing of either of

these technologies progresses to field scale, substances will be injected to the aquifer to test the technology's ability to aid the remediation effort. In situ oxidation involves adding oxidant to chemically degrade VOCs. In situ bioremediation generally involves adding nutrients to enhance growth of microorganisms that are responsible for degrading VOCs. In situ bioremediation may also involve addition of microorganisms to the aquifer to aid the degradation process. The effects of each of these substances on TAN groundwater will first be tested and evaluated at bench-scale. If field-scale tests are implemented, effects to the aquifer will be carefully monitored.

Risk Assessment

3. Comment: One commentor stated that there is no evidence the ecological risks from the remediation activities were considered in the evaluation of alternatives. He contended that, in many cases, remediation activities designed to reduce human health risks impose unacceptable ecological risks. In this case, facility construction and the disturbance to animal populations from operation of the facilities impose risks on local populations. He stated that these factors should be considered in the remediation activity. (W4-1)

Response: It is true that ecological risks (as the term is used by the commentor) to animal populations from remediation activities were not specifically addressed in the Proposed Plan or the RI/FS. However, the types of activities proposed (extraction/injection well drilling, aboveground treatment, etc.) do not involve a great deal of disturbance to the surrounding area and are not anticipated to have a significant impact on local animal popluation. The treatment facility will be constructed within the TSF in an area that has had historically high levels of activity (i.e., already been disturbed). The agencies believe that the remediation activity at this site will not impose unacceptable ecological risks.

Impacts to the environment that would be unavoidable during the implementation of Alternative 4 will include disturbances to soils associated with well installation and the layout of equipment supporting the enhanced extraction technologies and groundwater treatment systems. The equipment layout will include the placement of a concrete pad

and enclosure (e.g., metal building) to support the different unit operations for long-term operation. Overall, activities associated with this alternative will not pose an irreparable threat nor a significant negative impact to site flora and fauna at TAN; no rare or endangered plants nor suitable habitats for endangered animal species or species of special concern to the Idaho Department of Fish and Game will be impacted. In addition, no other environmentally sensitive elementsÄÄsuch as archaeological or historical sites, wetlands, or critical habitatsÄÄwill be impacted.

The RI report contains an ecological risk assessment. This ecological risk assessment, although cursory, provides a conservative estimate of the contaminants of concern introduced into the food web. This ecological risk assessment is based on conservative and general assumptions, and only one exposure route (ingestion) for one receptor (rodent). The calculated risk from organic contaminants to a primary consumer is orders of magnitude below Lowest Observable Adverse Effects Levels lending confidence that actual risk to ecological receptors would also be insignificant. Implementing Alternative 4 will not create exposure to radionuclides for ecological receptors because evaporation ponds will not be used. The quantitative ecological risk assessment for the WAG 1 Comprehensive RI/FS will more fully address ecological receptors.

General Comments on the Proposed Alternatives

4. Comment: One commentor asked, "What if the remedial action objective (RAO) changed during Phase 1?" Further, he asked, "After Phase 1, what if you find that progress towards achieving the RAO is minimal?" (W1-2, W1-3)

Response: RAOs are goals set for protecting human health and the environment. The way RAOs are achieved may change as a result of treatability testing (described in Section 9) but they will remain protective of human health and the environment. If the treatability studies result in a significant change to the remedy, the agencies will provide information to the public. Depending on the extent of the change to the remedy, the agencies will either issue an Explanation of Significant Difference or will issue a revised Proposed Plan (with a new public comment period) and amend this ROD accordingly.

The comment also referred to RAOs for Phase 1 (enhanced extraction technologies), that had been intended to help remove the secondary source of contamination at the hotspot.

The commentor asked what would be done if use of enhanced extraction technologies made minimal progress toward removing the hotspot. As described in Section 9 of the ROD, the agencies have reevaluated the Preferred Alternative described in the Proposed Plan, and as a result, have removed the proposal to use enhanced extraction technologies (formerly the focus of Phase 1). The selected remedy described in this ROD focuses on removing as much of the secondary source as practical in Phase A (i.e., surging and stressing well TSF-05). If the secondary source is not removed through Phase A, any residual will be contained and prevented from further leaching through Phase B. The agencies will evaluate the success of the selected remedy within 5 years, and at least every 5 years thereafter until contaminant concentrations drop below MCLs or other risk-based levels.

5. Comment: One commentor said that it "seems like [the agencies] might want to review the entire approach rather than continuing pumping." (W1-4)

Response: The agencies agree with the commentor and have reevaluated the remedial alternatives in light of new information that became available in the year since the proposed plan was issued. As a result of this process, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3 (which was identified as the preferred alternative in the Proposed Plan). Among the new information considered, the agencies have found that the groundwater pumping rates estimated in the Proposed Plan are overly conservative, thereby excessively inflating the costs of remediation. On the basis of reduced pumpiag rates now considered adequate for Alternative 4, the total cost of this alternative is estimated at $29,888,000. In light of this and other new information considered, the agencies have determined that Alternative 4 satisfies the CERCLA evaluation criteria better than Alternative 3. A complete description of the selected remedy is presented in Section 9 of this ROD.

In addition, the agencies will evaluate the success of the selected remedy within 5 years, and at least every 5 years thereafter until contaminant concentrations drop below MCLs or risk-based levels. Any new information generated by the remedial action will be evaluated during these periodic reviews.

6. Comment: One commentor simply stated that the groundwater should be cleaned up as quickly as possible. (W5-1)

Response: The agencies agree with the commentor. The National Contingency Plan which is the implementing regulation for CERCLA requires that TAN groundwater restoration occurs within a reasonable timeframe. Furthermore, the National Contigency Plan delineates the Groundwater Protection Strategy which will be followed during the course of remedial action for TAN groundwater. The Groundwater Protection Strategy requires that both current and potential future use of the groundwater be considered in remedy selection, and that groundwater resources be protected and restored if necessary and practicable. Therefore the agencies have determined that a reasonable timeframe for aquifer restoration to drinking water standards should not exceed 100 years. The 100-year timeframe is consistent with current INEL land use assumptions. The estimated time frame required for remediation under the preferred alternative is 30 years and is not to exceed 100 years. The preferred alternative will be implemented in a phased approach because of the complexity of the contaminants and aquifer system. The actual length of time necessary to remediate the hotspot and the 25-æg/L groundwater plume is largely dependent upon the success of each phase.

7. Comment: One commentor suggested that, because the only unacceptable risk identified in the baseline risk assessment was to a future resident who ingests drinking water taken from the vicinity of the TSF Injection Well, it was suggested that this scenario could be rendered impossible by filling the well with bentonite, capping the wellhead with concrete, and covering a 1-acre area around the well shaft with 2- to 4-in. size basalt cobble 10 ft deep. He estimates the cost of this suggestion at approximately one million dollars. (W8-2)

Response: The scenario envisioned by the commentator is a more aggressive variation of proposed Alternative 2: Limited Action Consisting of Institutional Controls. The problem with Alternative 2 and the scenario suggested by the commentator is that it leaves the groundwater untreated and does not prevent future resident exposure to the large downgradient plume with higher risks than is acceptable under Federal and State drinking water standards. To prevent this exposure it is necessary to contain and/or remove the source of contamination. Grouting may have value in the context of

another alternative to inhibit contaminant migration. The agencies agree that treatment or containment is necessary to return the aquifer to beneficial use within 100 years and alternatives that do not provide for treatment or containment of groundwater are unacceptable.

8. Comment: One commentor stated that due to decreased replenishment (drought) and increased use (irrigation, etc.), the water table has dropped. (W9-3)

Response: In the past 5 years the average depth of the water table beneath the INEL has dropped. In some places, the level has dropped about 10 ft, from approximately 210 to 220 ft below the surface. The water table below TAN ranges in depth from approximately 206 to 210 ft below the surface. As the commentor stated, this decline in the top level of the aquifer is largely due to decreased replenishment and increased consumptive use.

9. Comment: One commentor expressed support of the concept of reinjection of treated groundwater due to the nonconsumptive use. (W11-4)

Response: Comment noted and is agreed with by the agencies. The selected alternative will employ reinjection of treated groundwater as a component of remediation.

10. Comment: One commentor had a hard time seeing how [the agencies] can have a high degree of confidence that [the agencies] have adequately described the extent or the degree of contamination in the aquifer. He asserted that because the agencies are seeing things that are surprising them, this is an indication that they lack some understanding as to the degree of contamination in the aquifer. The commentor also suggested that the agencies lack an adequate understanding of how the aquifer works under the INEL. (T4-3, T4-4)

Response: The commentor is correct in stating that there are uncertainties regarding the magnitude and extent of contamination in the aquifer. The Snake River Plan Aquifer is a complex hydrogeologic system. However, the objective of the RI process is not to remove all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears the most appropriate for the site.

Although the groundwater contamination at TAN has not been fully characterized, a great deal of data has been collected about the area. Based on the information gathered as part of this decision making process, the agencies believe they have chosen a remedial action that will be protective of human health and the environment.

11. Comment: One commentor asserted that the compounds existing in the aquifer in the vicinity of the TSF Injection Well should be considered as listed wastes. He took issue with DOE and EG&G's statements that inadequate records exist to determine the past use of the halogenated organics found in the contaminated groundwater. The commentor stated that it is widely known among craft workers who used TCE at TAN that the bulk of the TCE was used for cleaning operations. He concluded by asking that a confidential, independent survey of the current and former workers at the site be conducted and the results of the survey be reported directly to DOE. (W13-1 through W13-5)

Response: DOE-ID conducted an evaluation of the solvent usage at TAN that can be found in the Administrative Record. The document is entitled Evaluation of Chemical Usage at TAN dated Apri1 1992 and is numbered as AR 3.2 in the Administrative Record. This evaluation concluded that the waste discharged to the aquifer through the injection well was not a listed hazardous waste because the organic chemicals in the waste were not used as solvents and disposal practices were not documented. This initial evaluation was quite exhaustive and further investigation or surveys would not be a productive use of current resources. It is likely that any identified listed waste within the operable unit would be de-listed during the ROD and thus, the selected remedy would not be significantly altered.

12. Comment: One commentor stated that the [sludge removal] cleanup operation was not completed in accordance with the Work Package documentation and the cleanup instructions. Specifically, the commentor states that the well was to have been flushed until the effluent was clear, but at the termination of the work, the effluent was still laden with contaminated sediment and sludge. (W13-6 through W13-8)

Response: The comment is correct with regard to the past events that happened during the sludge removal activity. The full scope of the field work was not completed because the site conditions were different than planned and outside of the work scope. The cleanup operation had two objectives. The first was to remove the sludge from within the well. This effort was completed. The second was to continue pumping until the water cleared up, however, this objective was not completed due to a lack of waste effluent storage capacity. Therefore, work was suspended as documented in the May 1992 Remedial Investigation/Feasibility Study Work Plan for OU 1-07B. However, 60 drums of sludge and liquid were removed.

13. Comment: One commentor stated that when the well's pump and piping were removed after the sludge removal activity was abandoned, external contamination (on the outside of the pump and piping) was flushed back down the well during steam cleaning operations. The commentor argued that contaminated liquid, which was flushed back down the well, should have been disposed of as mixed waste. He advocated additional action be taken to remove the remaining sludge and contamination from the well. (W13-9 through W13-12)

Response: The comment is correct with regard to past events that occurred during the pump and sludge removal activity. Part of the purpose of the proposed remedial action at the TSF Injection Well (TSF-05) is to remove residual contamination from the injection well. Part of the purpose of the selected alternative is to contain and treat the portion of the aquifer contaminated with TCE concentrations above 5,000 æg/L. These actions include treatment of the contaminated groundwater with a more thorough design than the 1990 removal effort.

14. Comment: One commentor favored Alternative 2 (Limited Action Consisting of Institutional Controls). (W2-1) He argued that the movement of water in the aquifer has been so slight that the contamination would not pose a threat to anyone unless they drilled into the area. "Drilling such a well," he stated, "is highly unlikely since the property should be retained for its present purpose for a number of years into the future." (W2-2, W2-3)

Response: For an alternative to be selected at a Superfund site, the alternative must meet two threshold criteria: overall protection of human health and the environment and

compliance with ARARs. The primary ARAR at this site is the drinking water standards promulgated pursuant to the Safe Drinking Water Act. Because Alternative 2 would not have met the drinking water standards for hundreds of years in the future, it was not selected.

Risk modeling conducted as part of the RI indicated that if the site was not remediated, contaminant levels in the vicinity of the TSF injection well would still exceed drinking water standards even at this later date. In fact, the results of the RI indicated that without remediation, the well would continue to pollute the Snake River Plain Aquifer for hundreds of years into the future.

15. Comment: A commentor asked "If land-use is considered, is the additional cost of Alternative 3 justified over Alternative 2?" (W10-1)

Response: The comment specifically asked whether the additional cost of Alternative 3 (i.e., the Preferred Alternative in the Proposed Plan) was justified over Alternative 2. Please note that the agencies have reevaluated the remedial alternatives in light of new information that became available in the year since the proposed plan was issued. As a result of this process, the agencies chose Alternative 4 as the selected remedy rather than Alternative 3. A description of the selected remedy is presented in Section 9 of this ROD.

The need for a reasonable timeframe for restoration of TAN groundwater is dictated in the National Contingency Plan which is the implementing regulation for CERCLA. The remedial action for TAN groundwater is conducted in accordance with the Groundwater Protection Strategy presented in the National Contingency Plan. This regulation requires that both current and potential future use of the groundwater be considered in remedy selection, and that groundwater resources be protected and restored if necessary and practicable. Accordingly, the agencies have determined that a reasonable timeframe for restoration of the aquifer to drinking water standards should not exceed 100 years,

which is consistent with current land use assumptions for INEL.

The agencies believe that the additional cost of Alternative 4 is justified over both Alternatives 2 and 3. Alternative 2 proposes institutional controls to prevent the use of contaminated groundwater until cleanup standards are achieved. However, under this alternative, the contaminant plume would continue to grow and contaminant concentrations would exceed drinking water standards for hundreds of years. Consequently, exposure to the plume would continue to pose unacceptable risks to human health and the environment for an unreasonably long time period. It cannot be assumed that institutional controls would be maintained for hundreds of years. Therefore, Alternative 2 was not selected.

Alternative 3 involves removal or containment of the greater than 5,000 æg/L portion of the TCE plume and institutional controls for the rest of the plume. Recent modeling has shown that after removal of the greater than 5,000 æg/L portion of the plume, approximately 200 years would be required for dispersion to reduce the remaining plume to concentrations below MCLs. Therefore, Alternative 3 would only meet the 100-year restoration timeframe if further remediation of the less than 5,000 æg/L portion of the plume is included in the Site-wide ROD. Alternative 4 is considered more effective in the long-term than Alternative 3 because it is less dependant on subsequent remedial actions. In addition, Alternative 4 is more effective in reducing the toxicity, mobility, and volume of the contaminant plume through treatment because it addresses a much larger volume of contaminants than Alternative 3, and would prevent migration of a major component of the plume into previously uncontaminated groundwater. With respect to remedial action costs, the operations and maintenance costs to implement Alternative 4 would be greater than Alternative 3, but the restoration timefame would be accelerated. Therefore, the agencies agree that Alternative 4 better satisfies the CERCLA evaluation criteria than does Alternative 3.

16. Comment: A commentor queried, "Considering the flow rate of the aquifer, has the concentration of contaminants at a point where unrestricted access will be possible (likely) in the future been calculated to justify the cost of Alternative 3?" (W10-2)

Response: Please note that in light of new information made available in the year since

the proposed plan was issued, the agencies have reevaluated the remedial alternatives.

As a result of reevaluation of the remedial alternatives, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3. A description of the selected remedy is given in Section 9 of the ROD.

Contaminant concentration levels were estimated for the time at which unrestricted access to the site is possible. The baseline risk assessment conducted as part of the RI evaluated risks to future residents ingesting water pumped from the TSF Injection Well. It evaluated the risks for the years 2024, 2040, and 2094. The risk assessment assumed the site was not remediated. Results of the risk assessment indicated that even as late as 2094 contaminant levels at the injection well will still be at levels that exceed drinking water standards and thus pose an unacceptable risk to human health and the environment.

The agencies believe that the additional cost of Alternative 4 is justified over both Alternatives 2 and 3. Alternative 2 proposes institutional controls to prevent use of contaminated groundwater until cleanup standards are achieved by plume dispersion and radioactive decay. However, Alternative 2 would require an unacceptable time period, i.e., hundreds of years, during which groundwater contaminant concentrations would exceed drinking water standards. Therefore, exposure to groundwater contamination would pose unacceptable risks to human health and the environment for an unreasonable period of time. It cannot be safely assumed that institutional controls would be maintained for hundreds of years, consequently Alternative 2 was not selected.

Alternative 3 involves removal or containment of the greater than 5,000 æg/L portion of the TCE plume and institutional controls for the remainder of the plume. Recent modeling indicates that upon removal of the greater than 5,000 æg/L portion of the plume; approximately 200 years would be required for dispersion to reduce the remaining plume to concentrations below MCLs. Consequently, Alternative 3 would only meet the 100-year timeframe for aquifer restoration if additional remediation of the less than 5,000 æg/L portion of the plume is included in the Site-wide ROD. Alternative 4 is considered more effective in the long-term than Alternative 3 because it is less dependent on subsequent remedial actions. Furthermore, Alternative 4 is more effective in

reducing toxicity, mobility, and volume of the contaminant plume through treatment because it addresses a much larger volume of contaminants than Alternative 3, and would prevent migration of a major component of the plume into previously uncontaminated groundwater. Although the operations and maintenance costs are greater to implement Alternative 4, the restoration time would be accelerated. Therefore, the agencies agree that Alternative 4 better satisfies the CERCLA evaluation criteria than does Alternative 3.

17. Comment: One commentor asked about the selected alternative, "How many injection wells would be required and where would they be sited so as to not influence the pump/treat operation and dilute existing groundwater contamination?" (W11-3)

Response: The specific number and location of reinjection and extraction wells will be determined as part of the RD process. The locations of the reinjection and extraction wells will be selected such that the well system will provide hydraulic containment and enhance groundwater extraction and cleanup as applicable. The well system will be designed to provide remediation of the entire TCE contaminant plume where TCE concentrations are greater than 25 æg/L. The remediation strategy will promote aquifer restoration by collected reinjection of treated groundwater into the aquifer and simultaneous extraction and treatment of contaminated groundwater. Dilution is not the intent of the proposed reinjection. Reinjection will be performed upgradient of TSF-05

to maintain hydraulic control in the zone of greatest contamination. In the dissolved phase plume, downgradient reinjection of treated groundwater will be used to avoid dilution of dissolved phase contamination.

18. Comment: One commentor stated that he supported the selected alternative because he couldn't see where there would be worth spending all that additional money to do (Alternative 4) when you don't really accomplish that much more out of it. (T1-2)

Response: Please note that in light of new information made available in the year since the proposed plan was issued, the agencies have re-evaluated the remedial alternatives. As a result of re-evaluation of the remedial alternatives, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3.

Alternative 3 involves removal or containment of the greater than 5,000 æg/L portion of the TCE plume and institutional controls for the remainder of the plume. Alternative 3 would only meet the 100-year timeframe for aquifer restoration if additional remediation of the less than 5,000 æg/L portion of the plume is included in the Site-wide ROD. Alternative 4 is considered more effective in the long-term than Alternative 3 because it is less dependent on subsequent remedial actions. Furthermore, Alternative 4 is more effective in reducing toxicity, mobility, and volume of the contaminant plume through treatment because it addresses a much larger volume of contaminants than Alternative 3, and would prevent migration of a major component of the plume into previously uncontaminated groundwater. Although the operations and maintenance costs are greater to implement Alternative 4, the restoration time would be accelerated. Furthermore, the current cost evaluation of Alternative 4 shows that the cost of the selected alternative is considerably less in comparison to the cost given in the Proposed Plan and the costs of Alternative 3 and Alternative 4 are comparable. Therefore, the agencies agree that Alternative 4 better satisfies the CERCLA evaluation criteria than does Alternative 3.

19. Comment: A person stated that one of the surprises at the site was finding contaminants that the (DOE) didn't know were there. He stated that although the selected alternative takes care of what (the agencies) currently know about the site, if there are changes in the future, (the agencies) will have to reassess things. (T1-3)

Response: New information may be generated during the Remedial Design (RD)/Remedial Action (RA) process that could affect the remedy selected in the ROD. If new information is received, the agencies would reassess the site in light of the new information to determine whether changes should be made to the selected remedy. Three types of changes could take place: (1) nonsignificant change (e.g., changes that fall within the normal scope of changes taking place during thc RD/RA engineering process); (2) signficant changes (e.g., changes to a component of the remedy or a change in timing, cost, or implementability); and (3) fundamental changes (e.g., changes that may cause the agencies to reconsider the hazardous waste management approach selected in

the ROD) Nonsignificant changes will be recorded in the Administrative Record. Significant changes to the ROD will be documented in an Explanation of Significant Differences. Fundamental changes require an amendment to the ROD.

In addition, the agencies will evaluate the success of the selected remedy within 5 years, and at least every 5 years thereafter until concentrations drop below MCLs or risk-based levels. Any new information generated by the remedial action will be evaluated during these periodic reviews.

If the additional decisions are determined to be either (1) a significant difference to a component of a remedy or (2) a significant change that fundamentally alters the remedy requiring amendment of the ROD, the appropriate public information will be provided. In the first case, and Explanation of Significant Difference (ESD) will be prepared. The agencies would also conduct the following public involvement activities:

Publish a notice of availability and brief description of the ESD in a local newspaper of general circulation, as required by the CERCLA, Section 117(c).

Make the ESD available to the public by placing it in the administrative record file and information repository.

Place the information supporting the change in the administrative record file, as well as the lead agency's response to any comments. A Responsiveness Summary is not required.

In the second case, the agencies would repeat the ROD process in accordance with the Comprehensive, Environmental Response, Compensation, and Liability Act, Section 117 by issuing a revised proposed plan and an amended ROD.

20. Comment: The Environmental Defense Institute supported Alternative 4 (25 æg/L Groundwater Plum Extraction with Air Stripping; Enhanced Extraction of Hotspot with Aboveground Treatment) with a few caveats. The commentor asserted that discharge of the "treated" groundwater would contain strontium-90 at levels greater than 300 picocuries per liter (pCi/L). This, he maintained, violates the Clean Water Act and the Idaho Hazardous Waste Management Act and, therefore, does not meet ARARs. The commentor concluded that discharging Sr-90 at levels 300 times greater than the EPA's

MCL of 8 pCi/L so that it can migrate back into the aquifer is unconscionable. (W12-1, W12-2, T3-2)

Response: The agencies agree with the commentor regarding the preferred alternative. The agencies have re-evaluated the remedial alternatives in the year since the Proposed Plan was issued. As a result of this process, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3. A complete description of the selected remedy is given in Section 9 of the ROD.

The commentor is specifically concerned about discharge of treatod effluent containing radionuclides at concentrations above MCLs to the TSF-07 disposal pond. Please note that the selected remedy no longer proposes discharge of treated effluent to the TSF-07 percolation pond. Instead, the treated effluent will be reinjected to the aquifer through wells designed for that purpose. The extent of radionuclide contamination in the aquifer is limited to the hotspot in the general vicinity of the TSF-05 injection well. Therefore, it is expected that only the portion of the remedy which focuses on the hotspot will need to address radiocuclides.

Radionuclides will be treated at the hotspot to the extent practicable. The resins used in the OU 1-7A Interim Action were not effective in removing cesium-137 from TAN groundwater. Therefore, laboratory tests are currently being conducted to determine the best commercially-available resins to remove cesium-137, strontium-90, and other radionuclides from TAN groundwater. Additionally, studies are being conducted to determine the most effective techniques (e.g., filtering, use of clarifiers) to remove radiologically-contaminated particulate from the extracted groundwater. The agencies will review the results of these studies in the fall of 1995 to develop treatment options for radionuclides in the extracted groundwater. The agencies will then evaluate the various treatment options within the context of the CERCLA threshold and balancing criteria to assess their anticipated relative performance for this final remedy. The CERCLA evaluation criteria are discussed in Section 8 of this ROD. If none of the active treatment

options effectively satisfy the evaluation criteria, a possible option could include no active radionuclide removal from the extracted groundwater. Under this "worst case" option, the extracted groundwater would be treated to remove VOCs only, and then reinjected into the upgradient portion of the hotspot. In this way, the radiologically contaminated groundwater would be hydraulically contained with extraction downgradient and reinjection upgradient. The extent of radionuclide contamination would decrease over time due to radioactive decay.

The extent to which radionuclides will be treated at the hotspot cannot be determined until the results of the laboratory studies are available. The agencies will reach a decision regarding radionuclide treatment by the fall of 1995 after they fully evaluate the laboratory tests. However, since there is currently no practical treatment technology for tritium, it is expected that the effluent reinjected into the hotspot will contain tritium.

Provisional startup of the Groundwater Test Facility will occur prior to the agencies decision regarding radionuclide treatment, concurrent with the resin tests. Water would be pumped from TAN-25 or one of the other wells located farther from TSF-05. These wells are not expected to have as high of a percentage of contaminated sludges or concentration of dissolved contaminants as TSF-05. By pumping from these wells during provisional startup, the elements of the treatment train can be optimized, and data regarding removal efficiencies for COCs wiU be obtained, while still providing some mass removal for the VOCs. These data will be useful in making the decision on radionuclide removal standards. Treated effluent will be reinjected to upgradient portions of the hotspot.

The selected remedy meets ARARs by restoring as much of the aquifer as practicable in accordance with the Groundwater Protection Strategy presented in the National Contingency Plan. This regulation requires that both current and potential future use of the groundwater be considered in remedy selection, and that groundwater resources be protected and restored if necessary and practicable. Accordingly, the agencies have determined that a reasonable time frame for restoration of the aquifer to drinking

water
standards should not exceed 100 years, which is consistent with current land use assumptions for the INEL.

21. Comment: The Environmental Defense Institute (EDI) supports Alternative 4: 25 æg/L Groundwater Plume Extraction with Air Stripping; Enhanced Extraction of Hotspot with Above Treatment but suggests use of a lined evaporation pond to receive the treated discharge from the filtration system at TAN. (W12-3)

Response: The agencies agree with the commentor regarding the preferred alternative. The agencies have re-evaluated the remedial alternatives in the year since the Proposed Plan was issued. As a result of this process, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3. A complete description of the selected remedy is given in Section 9 of the ROD.

The commentor specifically suggests discharge of treated effluent to a lined evaporation pond instead of a percolation pond. The agencies propose that the treated effluent will be reinjected to the aquifer through wells designed for that purpose and therefore unlined percolation ponds will not be used to receive effluent.

The extent of radionuclide contamination in the aquifer is limited to the hotspot in the general vicinity of the TSF-05 injection well. So it is expected that only the portion of the remedy which focuses on the hotspot will need to address radionuclides.

Radionuclides will be treated at the hotspot to the extent practicable. The resins used in the OU 1-7A Interim Action were not effective in removing cesium-137 from TAN groundwater. Therefore, laboratory tests are currently being conducted to determine the best commercially-available resins to remove cesium-137, strontium-90, and other radionuclides from TAN groundwater. Additionally, studies are being conducted to determine the most effective techniques (e.g., filtering, use of clarifiers) to remove radiologically-contaminated particulate from the extracted groundwater. The agencies will review the results of these studies in the fall of 1995, to develop treatment options for radionuclides in the extracted groundwater. The agencies will then evaluate the various treatment options within the context of the CERCLA threshold and balancing

criteria to assess their anticipated relative performance for this final remedy. The CERCLA evaluation criteria are discussed in Section 8 of this ROD. If none of the active treatment options effectively satisfy the evaluation criteria, a possible option could include no active radionuclide removal from the extracted groundwater. Under this "worst case" option, the extracted groundwater would be treated to remove VOCs only, and then reinjected into the upgradient portion of the hotspot. In this way, the radiologically contaminated groundwater would be hydraulically contained with extraction downgradient and reinjection upgradient. The extent of radionuclide contamination would decrease over time due to radioactive decay.

The extent to which radionuclides will be treated at the hotspot cannot be determined until the results of the laboratory studies are available. The agencies will reach a decision regarding radionuclide treatment by the fall of 1995, after they fully evaluate the laboratory tests. However, since there is currently no practical treatment technology for tritium, it is expected that the effluent reinjected into the hotspot will contain tritium.

22. Comment: A number of commentors supported proposed Alternative 3 (5,000 æg/L) Groundwater Plume Extraction; Enhanced Extraction of Hotspot with Aboveground Treatment. (W1-1, W3-1, W11-1, T1-1, T1-4, T2-1)

Response: Please note that in light of new information made available in the year since the proposed plan was issued, the agencies have reevaluated the remedial alternatives. As a result of reevaluation of the remedial alternatives, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3.

DOE, EPA, and IDHW agree that AIternative 4 is the alternative that best meets the RAO and the nine evaluation criteria identified under the CERCLA. A long-term groundwater monitoring program will ensure that this selected remedy will be protective of human health and the environment.

Alternative 3 would only meet the 100-year timeframe for aquifer restoration if additional remediation of the less than 5,000 æg/L portion of the plume is included in the Site-wide

ROD. Alternative 4 is considered more effective in the long-term than Alternative 3 because it is less dependent on future remedial actions. Furthermore, Alternative

4 is more effective in reducing toxicity, mobility, and volume of the contaminant plume through treatment because it addresses a much larger volume of comtaminants than Alternative 3, and would prevent migration of a major component of the plume into previously uncontaminated groundwater. Also the current cost evaluation of Alternative 4 shows that the cost of the selected alternative is considerably less in comparison to the cost given in the Proposed Plan and the costs of Alternative 3 and Alternative 4 are comparable.

23. Comment: While a number of commentors expressed their preferences for other proposed alternatives, one commentor expressed strong disagreement with the selected alternative. The commentor argued that the cost to taxpayers does not justify remediating a negligible public health risk. (W8-1)

Response: Please note that in light of new information made available in the year since the proposed plan was issued, the agencies have reevaluated the remedial alternatives. As a result of reevaluation of the remedial alternatives, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3. A description of the selected remedy is given in Section 9 of the ROD.

The agencies share the commentor's concerns regarding the amount of money spent on remedial actions. The cost estimate of approximately $29,888,000 million for the preferred alternative includes capital costs associated with construction, operations and maintenance costs, and post-closure costs for long-term monitoring. The current evaluation of Alternative 4 shows that the cost is considerably less in comparison to the cost given in the Proposed Plan and the costs of Alternative 3 and Alternative 4 are comparable.

Despite the high cost of remediating this site, the CERCLA requires that actual or threatened releases of hazardous substances that may present an imminent and substantial endangerment to human health and welfare or the environment be addressed by implementing a remedial action. The National Contingency Plan which is the implementing regulation for CERCLA requires that TAN groundwater restoration occurs within a reasonable timeframe. Furthermore, the National Contingency Plan delineates the Grondwater Protection Strategy, which will be followed during the course of remedial action for TAN groundwater. The Groundwater Protection Strategy requires that both current and potential future use of the groundwater be considered in remedy selection, and that groundwater resources be protected and restored if necessary and

practicable. Therefore, the agencies have determined that a reasonable timeframe for aquifer restoration to drinking water standards should not exceed 100 years. The 100-year timeframe is consistent with current INEL land use assumptions.

Alternative 4 is considered more effective than Alternative 3 in the long-term because it is less dependent on future remedial actions. Futhermore, Alternative 4 is more effective in reducing toxicity, mobility, and volume of the contaminant plume through treatment because it addresses a the largest volume of contaminants, and would prevent migration of a major component of the plume into previously uncontaminated grountwater. Although the operations and maintenance costs are greater to implement Alternative 4 as opposed to Alternative 3, the restoration timeframe would be accelerated.

Therefore, the agencies agree that Alternative 4 best satisfies the CERCLA evaluation criteria.

Remedial Design/Remedial Action Concerns

24. Comment: One commentor stated that, "In 1953, the TSF Injection Well was drilled at TAN. It was used from 1955 through 1972. The well was drilled to a depth of 310 ft. Perforations to allow deposit of injected materials into the aquifer were placed from 180 to 244 ft and from 269 to 305 ft. Presently the aquifer is found between its top at 200 ft and the interbed at 400 ft." (W9-1)

Proposed: The commentor is correct about the depths of perforations in the well shaft. Because there are perforations above the current water table, it is possible that contaminants are present around the injection well in the subsurface bedrock materials above the aquifer.

25. Comment: One commentor suggested that contaminants had been injected into the vadose zone in a "dry area" approximately 20 ft above the aquifer. (W9-4) Because the water level of the aquifer has dropped enhanced extraction technologies used as part of the selected alternative will not be effective at decontaminating dry areas above the aquifer. He concluded that contaminants will remain after completion of the planned remediation. (W9-2) The commentor wanted to know, "What can or will be done to abate contamination in this dry, contaminated area above the 200-ft mark which the proposed techniques do not address?" (W9-6)

Response: Please note that in light of new information made available in the year since the proposed plan was issued, the agencies have reevaluated the remedial alternatives. As a result of reevaluation of the remedial alternatives, the agencies have chosen Alternative 4 as the selected remedy rather than Alternative 3. A description of the selected remedy is given in Section 9 of the ROD.

The selected alternative focuses on remediation of groundwater contaminants and the secondary source in the TSF injection well and not on contamination that may be present above the aquifer. If, during the course of the RD/RA, new information becomes available that indicate contaminants are present above the aquifer that pose an unacceptable risk to human health and the environment, the agencies will reevaluate the remedial action in light of this new information.

Because contaminants will remain at the site above levels that would permit unlimited use and unrestricted exposure, the NCP requires the agencies to review the remedial action every 5 years. Thus, if the situation envisioned by the commentor arises, the agencies are required by law to reevaluate the remedial action to ensure it remains protective of human health and the environment.

All waste area groups at the INEL will perform comprehensive RI/FSs after each operable unit at the WAG has been evaluated. During the comprehensive RI/FS for WAG 1, the agencies will reevaluate available data to ensure all contaminants at TAN are or will be remediated to levels that are protective of human health and the environment.

26. Comment: A commentor asked, "If the waterline were to rise above the top perforation, will a second "hotspot" and attendant contamination plume form? Will this require a second abatement procedure?" (W9-5)

Response: The scenario of a rising waterline was not evaluated during the RI/FS phase of this action. It is true that the well is perforated above the water table and as a result, it is possible that contaminants are present around the injection well above the water table. If the waterline were to rise into this area and if contaminant

concentrations were at high enough levels, it is possible that a "hotspot" and attendant plume could form.

The TSF Injection Well site will be subject to future reviews mandated by the FFA/CO and the CERCLA. If the scenario envisioned by the commentor occurs, it could be evaluated as new information in one of these reviews. The RD/RA Work Plan requires DOE to routinely evaluate data compiled from the WAG to determine any potential WAG-specific problems that may become evident. In addition, the entire WAG-1 (which includes OU 1-07B) must undergo a comprehensive WAG-wide RI/FS which is scheduled to begin July-August 1995. The CERCLA requires that any new information received during the RD/RA phase of the cleanup be evaluated to ascertain its impact on the selected remedial alternative. Because contaminants will remain at the site above levels that allow for unlimited use and unrestricted exposure, the NCP requires the agencies to review the remedial action every 5 years. Thus, if the scenario envisioned by the commentor occurs, the agencies may determine that a second abatement procedure would be necessary.

27. Comment: One commentor recommended that if the treatment technology is not able to extract enough strontium to get (strontium-90 levels) down to drinking water standards, then at least (the liquid effluent) should go into a lined evaporation pond. (T3-3) Another commentor shared this concern about using a lined evaporation pond. (T4-2)

Response: Instead of using a percolation pond to receive effluent, the agencies propose that the treated effluent will be reinjected to the aquifer through wells designed for that purpose. Since the extent of radionuclide contamination in the aquifer is limited to the hotspot in the general vicinity of the TSF-05 injection well; it is expected that only the portion of the remedy which focuses on the hotspot will need to address radionuclides.

Radionuclides will be treated at the hotspot to the extent practicable. The resins used in the OU 1-7A Interim Action were not effective in removing cesium-137 from TAN groundwater. Therefore, laboratory tests are currently being conducted to determine the best commercially-available resins to remove cesium-137, strontium-90, and other radionuclides from TAN groundwater. Additionally, studies are being conducted to determine the most effective techniques (e.g., filtering, use of clarifiers) to remove

radiologically-contaminated particulate from the extracted groundwater. The agencies will review the results of these studies in the fall of 1995 to develop treatment options for radionuclides in extracted groundwater. The agencies will then evaluate the various treatment options within the context of the CERCLA threshold and balancing criteria to assess their anticipated relative performance for this final remedy. The CERCLA evaluation criteria are discussed in Section 8 of this ROD. If none of the active treatment options effectively satisfy the evaluation criteria, a possible option could include no active radionuclide removal from extracted groundwater. Under this "worst case" option, the extracted groudwater would be created to remove VOCs only, and then reinjected into the upgradient portion of the hotspot. In this way, the radiologically contaminated groundwater would be hydraulically contained with extraction downgradient and reinjection upgradient. The extent of radionuclide contamination would decrease over time due to radioactive decay.

28. Comment: One commentor was concerned about the aerial dispersement problems associated with using evaporation ponds. (T4-2)

Response: The selected alternative proposes to reinject treated groundwater directly into the subsurface and will not use evaporation ponds. Therefore aerial dispersement problems will not be an issue.

29. Comment: One commentor urged the use of steam over other surfactants because it would be a cleaner operation. (T1-5)

Response: Because of the heterogeneity of the material disposed in the TSF-05 injeceion well, the potential for contaminants mobilization, and the potential noncontactability of the secondary source present within the hotspot, the proposal to use surfactant or steam has been removed.

COMMENTS PERTAINING TO NO ACTION TRACK 1 SITES

General Technical Comments

30. Comment: Citing Table 3 (see page 14 of the Proposed Plan), a commentor asked, "How can risk-based soil concentrations calculated from 10-6 excess cancers be

calculated for noncarcinogens?" (W6-1) "How can you have greater than 1,000,000 ppm in soil?" He reminded the agencies of the risks other than cancer: acute toxicity of solvents; explosion and fire hazards; and hazard from instability of soils composed totally of solvents? (W6-2)

Response: A hazard quotient (HQ) was determined for the noncarcinogen risk-based concentrations and not a 10-6 risk value. Table 3 differentiated carcinogenic and noncarcinogenic contaminants by shading the carcinogenic contaminants. The range of contaminant concentrations shown in Table 3 resulted from the various sizes of the sites evaluated. As a site gets smaller, greater concentrations of a contaminant are required to pose a 10-6 risk. Some sites that were evaluated were so small that essentially pure contaminant (i.e., 1,000,000 ppm) was needed to pose a risk.

The other risks mentioned are valid but were not considered the main scenarios for risk at the sites to the potential occupational and future resident receptors. The process agreed to by the agencies in evaluating these low probability hazard sites was to use a conservative risk model that evaluated the effects of potential contaminants to humans along the most sensitive and likely pathways shown in Table 3.

31. Comment: One commentor asked, "How can 46% benzene not be an inhalation hazard?" (W6-3)

Response: Table 3 of the Proposed Plan does show that 46% (or 465,000 ppm) of benzene to be an air inhalation hazard. The purpose of this table was to show the required contaminant concentrations for the various pathways to pose a 10-6 on HQ > 1 risk (i.e., risk-based soil concentrations). The actual benzene concentration detected at the site (0.55 ppm) is presented in the discussion for TSF-14. Since the actual benzene at the site is several orders of magnitude below the risk-based soil concentrations shown in Table 3, the site was recommended for No Action.

32. Comment: One commentor was glad to see resolution of the "No Action" sites. (W1-5)

Response: Comment noted.

33. Comment: Two commentors disagreed about whether an indoor pathway should be evaluated in determining the risk posed to future residential users by surface contaminants at the No Action Track 1 Sites. One commentor felt that an indoor pathway should be addressed because contaminants present in the soil would be in higher concentrations in a basement because of the basement's lower barometric pressure. (T2-3) The other commentor stated that if contamination was present, it would not be deep enough to create an exposure pathway to the residence. (T1-7)

Response: The risk assessment used for the 31 No Action Track 1 sites evaluated the risk posed by volatile inhalation in a conservative manner. The risk assessment calculated the concentration of a specific volatile compound that would need to be present in the site soils to pose a risk via the air volatilization pathway. This approach conservatively assumes that the receptor would be exposed to site soil contaminated with volatiles to a depth of 10 ft, and is not restricted to a location.

34. Comment: One commentor argued that the most dominant pathway for exposure to surface contaminants is an outdoor pathway because the wind would stir up the surface areas. (T1-8) Another commentor discounted the other's statement stating that the wind decreases the surface concentrations of surface contaminants. High wind and fresh air will move the contaminants away. (T2-2)

Response: The effect of airborne contaminants was identified as a major pathway to the Track 1 risk evaluation process and was considered during the 31-site assessment by evaluating the air inhalation pathway for dust and air volatilization pathway for vapors.

The risk assessment used for the 31 No Action Track 1 sites evaluated the risk posed by volatile inhalation in a conservative manner. The risk assessment calculated the concentration of a specific volatile compound that would need to be present in the site soils to pose a risk via the air volatilization pathway. This approach conservatively assumes that the receptor would be exposed to the site soil contaminated with volatiles to a depth of 10 ft and is not restricted to a location.

Comments Received on Loss-of-Fluid-Test (LOFT)-05 Fuel Tanks

35. Comment: One commentor asked about the LOFT-05 tanks and associated piping and whether there were plans to upgrade the system to current underground storage tank (UST) standards? "If so," he asked, "why not remove the old system and replace it with a new, double-contained system with leak detection that can be relied upon?" (W7-1)

Response: The residual product in the LOFT-05 Fuel Tanks was removed in 1991 because they were no longer in use. However, the tanks were left in the ground in an "active" status to maintain the building's capabilities because the future use for the LOFT facility was uncertain. If, or when, the tanks are needed for use again, they will have to meet the current UST regulations. The final use of the tanks versus replacement or complete removal will depend on the specific need of the future use.

Comments Received on TSF-39 [Transite (Asbestos) Contamination]

36. Comment: A commentor stated about the TSF-39 asbestos contamination site, "[it seems as if it] would be relatively easy to clean up and dispose of the asbestos cement with other asbestos at the Central Facilities Area (CFA) landfill." (W7-2)

Response: The TSF-39 Transite Site consists of small pieces of asbestos cement (Transite) scattered over an approximately 400 x 2,500-ft area. The material is continually being brought to the surface as a result of wind and water erosion. As a result, multiple cleanup efforts would be required. Asbestos bound in cement does not present an unacceptable risk and the expense of multiple cleanup efforts is not justified.

Comments Received on Water Reactor Research Test Facility (WRRTF)-02, -03 and -06 (Waste Water Disposal Sites)

37. Comment: One commentor thought that the wastewater treatment or wastewater disposal sites should be sampled and fully analyzed because the records are incomplete. (T4-6) Another commentor agreed that failing to sample the no action sites didn't sound to him to be a very reasonable way to approach that kink of assessment. (T3-4) A third asked "Why not take some samples and be sure?" (W7-3)

Response: The DOE received additional sampling information from the WRRTF-05 injection well that further increased the confidence that the WRRTF disposal pond sites do not pose an unacceptable risk to either human health or the environment. The WRRTF-05 injection well was operational from 1959 to 1983, when it was abandoned and replaced by the various WRRTF disposal ponds. The results from two rounds of groundwater monitoring samples collected in May and July of 1994, from the former WRRTF-05 injection well detected only Co-60 at concentrations greater than acceptable risk levels. The presence of Co-60 in the WRRTF-05 injection well is from a known one-time release in the mid-1960s, and not the result of routine disposal activities at the WRRTF. Site investigations and radiological field surveys have not detected the presence of Co-60, or any other radionuclide, at the WRRTF disposal ponds.

COMMENTS DEEMED BEYOND THE SCOPE OF THE TSF INJECTION WELL AND SURROUNDING GROUNDWATER CONTAMINATION AND NO ACTION SITES ROD

Comments and questions on a variety of subjects not specific to TSF Injection Well and Surrounding Groundwater Contamination and No Action Sites were received during the public comment period. Those comments addressed a general distrust of government agencies, statements questioning past management practices, concerns that the nuclear industry will not do the "right" thing, and disagreement amongst public meeting commentors. These out-of-scope comments are not responded to in this Responsiveness Summary. Information on these out-of-scope comments can be obtained from the INEL Public Affairs Office in Idaho Falls or at the local INEL offices in Pocatello, TWIN Falls, and Boise.

APPENDIX B

Public Comment/Response List

APPENDIX B

Public Comment/Response List

Description of Comment/Response List Index

The Public Comment/Response List Index was created to enable commentors and other interested persons to locate the agencies' responses to individual public comments. All oral comments, as given at the public meetings, and all written comments, as submitted, were typed into the attached index. Each comment was then subdivided and assigned a comment code. The codes indicate whether the comment was either written (W code) or taken from the public meeting transcript (T code). The agencies tried to divide comments according to specific concerns, issues or points made by the commentor.

Thirteen people submitted written comments (comments W1-W13) and four others gave oral comments at the public meetings (comments T1-T4). Copies of oral and written comments annotated with their respective comment codes are located in the Administrative Record.

To locate a response to a specific individual's comments, look up the name of the commentor, identify the specific comment you are looking for, then turn to the comment number or page indicated in the Responsiveness Summary.

If, after reviewing the annotated comments in the administrative record, a reader wishes to locate a response to a specific comment, he/she can use the comment code to locate a response as well. The reader should identify the comment code in the index, look up the comment and page number of the response then turn to that page of the Responsiveness Summary.

Comments involving multiple issues were further subdivided and answers may appear in more than one place in the Responsiveness Summary. This was done for only three of the 77 comments.

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Public Comment/Response List Index

Code	Commentor	Comment	Comment/ Response	Page No.
		WRITTEN COMMENTS RECEIVED ON TAN GROUNDWATER SITES		
W1-1	Joseph W. Henscheid	Alternative #3 sounds reasonable.		

W1-2	Joseph W. Henscheid	However, this plan ought to recognize a couple of other possible outcomes: (1) What if (for whatever reason) the RAOs change during Phase 1 (10 volume removals)?	22 A-17 4 A-8	
W1-3	Joseph W. Henscheid	(2) After Phase 1, what if you find that progress towards achieving the RAOs is minimal?	4 A-8	
W1-4	Joseph W. Henscheid	Seems like you might want to review the entire approach rather than continuing pumping.	5 A-8	
W2-1	Warren Barry	I would favor Alternative #2. Limited Action Consisting of Control.	14 A-11	
W2-2	Warren Barry	The movement of the water in 40 years has been so slight that it would pose no threat to anyone unless they proceeded to drill a well into the area.	14 A-11	
W2-3	Warren Barry	This seems highly unlikely since the property should be retained for its present purpose for a number of years in the future.	14 A-11	
W3-1	Thomas J. Setter, M.D.	I support Alternative #3 as the final alternative for OU 1-07B	22 A-17	
W4-1	Randall C. Morris	There is no evidence that the ecological risks from the remediation activities themselves were considered in the evaluation of alternatives. In many cases, remediation activities designed to reduce human health risks impose unacceptable ecological risks. In this case, facility construction and the disturbance to animal populations from operation of the facilities impose risks on local populations. These should be considered.	3 A-7	

W5-1	Beverly Ferrell	I believe the groundwater contamination should be cleaned up as quickly as possible.	6	A-9
W5-2	Beverly Ferrell	We should put no more nuclear waste in the site.	OS	
W5-3	Beverly Ferrell	I am a victim of radiation releases near Hanford. I lived diectly across and on the river from Richland (1947-1965).	OS	
W5-4	Beverly Ferrell	I do not trust any government agency (or private) when nuclear waste is concerned.	OS	
W5-5	Beverly Ferrell	I do not believe members of the nuclear industry will do the "right" thing.	OS	
W5-6	Beverly Ferrell	Please do not send me any more propaganda.	OS	
W5-7	Beverly Ferrell	I have lost all respect for our government.	OS	

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Code	Commentor	Comment	Page No.	Comment/ Response
WRITTEN COMMENTS RECEIVED ON TAN GROUNDWATER SITES				
W8-1	Guy Loomis	I cannot accept the preferred alternative (#3) - Air Stripping and Enhanced Extraction of Hotspot with Aboveground Treatment for the TAN Groundwater Contamination. The dollars per cancer death averted are unacceptable for any of the proposed scenarios. The U.S. Government cannot afford to clean up sites with these kinds of risks. If one could show numbers like $1M per cancer	23	A-18

			death, then the action would be justified.
W8-2	Guy Loomis		Suggestion: Render the scenario for residential
7			
A-9			
			use invalid by filling in the well with bentonite, cap the well head with concrete, and cover a 1-acre area around the site with 2 to 4 in.-size basalt cobble 10 ft deep. [Estimated cost $1M.]
W9-1	Rich Ravhill		In 1953, the TSF Injection Well was drilled at
24			
A-19			
			TAN. It was used from 1955 through 1972. The well was drilled to a depth of 310 ft. Perforations to allow deposit of injected materials into the aquifer were placed from 180 to 244 ft and from 269 to 305 ft. Presently the aquifer is found between its top at 200 ft and the interbed at 400 ft.
W9-2	Rich Ravhill		The below surface abatement techniques of
25			
A-19			
			steam and surfactant injection (enhanced extraction technologies of Alternative 3) only work where water is present (i.e., within the aquifer). These techniques do not decontaminate dry areas above the aquifer. Since these will not be abated by techniques to be implemented by proposed Alternative 3, these contaminants will remain upon completion of the planned remediation.
W9-3	Rich Ravhill		Due to decreased replenishment (drought) and
8			
A-9			
			increased use (irrigation, etc.), the water table has dropped.
W9-4	Rich Ravhill		Assuming previous water levels were higher than
25			
A-19			
			the highest perforation (180 ft) and based upon reports that contaminants were found throughout the 200 to 400-ft aquifer area, it is safe to assume contaminants are to be found within the "hotspot" in the dry area above the top of the aquifer at its present 200-ft level.

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Code	Commentor	Comment	Comment/ Response	Page No.
		WRITTEN COMMENTS RECEIVED ON TAN GROUNDWATER SITES		
W9-5	Rich Ravhill	If the "hotspot" above the waterline will not be decontaminated through the proposed remediation and, due to increased future runoff and replenishment, the water level rises above the top perforation (180 ft or higher), will a second "hotspot" and attendant contamination plume form? Will this require a second abatement procedure?	A-20	26
W9-6	Rich Ravhill	What can/will be done to abate contamination in this dry, contaminated area above the 200-ft mark which the proposed techniques do not address?	A-19	25
W10-1	Mary Magleby	If land use is considered, is the additional cost of Alternative 3 justified over Alternative 2?	A-12	15
W10-2	Mary Magleby	Considering the flow rate of the aquifer, has the concentration of contaminants at a point where urrestricted access will be possible (likely) in the future been calculated to justify the cost of Alternative 3?	A-12	16
W11-1	Lee Tuott	I support the preferred alternative.	A-17	22
W11-2	Lee Tuott	Please provide additional information on the proposed injection of the treated groundwater to the aquifer.	A-6	2
W11-3	Lee Tuott	How many injection wells would be required? Where would they be sited so as to not influence	A-13	17

the pump/treat operations and dilute the existing groundwater contamination?

W11-4 Lee Tuott I support the concept of reinjection of treated
9
A-10
groundwater due to the nonconsumptive use.

W12-1 Chuck Broscious The Environmental Defense Institute supports
20
A-15
Alternative 4 as outlined in the RI/FS with the following caveats.

W12-2 Chuck Broscious Discharge of the "treated" groundwater that
20
A-15
contains Sr-90 greater than 300 pCi/L to an unlined percolation pond violates the Clean Water Act, Idaho Hazardous Waste Management Act and, therefore, does not meet the Applicable or ARARs.
It is hard to believe that a waste management technique that has caused so much contamination of the soil and groundwater at INEL is still used today.
Discharging Sr-90 three hundred times the EPA MCL of 8 pCi/L so that it can again migrate back into the aquifer is unconscionable.

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WRITTEN COMMENTS RECEIVED ON TAN GROUNDWATER SITES				
W12-3	Chuck Broscious	As stated in previous comments, EDI advocates the use of a lined evaporation pond to receive the "treated" discharge from the filtration system at TAN.	A-16	21
W13-1	Anonymous	The Remedial Investigation/Feasilbility Study Work Plan for Operable Unit 1-07B, dated May 1992, indicates that approximately 35,000	A-10	11

			gallons of TCE has been injected into the aquifer. The RI/FS and the Proposed Plan both state that the original uses of the TCE and PCE cannot be identified due to lack of disposal records and usage records. The compounds existing in the aquifer are not considered listed wastes for these reasons. By the very nature of the chemicals used, the typical uses of these chemicals for cleaning operations and the fact that cleaning operations were conducted at the Test Area North, DOE should have concluded that TCE in the aquifer is a listed waste. During the RI process, EG&G personnel were informed that substantial quantities of TCE were used for solvent cleaning operations and subsequently disposed of through the facility drain system. This information was known by the EG&G WAG 1 Manager in 1991 and suppressed due to the difficulty of dealing with the TCE in the aquifer as a listed waste.
W13-2	Anonymous	11 A-10	It is widely known among the craft workers who used TCE at the Test Area North that the bulk of the TCE was used for cleaning operations (i.e., solvent usage). It is inconceivable that the DOE and EG&G Idaho personnel can assume that such massive quantities of halogenated organics would have been utilized for other purposes. Simply stating that inadequate records exist to determine usage is highty suspect.
W13-3	Anonymous	11 A-10	It was not necessary and not usual to maintain records for chemical usage before the passage of recent environmental laws.
W13-4	Anonymous	11 A-10	The Department of Energy should revisit the issue of TCE usage at the Test Area North.
W13-5	Anonymous	11 A-10	A confidential, independent survey of the current and former craft workers and supervisors should be conducted and the results directly reported to DOE to eliminate the screening of information performed by EG&G Idaho.

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Code	Commentor	Comment	Response	No.
WRITTEN COMMENTS RECEIVED ON TAN GROUNDWATER SITES				
W13-6	Anonymous	The Remedial Investigation/Feasibility Study Work Plan for Operable Unit 1-07B, dated May 1992, indicates that 55 ft of sediment and sludge was removed from the Injection Well. It is true that some of the contamination was removed from the well. However, due to lack of funding, the task was terminated before the remainder of the sludge was removed.	12 A-10	
W13-7	Anonymous	The cleanup operation was not completed in accordance with the Work Package documentation and the cleanup instructions. Specifically, the well was to be flushed until the effluent was clear.	12 A-10	
W13-8	Anonymous	At the termination of the work, the effluent was still laden with contaminated sediment and sludge.	12 A-10	
W13-9	Anonymous	The equipment used to perform the cleanup operation was abandoned in place at the instruction of the EG&G Project Manager. The equipment was removed months later after the EG&G Project Manager had retired.	13 A-11	
W13-10	Anonymous	When the pump and piping abandoned in the well was later removed, external contamination (on the outside of the pump and piping) was flushed back down the well during steam cleaning operations, at the direction of the EG&G Project Manager. The contaminated liquid, which should have been disposed of as mixed waste, was flushed back into the aquifer.	13 A-11	

W13-11 Anonymous DOE should consider additional action to remove
13
A-11
the remaining sludge from the well and determine what action to consider for removal of the contaminants flushed back down the well.

W13-12 Anonymous The proposed pump and treat system design does
13
A-11
not consider that substantial residual contamination exists in well casing and at the bottom of the well.

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Code	Commentor	Comment	Comment/ Response	Page No.
ORAL COMMENTS RECEIVED ON TAN GROUNDWATER SITES				
T1-1	C. E. White	What you accomplish with remedial Alternative No. 3 would be the preferred one. It certainly appears from anything that you can come up with from the study, it would alleviate any major problems.	A-17	22
T1-2	C. E. White	I can't see where there would be worth spending all that additional money to do [Alternative] 4 when you don't really accomplish that much more out of it. Your relationship between what's accomplished against what is spent. The closer you get to [Alternative] 4 from [Alternative] 3, the more the ratio changes and you get less for your money. Not that money should be the total alternative or total basis of the alternative, but with what you get out of [Alternative] 3, certainly seems to solve the problem, unless, in the future it's discovered that [Alternative] 3 is not doing what we thought it was going to do. Let's put it that way.	A-14	18
T1-3	C. E. White	One of your surprises was finding some		

19
A-14

things which you didn't know were there. Well, who knows, maybe in the future, although you'll take care of those now, who knows in the future if something else comes up in their little head, and you have to reassess something.

T1-4 C. E. White But, to me, the Remedial No. 3 would be

22
A-17

the way to go, and it would be, I think enough protection to satisfy most anybody that I've ever talked to about it.

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	ORAL COMMENTS RECEIVED ON TAN GROUNDWATER SITES			
T1-5	C. E. White	I would like to add one more item to what I		
29 A-21		just said. We were discussing the injection of other substances to try to, let's say, loosen up some of the things that are in that plume, the two were the steam and the other so-called soapy alternative. Certainly the steam, if it works the way it works in the oil the fields, would be a much cleaner type operation to go into rather than injecting some other item into the ground and then have to pull that out, soap or whatever that they drove into this thing, so I'm assuming that in looking at these that the steam would be looked at first, am I right?		
T2-1	Steve Novak	I guess I agree with Mr. White that the		
22 A-17		Alternative No. 3 is probably the best for your cost ratio, and groundwater is very difficult to clean up. It's a difficult problem and cleaning up the contaminated sediments and residuals, I think, is your best alternative as opposed to going after the		

entire plume.

T3-1 Chuck Broscious It's real encouraging to see improvements in
1
A-6

the public literature that's coming out, to see, you know, data that isÄÄnot only states the maximum observed concentrations, but besides that, the drinking water standard. And, you know, that is a significant change from the way things were done in the past. And it's very helpful to have the information presented in that way. I think it's a lot more candid and I would put it as a significant improvement.

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ORAL COMMENTS RECEIVED ON TAN GROUNDWATER SITES				
T3-2	Chuck Broscious	The one reservation that I have about the way the treated water is being discharged is that if, in fact, it has the concentrations of cesiumÄÄStrontium-90 at 30 picocuries per liter, which isÄÄI'm sorry, 300 picocuries per liter, which is almost 300 times the drinking water standard, being discharged into something that is universally recognized as a failed inadequate waste management approach, being the percolation pond, is just really distressing to see that that kind of continued practice is going on.	A-15	20
T3-3	Chuck Broscious	I would much rather see, as we've recommended in our written comments, that if indeed the treatment technology is not able to extract enough of the strontium to get it down to drinking water standards, then at least it should go into a lined evaporation pond.	A-20	27
T4-1	Tom Dechert	I guess what concerns meÄÄI'm like Chuck,	A-6	1

I appreciate the more open nature in the way that the information is being provided these days and the more complete nature of the data that's being provided.

T4-2 Tom Dechert And similar to Chuck, I'm concerned about
27, 28
A-20
evaporation ponds, and not only for
A-21
percolation reasons, but also for aerial dispersement problems that may occur if there are evaporation ponds. I'm not sure that those are addressed adequately any place or that the data is available, knowledge is available, to know exactly what's going to happen with that stuff in terms of aerial dispersement.

T4-3 Tom Dechert But in terms of the characterization of the
10
A-10
site and the extent of contamination of this site, I have some concerns about that as well.

In terms of the fact that just looking at your
10 A-10
sampling scheme, for instance, for this water plume, I have a hard time seeing how you can have a high level or degree of confidence that you have adequately described the degree of contamination there.

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mment/ Page
Code Commentor Comment
Response No.

ORAL COMMENTS RECEIVED ON TAN GROUNDWATER SITES

T4-3 Tom Dechert And I think by virtue of the fact that you're
(Cont.) getting stuff back out of the injection well that you haven't seen before, you're seeing things that are surprising you as you go along, is an indication that there is some lack of understanding, I think, of degree of contamination in the aquifer, and not only

			that, but how the aquifer works at that site, or any place else, as far as that goes, under the INEL.		
T4-4	Tom Dechert		I'm not fully convinced thatÄÄwhat should I sayÄÄwell, first off, having to do with the interbeds, that the characterization of those interbeds as you have described them and they were also described to me outside of this meeting can fully explainÄÄif we're talking about basaltÄÄwhat's going on with the containment of the contaminants that are down there. In other words, I would haveÄÄI just have a feeling that there's more to the interbeds, the silts and the clays, that are occurring in the aquifer, than you have a good handle on. And it disturbs me, I guess, that the models you use when you're looking at those or when you are describing those, what's going to happen with these plumes of theseÄÄthe movement of contaminants in the future are based on assumptions of the clays, the silts and the basalts in the aquifers that I don't think are very well documented or very well substaniated in your database.	10	A-10

Code	Commentor	Comment	Comment/ Response	Page No.
	WRITTEN COMMENTS RECEIVED ON TAN TRACK 1 NO ACTION SITES			
W1-5	Joseph W. Henscheid	I'm glad to see your resolution of the "No Action" sites.	32	A-22
W6-1	Donald Brice	Table 3, Page 14. How can risk-based soil concentrations calculated from 10-6 excess cancers be calculated for noncarcinogens?	30	A-21
W6-2	Donald Brice	Also, how can you have greater than one million	30	A-21

			parts per million solvent in soil? There are risks other than cancer. What about acute toxicity of solvents, explosion and fire hazard, and the hazard from instability of soils composed totally of solvents?		
W6-3	Donald Brice		How can 46% benzene not be an inhalation hazard?	31	A-21
W7-1	Alan Merritt		LOFT-05 . . . "tanks and assoc. piping remain in place pending future use." Are you going to upgrade this system to current UST standards? If so, are you doing the equivalent of putting a new engine into a 40-year-old truck? Why not remove this old system and replace with a new double-contained system with leak detection that can be relied upon?	35	A-22
W7-2	Alan Merritt		TSF-39 sounds like this would be relatively easy to clean up and dispose of the asbestos cement with other asbestos at the CFA landfill.	36	A-23
W7-3	Alan Merritt		WRRTF-02-03-06 "Although no soil sampling has been conducted . . . " Why not collect some samples and be sure?	37	A-23

Code	Commentor	Comment	Comment/ Response	Page No.	
ORAL COMMENTS RECEIVED ON TAN TRACK 1 NO ACTION SITES					
T1-6	C. E. White	I can't agree totally with my friend over here about the house basement, what have you.		OS	
T1-7	C. E. White	Most of the contaminationÄÄI'm even going as far as to say all of the contamination that was found on the ground or in that area, was not of a very deep nature. It was probably above four or five feet. Therefore, if you go down into the ground, you're not creating a dominant path, I don't think.		33	A-22

T1-8	C. E. White	I think your more dominant path is the way it's looked at because you're living in Idaho, and if you live in Idaho, you've got the wind. And this is going to be the greatest, I think, path of contaminant would be from the surface areas that would be stirred up by the wind or whatever.	34	A-22
T1-9	C. E. White	I can'tÄÄI agree with most of your other things, but I can't with that.	OS	
T2-2	Steve Novak	I feel that the indoor pathway should be addressed as well as the outdoor pathway. For several reasons. And I'll address Mr. White's comments. The fact that there is a lot of wind in Idaho probably decreases the outdoor pathway even more, because the concentration on the outdoor pathway most likely would be lower due to the fact that there is high wind, fresh air will bring and move contaminants away.	34	A-22
T2-3	Steve Novak	As far as the basement scenario, contaminant not only go through the basement, they go through the walls and the sides of the basement as well. So, usually, contamination anywhere from one to ten feet was a concern when you have a basement because it gets sucked into the basement in the pressure through the outside and the basement.	33	A-22
T2-4	Steve Novak	There is a large concern of radon. It's also a concern of volatiles: benzene, toluene, ethylbenzene, especially benzene which is more toxic than the other contaminants.	OS	
T3-4	Chuck Broscious	That was what I had underlined, too, the fact that it says here "although no soil sampling was conducted," "no soil sampling conducted," "although no soil sampling conducted," and it goes on and on. You know, good gosh, that doesn't sound to me like a very reasonable way to approach that kind of assessment.	37	A-23

Comment/ Page

Code	Commentor	Comment	Response No.
		ORAL COMMENTS RECEIVED ON TAN TRACK 1 NO ACTION SITES	
T4-6	Tom Dechert	I just, as a comment, I think that those wastewater treatment or wastewater disposal sites, the soils should be sampled and fully analyzed, because I think the records are, you know, incomplete.	37 A-23

APPENDIX C

Administrative Record Index

APPENDIX C

Administrative Record

Test Area North Injection Well 07/14/94

File Number

Technical Evaluation

11.7

Document #: 5694
Title: Letter ReportÄÄTechnical Evaluation of the TAN-OU 1-07B RI/FS and Proposed Plan
Author: GeoTrans, Inc.
Recipient: EG&G Idaho, Inc.
Date: 11/30/93

R.12.1 EPA Comments

Document #: 5341
Title: Review Comments for Draft Remedial Investigation Report W/Addenda for the Test Area North Groundwater Operable Unit at the INEL
Author: Liverman, E.
Recipient: Green, L.
Date: 07/09/93

Document #: 5573
Title: Review of Draft Remedial Investigation/Feasibility Study for the Test Area North
Groundwater Operable Unit 1-07B
Author: Liverman, E.
Recipient: Williams, A. C.
Date: 11/05/93

Document #: 5682
Title: Resolution of EPA's Comment on TAN OU 1-07B Draft Final RI/FS
Author: Pierre, W.
Recipient: Lyle, J. L.
Date: 01/26/94

Document #: 5697
Title: Review of Draft Final Remedial Investigation/Feasibility Study for the Test Area
North Groundwater Operable Unit 1-07B
Author: Liverman, E.
Recipient: Green, L.
Date: 01/12/94

Document #: 5698
Title: Review of Draft Proposed Plan for the Test Area North Groundwater Operable
Unit 1-07B
Author: Liverman, E.
Recipient: Harelson, D. B., English, M.
Date: 03/28/94

Test Area North Injection Well 07/14/94

File Number

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Recipient: Lyle, J. L.; Pierre, W.
Date: 01/28/94

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/28/1995
Operable Unit: 08
ROD ID: EPA/ROD/R10-95/122

Text: Full-text ROD document follows on next page.

PB95-964612
EPA/ROD/R10-95/122
May 1996

EPA Superfund Record of Decision:

U.S. DOE Idaho National Engineering Laboratory (O.U. 4-12 and 4-03), ID 9/28/1995

October
~~September~~ 1995

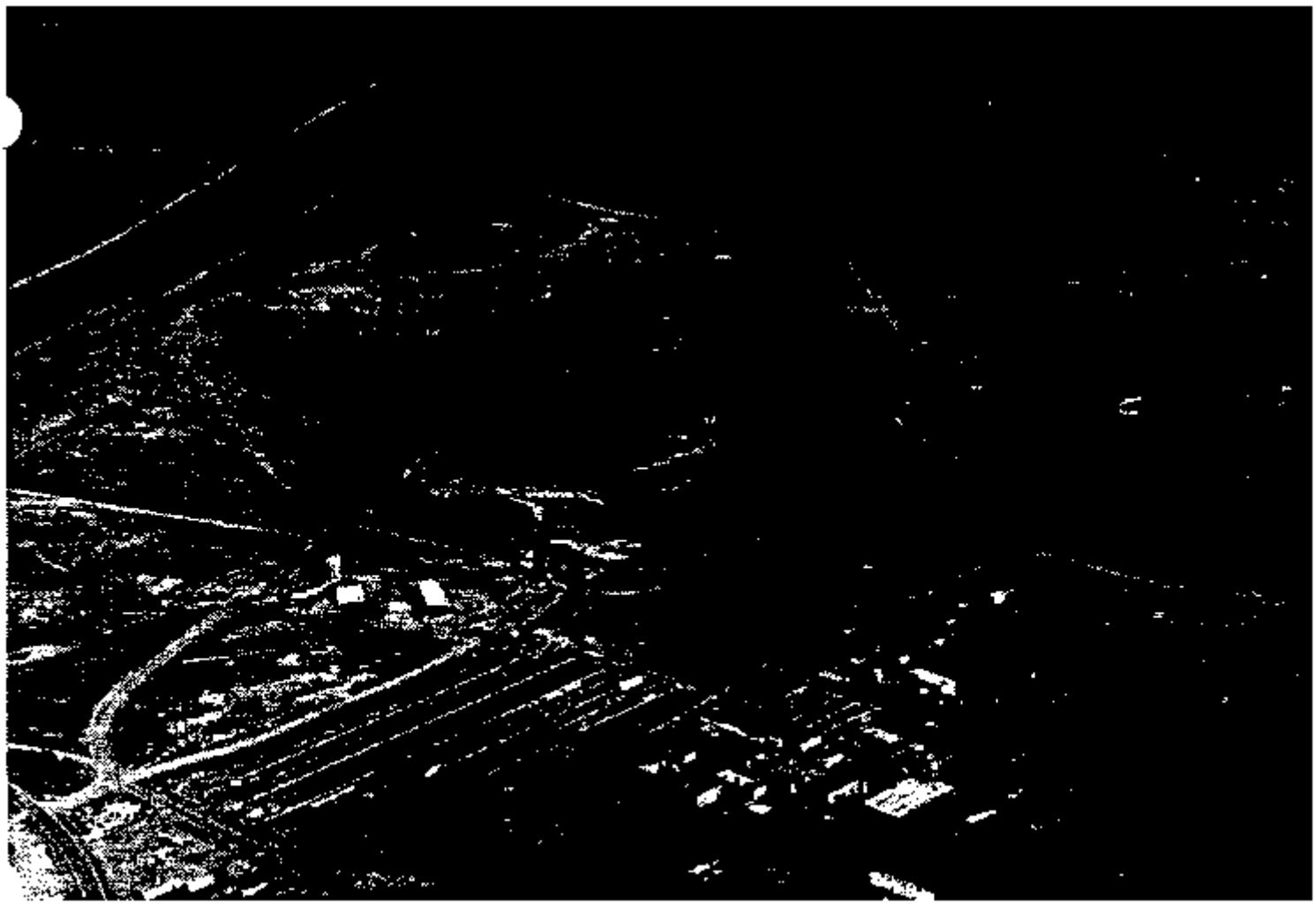
Idaho National Engineering Laboratory

IDAHO DEPARTMENT OF HEALTH AND WELFARE
DIVISION OF ENVIRONMENTAL QUALITY

Record of Decision

Declaration for Central Facilities Area Landfills I, II, and III (Operable Unit 4-12), and No Action Sites (Operable Unit 4-03)

Idaho National Engineering Laboratory
Idaho Falls, Idaho



Aerial view of Central Facilities Area Landfills I, II, and III

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Central Facilities Area Landfills I, II and III
Idaho National Engineering Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Central Facilities Area (CFA) Landfills I, II, and III located at the Idaho National Engineering Laboratory (INEL). The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300). Information supporting the selection of the remedy is contained in the Administrative Record for the CFA Landfills.

The lead agency of this decision is the U.S. Department of Energy (DOE). The U.S. Environmental Protection Agency (EPA) approves of this decision and, along with the Idaho Department of Health and Welfare (IDHW), has participated in the evaluation of final action alternatives. The IDHW concurs with the selection of the preferred remedy for the CFA landfills.

This decision document also summarizes information on 19 Track 1 investigations (consisting of underground storage tank sites) designated as “no further action” and documents the “no further action” decision for these sites.

ASSESSMENT OF THE SITE

Uncertainty associated with hazardous substances potentially disposed in CFA Landfills I, II, and III may present a potential threat to public health, welfare, or the environment if not addressed by implementing the response action selected in this record of decision (ROD).

Due to the uncertainty associated with the landfill contents and the need for containment of the landfill contents, a remedial action of containment is warranted for the site, even though the risk assessment indicates that the CFA landfills do not currently present an unacceptable risk to human health or the environment. Implementation of the remedial action selected in this ROD will provide for containment of the waste with a native soil cover, institutional controls, and monitoring.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses the source of contamination by containing the buried wastes and contaminated soils. The selected remedy will minimize the CFA landfills as a source of potential groundwater contamination and reduce potential risks associated with exposure to the contaminated waste. The selected remedy includes elements that are consistent with EPA's *Presumptive Remedy for CERCLA Municipal Landfill Sites*.

The major components of the selected remedy include:

- Placement of a native soil cover (in combination with the existing soil cover) to a minimum depth of 2 ft, compacted and graded to minimize erosion and infiltration by controlling surface water runon/runoff, resulting from seasonal precipitation.

- Implementation of administrative controls on future land use and the posting of signs.

- Conducting groundwater, infiltration, and/or vadose zone monitoring to monitor the effectiveness of the remedial action. A monitoring plan will be developed by the agencies during the remedial design phase.

- Periodically inspecting and maintaining the cover to ensure its integrity

- Maintaining institutional controls, including signs, postings, and land use restrictions.

STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. Because the wastes can be reliably controlled in place, treatment of the principal sources of the site was not found to be practicable. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. A remedy in which contaminants could be excavated and treated effectively is precluded because of the size of the landfills and because there are no known on-site hot spots that represent major sources of contamination.

Because this remedy will result in potentially hazardous substances remaining in the landfills on-site, a review will be conducted within 5 years after commencement of the remedial action, and every 5 years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature sheet for the foregoing Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

9/25/95

John M. Wilcynski
Manager
U.S. Department of Energy, Idaho Operations Office

Date

Signature sheet for the foregoing Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the US. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Clarke 9/28/95

Chuck Clarke Date
Regional Administrator, Region 10
U.S. Environmental Protection Agency

Signature sheet for the foregoing Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory Record of Decision, between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Wallace N. Cory October 19 1995

Wallace N. Cory Date
Administrator
Division of Environmental Quality,
Idaho Department of Health and Welfare

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ACRONYMS AND ABBREVIATIONS

ANL-W	Argonne National Laboratory-West
ARA	Auxiliary Reactor Area
ARARs	applicable or relevant and appropriate requirements
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COCA	Consent Order and Compliance Agreement
cpm	counts per minute
CPP	Chemical Processing Plant (a.k.a. ICPP)
d	day(s)
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facility Agreement/Consent Order
FR	Federal Register
FS	feasibility study
ft	foot (feet)
g	gram(s)
gal	gallon(s)
HEAST	Health Effects Assessment Summary Tables
ICPP	Idaho Chemical Processing Plant (a.k.a. CPP)
IDHW	Idaho Department of Health and Welfare
in.	inch(es)
INEL	Idaho National Engineering Laboratory
INWMIS	Industrial Nonradiological Waste Management Information System
IRIS	Integrated Risk Information System
kg	kilogram(s)
L	liter(s)
lb	pound(s)
LDU	land disposal unit
LEL	lower explosive limit
LOFT	Loss-of-Fluid Test Facility
MCL	maximum contaminant level
mg	milligram(s)
mg/kg-d	milligrams per kilogram day
mi	mile(s)
NCP	National Contingency Plan
NPL	National Priorities List
NRF	Naval Reactors Facility
NWT	northern waste trench
OU	operable unit
pCi	picocurie(s)
PBF	Power Burst Facility
PAH	polycyclic aromatic hydrocarbon

ppm	parts per million
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SARA	Superfund Amendments and Reauthorization Act
SF	slope factor
SRPA	Snake River Plain Aquifer
SWMU	solid waste management unit
TAN	Test Area North
TBC	to be considered
TRA	Test Reactor Area
UCL	upper confidence limit
WAG	waste area group
WRTF	Water Reactor Test Facility
WWT	western waste trench
yd^3	cubic yard(s)
yr	year(s)
Fg	microgram(s)

Decision Summary

1. SITE NAME AND LOCATION

Central Facilities Area Landfills I, II and III (Operable Unit 4-12)
and No Action Sites (Operable Unit 4-03)
Idaho National Engineering Laboratory, Idaho Falls, Idaho

The Idaho National Engineering Laboratory (INEL) is a government-operated facility managed by the U.S. Department of Energy (DOE). The INEL is located 42 mi west of Idaho Falls, Idaho, and occupies 890 mi^2 of the northeastern portion of the Eastern Snake River Plain (ESRP). The INEL encompasses portions of five Idaho counties: Butte, Jefferson, Bonneville, Clark, and Bingham. Public access to the INEL is limited to two Federal highways and three state highways that intersect the Site. The Central Facilities Area (CFA) is located in Butte county in the south-central portion of the INEL, approximately 50 mi from the larger southeastern Idaho cities of Idaho Falls and Pocatello. CFA Landfills I, II, and III are located approximately 0.5 mi north of CFA proper (Figure 1).

Current land use at the INEL is primarily nuclear research and development and waste management. Surrounding areas are managed by the Bureau of Land Management (BLM) for multipurpose use. The developed area within the INEL is surrounded by a 500-mi^2 buffer zone used for cattle and sheep grazing. Of the 10,300 people employed at the INEL, approximately 1,100 are located at CFA. The nearest off-site populations are in Atomic City (7 mi southeast of CFA), Arco (17.5 mi west of CFA), Howe (15 mi northwest of CFA), Mud Lake (32 mi northeast of CFA), and Terreton (33 mi northeast of CFA).

The INEL property is located an the northeastern edge of the ESRP, a volcanic plateau that is primarily composed of volcanic rocks and relatively minor amounts of sedimentary interbeds. The basalts immediately below the CFA are relatively flat, and are covered by 20 to 30 ft of alluvium.

The depth to the Snake River Plain Aquifer (SRPA) underlying the INEL varies from 200 ft in the northern portion to 900 ft in the southern portion. The depth to the SRPA at CFA is about 480 ft. Flow of the aquifer in this region is generally to the south-southwest.

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 in./yr, with estimated evapotranspiration of 6 to 9 in./yr. The only surface water present at the INEL is the Big Lost River, which is approximately 1.5 mi northwest of the CFA landfills at its nearest point Due to irrigation diversions upstream and semi-arid climate, the river is typically dry. The only naturally occurring surface water at CFA results from heavy rainfall or snowmelt, usually during the period from January to April.

Twenty distinctive vegetative types have been identified at the INEL Big sagebrush is the dominant species, covering approximately 80% of the ground surface. The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Several bird species at the INEL that warrant attention because of sensitivity to disturbance or their threatened status

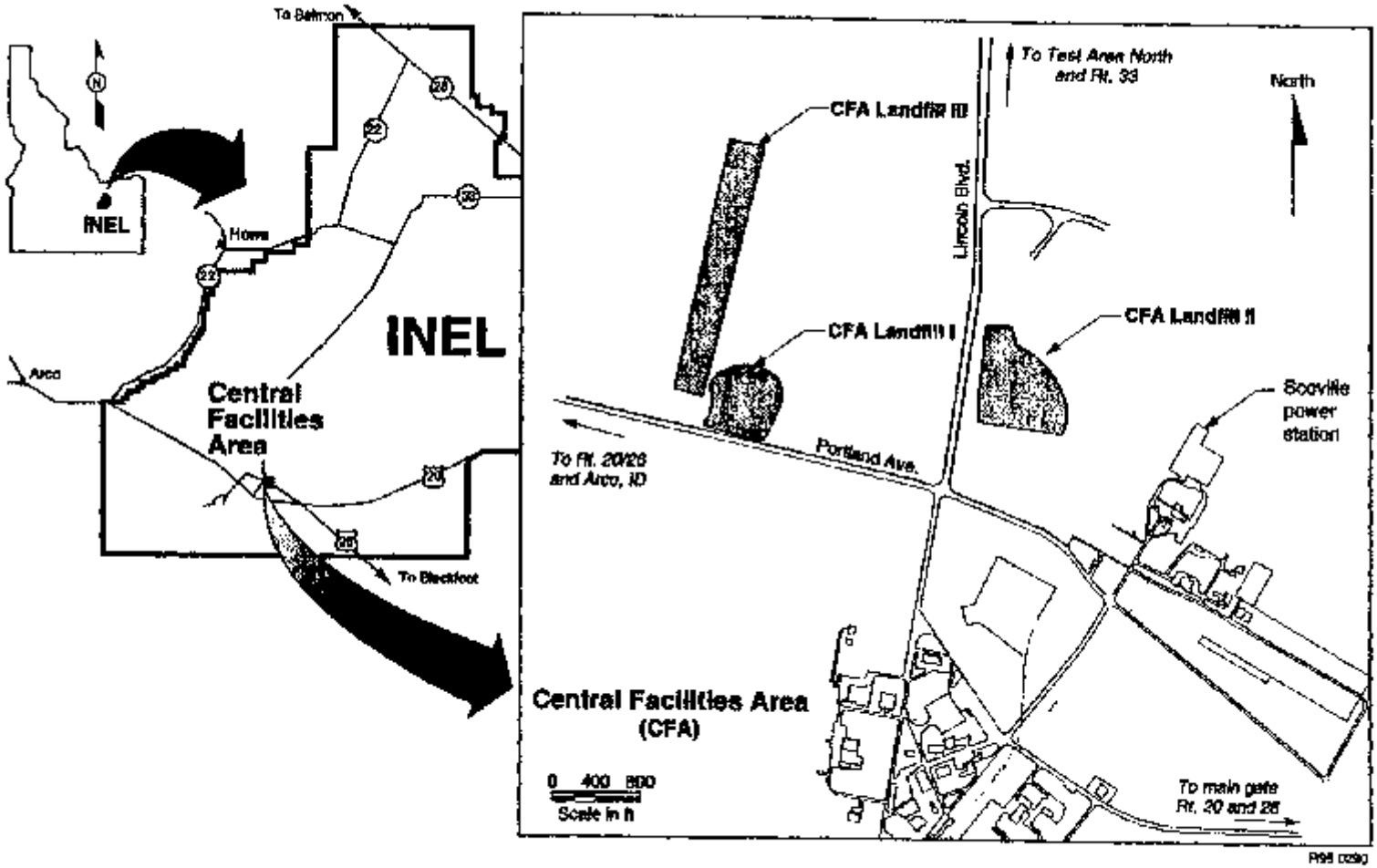

Figure 1. Location of CFA Landfills I, II, and III at the Idaho National Engineering Laboratory.

include the ferruginous hawk (*Buteo regalis*), bald eagle (*Haliaeetus leucocephalus*), long-billed curlew (*Numenius americanus*), and the loggerhead shrike (*Lanius Ludovicianus*). In addition, the Townsend's big-eared bat (*Plecotus Townsendii*) and pygmy rabbit (*Brachylagus Idahoensis*) are listed by the U.S. Fish and Wildlife Service as candidates for consideration as threatened or endangered species. The ringneck snake, whose occurrence is considered to be INEL-wide, is listed by the Idaho Department of Fish and Game as a Category C sensitive species.

CFA Landfill I was operated as a disposal facility from the early 1950s until the mid 1980s. The landfill covers a total surface area of approximately 8.25 acres. The landfill is composed of three major units, commonly referred to as the rubble landfill, the western waste trench, and the northern waste trench. CFA Landfill II, in use from 1970 until 1982, was a fill operation encompassing 15 acres in the southwestern portion of an abandoned gravel pit. CFA Landfill III, encompassing 12 acres, was opened in October of 1982, when operations at CFA Landfill II were terminated, and continued as a cut-and-fill operation until December 1984 when it also was terminated. An expansion to Landfill III was opened west of the original Landfill III and continued to handle the same types of waste. It was operational until 1993 and is no longer in use. This expansion to Landfill III is not considered part of OU 4-12 because it was still operational when this investigation began, and therefore is outside the scope of this ROD. All further references to Landfill III refer to that portion of Landfill III (original six trenches) operational prior to December 4, 1984.

The predominant waste types entering the landfills were construction, office, and cafeteria waste. Review of the waste inventory records indicate that the major types of waste accepted at the landfills include trash sweepings, cafeteria garbage, wood and scrap lumber, masonry concrete, scrap metal, weeds and grass, dirt and gravel, asphalt, and asbestos. To a lesser extent, potentially hazardous wastes were also disposed to the landfills such as waste oil, solvents, chemicals, and paint. Information regarding the types and amounts of potentially hazardous wastes disposed to the landfills is not complete due to incomplete waste disposal inventory records.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The original facilities at CFA were built in the 1940s and 1950s to house Naval Gunnery Range personnel. The facilities have been modified over the years to fit the changing needs of the INEL and now provide four major types of functional space: craft, office, service, and laboratory. The CFA landfills were operated as municipal-type landfills for the INEL from the early 1950s until the mid 1980s.

The Resource Recovery Act (enacted in 1970) initially governed the landfill activities. In 1976, the Resource Conservation and Recovery Act (RCRA) was enacted, with subsequent regulations governing landfills promulgated in 1980. A Consent Order and Compliance Agreement (COCA) was signed by DOE, the U.S. Geological Survey, and the U.S. Environmental Protection Agency (EPA) in 1987 that specified a RCRA corrective action program for INEL solid waste management units (SWMUs) under RCRA authority. A key element of the COCA was the identification of all known SWMUs within the INEL, including a specific subset designated as land disposal units (LDUs). SWMUs at the INEL were identified as LDUs if it was known or strongly suspected that RCRA hazardous wastes or radioactive-RCRA hazardous wastes

(mixed wastes) were managed or placed at the unit in a manner constituting land disposal after the cutoff date of November 19, 1980. CFA Landfill I was classified as a SWMU because it was suspected that RCRA hazardous wastes were not routinely disposed after the cutoff date. CFA Landfills II and III were identified as LDUs because it was suspected that hazardous wastes were disposed after the cutoff date.

On July 14, 1989, EPA proposed placing the INEL on the National Priorities List (NPL) of the National Contingency Plan (NCP) (54 FR 29820) (EPA, 1990a). This was done using Hazard Ranking System procedures found in the NCP. The INEL's score was 51.91 (sites scoring 28.5 or greater are eligible for the NPL) based in part on releases of contaminants to the groundwater at two facilities: Test Reactor Area (TRA) and Test Area North (TAN). Data that support listing the INEL as an NPL site are found in the Federal Facilities Docket, EPA Headquarters, Washington, D.C. After considering public input during a 60-day comment period following the proposed INEL listing, EPA issued a final rule listing the INEL Site. The rule was published in the Federal Register (FR 29820), November 21, 1989.

Subsequent to listing the INEL an the NPL and with the development of the Federal Facility Agreement/Consent Order (FFA/CO) and the Action Plan (effective date December 9, 1991), DOE, EPA, and the Idaho Department of Health and Welfare (IDHW) decided that the CFA landfills should be evaluated under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The status of LDUs was discussed in detail among DOE, EPA, and IDHW during the initial negotiations of the FFA/CO in 1991, and rationale for reclassifying LDUs to SWMUs was made. The results of the negotiations are summarized in a letter from DOE to IDHW and finalized in the FFA/CO. Under the new guidelines, a unit retained its RCRA LDU designation only if known RCRA hazardous waste was routinely or systematically disposed after November 19, 1980. Consequently, many units lost their RCRA LDU status if disposal of RCRA hazardous waste was a one-time event or where knowledge of the event was based on conjecture or hearsay. Landfills II and III lost their LDU status based on this rationale.

With respect to Landfill I, investigation conducted during the RI revealed a logbook maintained by landfill operators that contained disposal records for waste disposed to Landfill I, from 1981 through 1984. Review of this logbook indicated that the major types of waste accepted at this landfill during that time period included trash sweepings, cafeteria garbage, wood and scrap lumber, masonry concrete, scrap metal, weeds and grass, dirt and gravel, asphalt, and asbestos. To a lesser extent, potentially hazardous wastes were also disposed to the landfill such as paint, resins, sludge, and chemicals. However, because there was no conclusive evidence that RCRA hazardous wastes were disposed to Landfill I after November 19, 1980, Landfill I was not classified as a RCRA LDU.

A Track 2 investigation was performed on Landfill I under the FFA/CO. A recommendation was made in the Track 2 investigation to further evaluate the groundwater and air pathways of Landfill I as part of the OU 4-12 Remedial Investigation/Feasibility Study (RI/FS). The primary source of information on Landfill I is the *Preliminary Scoping Track 2 Summary Report for Operable Unit 4-10* (Trippet et al., 1995). A copy of this report can be found in the Admmistrative Record for Waste Area Group (WAG) 4. This ROD documents the results of the RI/FS and the selected remedy for CFA Landfills I, II, and III.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA § 113(k)(2)(B)(i-v) and 117, a series of opportunities for public information and participation in the remedial investigation and decision process for the CFA landfills were provided to the public from August 1993 through May 1995. For the public, the activities ranged from receiving a fact sheet that briefly discussed the CFA landfills investigation to date, *INEL Reporter* articles and updates, and a proposed plan, to conducting a telephone briefing and public meetings.

In August 1993, a fact sheet concerning the CFA landfills remedial investigation was sent to about 6,700 individuals of the general public and 650 INEL employees on the INEL Community Relations Plan mailing list.

Informal open house meetings on the CFA landfills remedial investigation were held August 11 and 12,1993, in Pocatello and Twin Falls, respectively. Public information meetings on the CFA landfills remedial investigation were also held on August 17, 18, and 19, 1993, in Idaho Falls, Boise, and Moscow, respectively. During these meetings, representatives from DOE and INEL discussed the project, answered questions, and listened to public comments. Comments from the information meetings were evaluated and considered as part of the RI/FS process.

Regular reports concerning the status of the CFA landfills project were included in the *INEL Reporter* and mailed to those who attended the meetings and who were on the mailing list. Reports appeared in six issues of the *INEL Reporter* and three *Citizens' Guides*.

In April 1995, a fact sheet concerning the CFA landfills was sent to about 6,700 individuals of the general public and 650 INEL employees on the INEL Community Relations Plan mailing list. On April 11, 1995, the DOE issued a news release to more than 100 news media contacts concerning the beginning of a 30-day public comment period, which began April 26, 1995 and ended May 26, 1995, pertaining to the CFA Proposed Plan. Both the fact sheet and news release gave notice to the public that CFA documents would be available before the beginning of the comment period in the Administrative Record section of the INEL information repositories located in the INEL Technical Library of Idaho Falls, the INEL Boise Office, as well as in public libraries in Idaho Falls, Fort Hall, Pocatello, Twin Falls, Boise, and Moscow.

Opportunities for public involvement in the decision process for the CFA landfills were provided beginning in April 1995. For the public, the activities ranged from receiving the proposed plan, conducting one teleconference call, and attending open houses and public meetings to informally discuss the issues and offer verbal and written comments to the agencies during the 30-day public comment period.

Copies of the proposed plan for the CFA landfills were mailed to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list on April 24, 1995, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the same information and the location of public meetings on May 16, 17, and 18, 1995, in Idaho Falls, Boise, and Moscow, respectively, appeared in seven major Idaho newspapers. Large advertisements appeared in the following newspapers on April 26: *Post Register* (Idaho Falls); *Idaho State Journal* (Pocatello); *South Idaho Press* (Burley); *Times News*

(Twin Falls); *Idaho Statesman* (Boise); *Lewiston Morning Tribune* (Lewiston); and *The Daily News* (Moscow).

A post card was mailed on May 10, 1995, to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list to encourage them to attend the public meetings and provide verbal or written comments. Both media, the news release and newspaper advertisements, gave public notice of public involvement activities and offerings for briefings, and the beginning of a 30-day public comment period that was to begin April 26 and run through May 26, 1995.

Written comment forms, including a postage-paid business reply form, were made available to those attending the public meetings. The forms were used to turn in written comments at the meeting and, by some, to mail in comments later. For those who did not attend the public meetings but wanted to make formal written comments, a written comment form was attached to the Proposed Plan. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep verbatim transcripts of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for the CFA landfills, Operable Unit (OU) 4-12, in eight INEL information repositories.

A total of about 10 people (other than agency representatives) attended the CFA landfills public meetings. Overall, eight provided formal comment; of these eight people, three provided oral comments and five provided written comments. All comments received on the proposed plan were considered during the development of this ROD. The decision for this action is based on the information in the Administrative Record for this OU.

A Responsiveness Summary has been prepared as part of the ROD. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment

On August 2, 1995, project managers from the Idaho Department of Health and Welfare Division of Environmental Quality gave a brief presentation on the project to the Environmental Management Site Specific Advisory Board—INEL. The advisory board is a group of individuals representing the citizens of Idaho, making recommendations to DOE, EPA, and the state of Idaho regarding environmental restoration activities at the INEL

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTIONS

Under the FFA/CO, the INEL is divided into ten WAGs. The WAGs are further divided into OUs. The CFA has been designated WAG 4, and consists of 13 OUs. OU 4-12 consists of the wastes disposed to the three landfills and the associated soil impacted by the landfills. Data from shipping records, along with process knowledge, written correspondence, and interviews with current and previous employees, and monitoring and sampling data were used to evaluate the CFA landfills OU 4-12.

A complete evaluation of all cumulative risks associated with CERCLA actions at WAG 4 will be conducted as part of the WAG 4 Comprehensive RI/FS (OU 4-13) to ensure that all risks have been adequately evaluated.

5. SUMMARY OF SITE CHARACTERISTICS

The following sections provide a summary of the physical characteristics of the CFA landfills as well as a description of the wastes disposed to the landfills, and a summary of the contaminants present in various media associated with the landfills. Greater detail may be found in the "Remedial Investigation/ Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory."

5.1 Physical Characteristics of the CFA Landfills

The CFA landfills are located on the ESRP in Big Lost River alluvial deposits overlying basalt bedrock. The sediments comprising these deposits are primarily sands and gravels and contain very few fine-grained materials. In some places, however, a clay-rich layer (0 to 9 ft thick) exists above the bedrock. Depth to basalt at these landfills ranges from 10 to 37 ft. The vadose zone, that portion of the subsurface that extends from the land surface down through the subsurface to the water table, at the CFA landfills is approximately 480 ft thick. It is composed of a relatively thin layer of surface sediments, in which the wastes are disposed, and thick sequences of interfingering basalt flows containing interbedded sediments. As a result of the relatively low annual precipitation, high potential evapotranspiration, and deep water table, vadose zone soils at the landfills tend to be relatively dry during most of the year. The SRPA, one of the largest and most productive groundwater resources in the United States, underlies the CFA landfills. The aquifer is listed as a Class I aquifer, and EPA has recently designated it as a sole source aquifer. The SRPA consists of a series of saturated basalt flows and interlayered pyroclastic, and sedimentary materials that underlie the ESRP. The depth to water at the CFA landfills varies from about 476 ft to just over 495 ft. The direction of groundwater flow in this general vicinity is in a south to southwesterly direction.

5.1.1 Landfill I

Landfill I occupies a total surface area of approximately 8.25 acres, and consists of three subunits: the rubble landfill, western waste trench, and northern waste trench. The rubble landfill originated as a gravel quarry that was operated by the U.S. Navy from 1942 to 1949. The quarry was used as a disposal area for Site-wide waste disposal sometime after 1949. The surface area of the rubble landfill is estimated to be 5.5 acres, and its depth is estimated to be 12 to 15 ft. The rubble landfill is covered with approximately 1 to 5 ft of soil overlain with a layer of gravel. The surface of the western waste trench is approximately 2 acres, consisting of smaller waste trenches, each excavated to a size of 8 ft wide by 10 ft deep by 50 ft long. Each of the smaller trenches is separated from the other by 15 ft of undisturbed soil. Filled trenches were covered with 1 to 5 ft of soil. The northern waste trench was identified from aerial photographs and has a surface area of approximately 0.75 acres. Information pertaining to its true dimensions is limited. Currently, it is covered with soil and is undiscernible at the surface.

5.1.2 Landfill II

Landfill II encompasses approximately 15 acres and is located in the southwest corner of an abandoned gravel pit. Depth to basalt at the landfill varies from 15 to 37 ft based on a seismic refraction survey and a subsurface borehole drilling investigation. The landfill waste profile, however, is estimated to range in depth from 12 to 28 ft because the pit probably was not excavated beyond the base of the gravel-bearing unit and into the clay material. Hand augering at 60 sampling sites indicated that the Landfill II soil cover ranges in thickness from 0.33 to 3.17 ft, with an overall mean of 1.50 ft. The landfill surface is gently undulating due to differential settling of the waste and maintains a stand of crested wheatgrass.

5.1.3 Landfill III

Landfill III consists of six trenches that cover approximately 12 acres. Depth to the underlying basalt is 10 to 33 ft based on a seismic refraction survey. The landfill waste profile is estimated to be 13 ft deep on average. It was common practice to excavate the landfill trenches, leaving a soil layer intact between the waste and underlying basalt. The Landfill III soil cover ranges in thickness from 1 to 8 ft with an overall mean of 2.83 ft, based on augering results. Ground-penetrating radar measurements indicate the average soil cover thickness to be 2 to 3 ft. The landfill surface is also gently undulating due to differential settling of the waste and maintains a stand of crested wheatgrass.

5.2 Landfill Waste Description

Contaminant sources in the CFA landfills can be generally described as solid and liquid nonradioactive materials disposed to the landfills over the past 40 years. The predominant waste types entering the landfills were construction, office, and cafeteria waste. Review of the waste inventory records indicate that the major types of waste accepted at the landfills include trash sweepings, cafeteria garbage, wood and wrap lumber, masonry concrete, scrap metal, weeds and grass, dirt and gavel, asphalt, and asbestos. To a lesser went, potentially hazardous wastes were also disposed to the landfills and may include waste oil, solvents, chemicals, and paint. Landfill waste descriptions have been determined from the Industrial Nonradioactive Waste Management Information System (INWMIS), interviews with site personnel, reports, and other information related to waste disposal. Many uncertainties (especially with Landfill I) are associated with the data gathered from these sources, including lost or unreadable records, overestimation and/or underestimation of waste volumes, and inconsistency in actual disposal locations. Although the reliability of the waste descriptions may not be very high, the waste descriptions do indicate the general categories of waste typically disposed to these landfills.

Solid nonradioactive materials disposed in the CFA landfills were generated by INEL facilities including the following: Argonne National Laboratory-West (ANL-W), Auxiliary Reactor Area (ARA), CFA, Idaho Chemical Processing Plant (ICPP), Experimental Breeder Reactor II, Naval Reactors Facility (NRF), Special Power Excursion Reactor Test, TAN, and TRA. Material was collected by the Central Facilities Maintenance Branch of the Site Services Division. Demolition and construction materials were disposed to the landfill directly by subcontractors responsible for a given project. Records show no indication of material segregation within the landfills. To a lesser extent, the disposal of liquid wastes in a sludge form, including oils, solvents, and other

chemicals did occur, usually by spreading upon the day's collection of solid wastes, compacting, and covering with at least 1 ft of natural soil cover. During operation of CFA Landfills II and III (1970 to 1984), screening procedures were in place to prevent radioactive wastes from being inadvertently deposited in the landfills during their operation. Screening was the responsibility of the generating facility. Prior to disposal of any waste material at the CFA landfills, the waste was screened by a radiological control technician for beta- and gamma-emitting radionuclides and for alpha-emitting radionuclides to determine if the waste material was above radioactive background levels. However, it is acknowledged that up to one shipment per month containing low levels of radioactive waste may have been inadvertently disposed to the landfills; wastes were not screened for radioactivity at the time of disposal on a full-time basis at INEL landfills until 1989.

5.2.1 Landfill I Land Subunits

This section discusses the waste disposal practices at Landfill I, which consists of three subunits: rubble landfill, western waste trench, and northern waste trench. Estimates of waste volume and type were made from the landfill logbooks, interviews with site personnel, and INWMIS, assuming the waste characteristics were similar for Landfill I to those recorded for Landfills II and III, since INWMIS does not contain information regarding disposals to Landfill I.

Rubble Landfill. The rubble landfill originated as a gravel quarry that was operated by the U.S. Navy from 1942 to 1949. In 1949, construction of the National Reactor Testing Station (now the INEL) began, and the quarry continued to be used as a gravel source. The quarry was used as a disposal area for Site-wide solid waste sometime after 1949. Waste disposal practices at the rubble landfill consisted of disposal of waste to the open gravel quarry, infrequent compaction with earth-moving equipment, and covering with available soil material. Soil covering was not performed consistently and probably only when areas were filled with waste. It is also known, based on interviews with knowledgeable personnel, that open burning of flammable wastes occurred before covering. Additionally, landfill personnel would use disposed flammable liquids to ignite wastes.

An incinerator, located adjacent to the landfill, operated from 1951 to 1957. It was used to incinerate classified documents and other paper waste. Paper waste was brought to the incinerator by truck and was burned. The waste ash was disposed to the rubble landfill.

Review of landfill disposal logbooks indicate that disposal of wastes also occurred from late 1981 through 1984 in the rubble landfill in an area known to workers at the time as the "east hole." The "east hole" is an L-shaped pit located within the rubble landfill south of the quarry spoil pile. It was noted during personnel interviews that a dumping area for several empty acid storage tanks referred to as the "acid pit" was also located in this area. Interviews with personnel indicate that the Navy disposed of waste, including shell casings, in the north end of the rubble landfill. Tables 1 and 2 summarize the wastes including volume estimates by waste types disposed to the rubble landfill for the periods from the 1950s to 1970 and from 1982 to 1984, respectively.

Western Waste Trench. Waste disposal practices at the western waste trench (WWT) consisted of disposal of waste to an open area of six smaller trenches. The waste was ignited inside the trench and covered with soil periodically. According to interviews with site personnel, flammable liquids were used to improve combustion of wastes. Table 3 summarizes the wastes including volume estimates by waste types disposed to the western waste trench of CFA Landfill I.

Table 1. Estimated waste volumes for Landfill I, rubble landfill from mid-1950s to 1970.

Waste type	Percent of total volume	Total volume (yd^3)	Assumptions
1. Trash, sweepings	0%	0	Trash and sweeping were burned openly in WWT or NWT
2. Cafeteria Garbage	0%	0	Cafeteria garbage was primarily disposed in WWT or NWT
3. Wood, scrap lumber	5%	6,550	Wood and scrap lumber were burned openly or salvaged by employees
4. Masonry, concrete	85%	111,389	Primary waste disposed from construction and demolition projects
5. Scrap metal	5%	6,550	Waste disposed from construction and demolition projects
6. Weeds, grass, trees	1%	1,308	Same percentages of total volume as Landfill II
7. Dirt, gravel	1%	1,308	Similar percentage of total volume as Landfill II and process knowledge
8. Asphalt	1%	1,308	Same percentage of total volume as Landfill II
9. Asbestos	1%	1,308	Same percentage of total volume as Landfill II
10. Other	1%	1,308	Same percentage of total volume as Landfill II
Waste oil, waste oil sludge, liquid wastes including paint thinner, paint, solvents	0%	0	This type of waste was not disposed to the rubble landfill according to site personnel. Waste oil was burned openly, used for dust suppression on roads, or disposed to the WWT or NWT according to interviews with site personnel. Liquid (i.e., solvent waste) was burned in the WWT and NWT.
Fire extinguishers (1,1,2-trifluorotrichloroethane)	Unknown	Unknown	Fire extinguishers were disposed to rubble landfill according to interviews with site personnel.

Table 2. Estimated waste volumes for Landfill I, rubble landfill from 1982 to 1984 (estimates based on Landfill I logbook).

Waste type	Total volume (yd^3)
1. Trash, sweepings	1,229
2. Cafeteria garbage	57
3. Wood, scrap lumber	5,444
4. Masonry, concrete	3,730
5. Scrap metal	213
6. Weeds grass, trees	180
7. Dirt, gravel	1,610
8. Asphalt	4,047
9. Asbestos	43
10. Other	134
Boxes of hazardous material	37
Sludge	10
Slag	2
Conductors	4
Tires	10
Resins	4
Lagging	11
Barrels/buckets/drums	248
Roofing	133
Insulation	306
Gilsolate/gilsotherm	9
Paint	28
Acid tanks	2 empty tanks
Rocks	87
Sodium nitrate	2
Calcium nitrate	2
Sump sludge	2

Table 3. Estimated waste volumes for Landfill I, western waste trench.

Waste type	Percent of Total volume	Total volume (yd^3)	Assumptions
1. Trash, sweepings	74%	7,026	Same percentage of total volume as Landfill II
2. Cafeteria garbage	11%	1,045	Same percentage of total volume as Landfill II
3. Wood, scrap lumber	0%	0	Disposed to rubble landfill
4. Masonry, concrete	0%	0	Disposed to rubble landfill
5. Scrap metal	0%	0	Disposed to rubble landfill
6. Weeds, grass, trees	<1%	95	Same percentage of total volume as Landfill II
7. Dirt, gravel	2%	190	Same percentage of total volume as Landfill II
8. Asphalt	0%	0	Disposed to rubble landfill
9. Asbestos	<1%	95	Same percentage of total volume as Landfill II
10. Other	1%	95	Same percentage of total volume as Landfill II
Waste oil, waste oil sludge, paint thinner, paint, solvents	10%	850	Waste oil was burned openly, used for dust suppression on roads, or disposed to the WWT or NWT according to interviews with site personnel. Liquid (i.e., solvent waste) was burned in the WWT and NWT.

Northern Waste Trench. Information on disposal practices for the northern waste trench (NWT) is not available; however, practices were probably similar to that of the WWT. Table 4 summarizes the wastes including volume estimates of waste types disposed to the NWT of CFA Landfill I.

5.2.2 Landfill II

Landfill II operated from September 1970 to September 1982. It occupies the southwest corner of an existing gravel pit that opened in the early 1950s. Waste disposal began in September of 1970 in the far southwest corner of the pit. It was standard practice for a single operator to be assigned to the landfill during the day to receive and log in waste. Waste was placed in the landfill randomly or in "low spots" and was then compacted by a D-8 caterpillar tractor into layers or cells that were 12 to 24 in. thick. The compacted waste was covered with approximately 1 ft of coarse soil material (sandy gravel) at the end of the day. Material for the intermediate cover was scraped from the bottom of the pit and from a previously unexcavated area north of the landfill. After the landfill operation ceased, overburden material, previously stockpiled during the opening of the pit, was used for cover material.

During the early 1970s, asbestos was placed in the bottom of the pit at Landfill II. The asbestos was normally covered with waste and then covered with fill material at the end of the day. By the late 1970s, disposal practices for asbestos were modified to require double bagging or boxing. According to site personnel, solvent sludges and chemical wastes were disposed at the landfill. These materials may have been absorbed onto rags and containerized or dumped directly onto the day's collection of solid waste. Personnel interviews also indicate that most of the drums disposed to the landfill were empty; occasionally, however, drums containing material (soaked rags and/or diatomaceous earth) were also disposed. Waste oils were disposed in the landfill; however, according to the personnel interviews, a significant amount of the waste oil was used on the roads for dust suppression throughout the 1970s and 1980s. Cooling tower wood from the Materials Test Reactor at the TRA potentially contaminated with chromates was also disposed in the landfill. According to personnel interviews, there was no open burning of wastes in Landfill II. Table 5 summarizes the wastes including volume estimates by waste types disposed to CFA Landfill II.

5.2.3 Landfill III

Landfill III opened in October 1982 after Landfill II was closed, and operated as a cut-and-fill trench until December 1984. Waste was placed in the six trenches as they were excavated. The eastern-most trench was the first to be excavated and was started from the south end with a trench 24 ft wide. The excavation proceeded from south to north on the first trench with overburden material being pushed to the sides. Excavation of the second trench then proceeded from north to south again with the overburden material being pushed to the sides. All six trenches in the landfill were excavated in this manner.

The logbook maintained by landfill personnel was reviewed to provide insight into the types of waste and disposal point locations in Landfill III. Similar to Landfill II, personnel interviews indicate that no open burning of waste in Landfill III was conducted. For the most part, asbestos was placed in the "asbestos pit" immediately north of Landfill III rather than in the Landfill III

Table 4. Estimated waste volumes for Landfill I, northern waste trench.

Waste type	Percent of Total volume	Total volume (yd^3)	Assumptions
1. Trash, sweepings	74%	4,862	Same percentage of total volume as Landfill II
2. Cafeteria garbage	11%	772	Same percentage of total volume as Landfill II
3. Wood, scrap lumber	0%	0	Disposed to rubble landfill
4. Masonry, concrete	0%	0	Disposed to rubble landfill
5. Scrap metal	0%	0	Disposed to rubble landfill
6. Weeds, grass, trees	1%	65	Same percentage of total volume as Landfill II
7. Dirt, gravel	2%	131	Same percentage of total volume as Landfill II
8. Asphalt	0%	0	Disposed to rubble landfill
9. Asbestos	1%	65	Same percentage of total volume as Landfill II
10. Other	1%	65	Same percentage of total volume as Landfill II
Waste oil, waste oil sludge, liquid wastes including paint thinner, paint, and solvents	10%	588	Waste oil was burned openly, used for dust suppression on roads, or disposed to the WWT or NWT according to interviews with site personnel. Liquid (i.e., solvent waste) was burned in the WWT and NWT.

Table 5. Estimated waste volumes for CFA Landfill II.

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (lb)	Liquid volume (gal)
1. Trash and sweepings	Q Office trash, paper, cardboard, plastic, glass, etc.	Q INEL Facilities, dumpster containers	285,308		275
2. Cafeteria garbage	Q Used grease Q Soybean oil Q vegetable oil Q Food waste Q Up to 70% moisture	Q ANL, CFA, CPP, NRF, RWMC, TAN, TRA	40,528		
3. Wood and scrap lumber	Q Wood and scrap lumber Q Scrap lumber	Q INEL Facilities, dumpster containers	19,078		
4. Masonry, concrete	Q Used masonry Q Used concrete	Q ANL, ARA, CFA, CPP, NRF, PBF, RWMC, TAN, TRA, WRTF	17,637		
5. Scrap metal	Q Scrap metal Q Scrap metal from welding, pipe fitting Q Sheet metal operations Q Metal vehicle parts including wheels, mufflers, bearings, vehicle batteries, etc.	Q ANL, ARA, CFA, CPP, NRF, PBF, RWMC, TAN, TRA, WRTF	7,154		
6. Weeds, grass, trees	Q Weeds, grass, and trees from landscape maintenance operations	Q ARA, CFA, CPP, NRF, RWMC, TRA	435		
7. Dirt, gravel	Q Dirt, gravel	Q ARA, CFA, CPP, NRF, PBF, TRA	6,415		
8. Asphalt	Q Used asphalt	Q ANL, ARA, CFA, CPP,	2,103		
9. Asbestos	Q Asbestos Q Asbestos coated materials such as pipes, etc.	Q ANL, CFA, CRF, PBF, NRF, TRA	807		

Table 5. (Continued).

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (1b)	Liquid volume (gal)
10. Other	Q Asphalt and dirt	Q CFA, NRF	973		
	Q Asphalt and concrete	Q ANL	19		
	Q Asphalt and gravel	Q NRF, TRA	20		
	Q Asphalt, dirt, and concrete	Q NRF	20		
	Q Asphalt, grass, and dirt	Q CFA	7		
	Q Asphalt, ground, sod, and rock	Q NRF	28		
	Q Barrels, crates	Q CPP	6		
	Q Buckets	Q CPP	11		
	Q Building material	Q NRF	1		
	Q Cans and bottles	Q CFA	1		
	Q Construction materials	Q NRF	129		
	Q Construction waste	Q NRF	3,014		
	Q Dead deer	Q TRA	1		
	Q Dirt and rock(s)	Q CFA, RWMC	105		
	Q Dirt barrels	Q CPP	130		
	Q Dirt, logs	Q PBF	5		
	Q Grass, weeds, and roofing material	Q CFA	66		
	Q Hyplon	Q NRF	1		
	Q Lumber and concrete	Q NRF	6		
	Q Mixed gravel and scrap metal	Q RWMC	7		
	Q Paper, barrels, and tire	Q TRA	1		
	Q Plants, dirt, and concrete	Q NRF	6		
	Q Siding	Q ANL	2		

Table 5. (continued).

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (1b)	Liquid volume (gal)
	Q Sod and dirt	Q TRA	26		
	Q Soot, rocks, and roofing materials	Q PBF	20		
	Q Structure consisting of wood, metal, and glass	Q TRA	24		
	Q Tar, buckets, plastic, and metal	Q ANL	2		
	Q Unknown (not specified)	Q ARA, CFA, CPP, TAN	265		
	Q Visqueen, dirt	Q CPP	7		
	Q Weeds, dirt	Q CPP	5		
	Q Weeds, grass, asphalt, and dirt	Q CFA	48		
	Q Weeds, barrels	Q CPP	4		
96. Oil	Q Waste oil sludge	Q NRF			4,790
	Q Waste oil sludge and scrap	Q NRF			2,928
97. Solvents	Q Carbon tetrachloride	Q NRF			0.5
	Q Paint	Q NRF			25
	Q Paint thinner	Q NRF			105
	Q Solvents	Q NRF			54
98. Chemicals	Q Asphalt lead	Q CPP	10		
	Q Antifreeze absorbed on Oil Dri	Q ANL	1		
	Q Beryllium chips	Q TAN	1		
	Q Boric acid	Q ANL		480	
	Q Boron solution	Q NRF			2,100
	Q Calcium chloride	Q CFA	14		
	Q Calcium hypochlorite	Q CFA		160	
	Q Chemicals	Q NRF		1,686	

Table 5. (continued).

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (1b)	Liquid volume (gal)
	Q Cr +3	Q ANL		590	
	Q Chromates	Q NRF, TRA	268		6,520
	Q Ether	Q ANL			1
	Q Ethylene glycol	Q ANL	268		165
	Q Mercury	Q TAN		4	
	Q Methylene dithiocyanate	Q NRF		50	
	Q Misc. chemicals	Q NRF		3,141	
	Q Morpholine	Q NRF			95
	Q Paint	Q CFA, NRF , TRA		2	52
	Q Paint cans	Q CPP	6		
	Q Powdered boric acid	Q TAN		2	
	Q Resin	Q TRA		38,767	
	Q Soda ash	Q NRF		9,100	
	Q Sodium dichromate sludge	Q ANL		15	
	Q Sulfuric acid	Q TAN			59
	Q Used paint	Q NRF			449
	Q Zircalloy turnings	Q ANL	1		
	Q Zirconium chips	Q TAN	1		

trenches; however, some nonfriable asbestos was disposed in Landfill III. According to personnel interviews, chemical or solvent disposal to Landfill III was relatively infrequent. Some of the drums disposed to the landfill did contain material or liquid absorbed on rags or diatomaceous earth, but the majority of the drums were empty upon disposal. Oil or sludge disposal to Landfill III was not noted during the personnel interviews. Table 6 summarizes the wastes including volume estimates by waste types disposed to CFA Landfill III.

5.3 Nature and Extent of Contamination

The following sections discuss the results of the site characterization conducted at each landfill to identify contaminants present in site soil, vadose zone, groundwater, and air.

5.3.1 Surface Soil

Surface soil samples were collected from the soil covers of each landfill for volatile organic, semivolatile organic, and inorganic compound analyses. Gross alpha/beta and gamma-emitting radionuclides were also analyzed for soil samples collected at CFA Landfill I. No volatile organic compounds were found in soil samples collected at Landfills I and III. A few volatile organic compounds were detected in soil collected from some locations, at Landfill II, but all concentrations detected in soil collected from this landfill are all well below the risk-based screening levels. Semivolatile organic compounds, including benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected in soil collected from Landfill I at concentrations ranging from 0.04 to 0.89 mg/kg and at Landfill II at concentrations ranging from 0.044 to 0.92 mg/kg. These compounds are commonly referred to as polycyclic aromatic hydrocarbons (PAHs); compounds found in asphalt or petroleum distillates, common wastes disposed in the landfills. Inorganic data from the landfills' cover soils were compared to naturally occurring background concentrations for INEL soils. Inorganics above naturally occurring background levels at Landfill I include beryllium, chromium, lead, silver, and zinc. The inorganics chromium, lead, silver, and zinc were detected at concentrations well below the risk based screening levels. Inorganic analyte concentrations detected at Landfills II and III were within the common range expected for soils of this area. Cobalt-60 was the only radionuclide detected at Landfill I at one sample location above background concentrations.

In summary, contaminants of concern identified for CFA Landfill I include beryllium, cobalt-60, and benzo(a)pyrene; a few PAHs at concentrations of less than 1 mg/kg at Landfill II; and no contaminants of concern were identified in the surface soils from the cover of Landfill III.

5.3.2 Subsurface Soil Sampling of Landfill II

Seven boreholes were drilled into the waste to the top of the underlying basalt layer at Landfill II to (a) determine the nature and concentration of leachable contaminants within and below the waste unit, and (b) determine if leachate is present in or below the landfill. Soil samples were collected within and below the waste unit for volatile organic, seimivolatile organic, and inorganic compound analyses. The drilling investigation indicated the presence of PAHs (compounds present in asphalt or petroleum products) at concentrations ranging from 0.15 to 0.75 mg/kg within the waste unit of Landfill II and correlates with the waste inventory evaluation. This suggests that the major types of waste that are present in quantities that appear to pose

Table 6. Estimated waste volumes for CFA Landfill III. (The INWMIS volume estimates for Landfill III have been adjusted to reflect that waste was also disposed to the rubble landfill from 1982 to 1984.)

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (1b)	Liquid volume (gal)
1. Trash and, sweepings	Q Office trash, paper, cardboard, plastic, glass, etc.	Q ANL, ARA, CFA, CPF, NRF, PBF, RWMC, TAN, TRA, WRTF	44,984		125
2. Cafeteria garbage	Q Used grease Q Soybean oil Q Vegetable oil Q Food waste Q Up to 70% moisture	Q ANL, CFA CPP, NRF, TAN, TRA	9,339		
3. Wood and scrap lumber	Q Wood and scrap lumber Q scrap lumber	Q ANL, ARA, CFA CPP, LOFT, NRF, PBF, RWMC, TAN, TRA, WRTF	3,947		
4. Masonry, concrete	Q Used masonry Q Used concrete	Q ANL, CFA, CPP, NRF, PBF, RWMC TAN, TRA, WRTF	2,211		
5. Scrap metal	Q Scrap metal Q Scrap metal from welding, pipe fitting Q Sheet metal operations Q Metal vehicle parts including wheels, mufflers, bearings, vehicle batteries, etc	Q ANL, ARA, CFA, CPP, NRF, PBF, RWMC, TAN, TRA, WRTF	809		
6. Weeds, grass, trees	Q Weeds, grass, and trees from landscape maintnance operations	Q ARA, CFA, CPP, NRF, TRA	217		
7. Dirt, gravel	Q Dirt and gravel from maintenance, construction, and demolition projects	Q CFA, CPP, NFR, PBF, RWMC, TRA, WRTF	0		

Table 6. (continued).

INWMIS waste category	Type of waste	Source	Solid volume (yd^3)	Solid weight (1b)	Liquid volume (gal)
8. Asphalt	- Waste asphalt from maintenance, construction, and demolition projects	- ANL, CFA, CPP, NRF, PBF, TAN, TRA	0		
9. Asbestos	- Asbestos	- ANL, CFA, CPP, NRF	88		
	- Asbestos coated materials such as pipes, etc.				
10. Other - must specify	- Asphalt and gravel	- CFA	1,697		
	- Barrels	- CPP	40		
	- Bucket boxes	- CPP	1		
	- Dirt and grass	- CFA	129		
	- Dirt and rock	- PBF	150		
	- Misc.	- CPP	5		
	- Outdated drugs	- CFA	1		
	- Resin barrels	- TRA	14		
	- Roofing materials, plastic barrels	- CFA	5		
	- Sod, weeds, and gravel	- CPP	11		
	- Weeds, gravel	- CPP	4		
96. Oil	- Asphalt	- RWMC			100
98. Chemicals	- Outdated medications	- CFA		6	
	- Paint in cans	- NRF			25
	- Paints	- CFA			30

potential contaminant sources include asphalt, oil, and oil sludge. Due to the heterogeneous nature of the waste and the limited number of boreholes, complete characterization of the landfills was not expected.

5.3.3 Vadose Zone Soil Gas

A shallow soil gas survey of Landfills I, II, and III was performed by collecting soil gas samples at a depth of approximately 4 ft. Soil gas samples were also collected from nine boreholes instrumented with gas ports at Landfills II and III. The gas ports ranged in depth from 12 to 31 ft. The soil gas samples were analyzed for volatile organic compounds and methane. Several volatile organic compounds were detected in gas samples collected from all three landfills at relatively low concentrations.

Methane, a common landfill gas, was not detected at Landfill I but was found at concentrations ranging from 14 to 120,000 parts per million (ppm) at Landfill II and 14 to 1,600 ppm at Landfill III in soil gas samples collected from 4 ft below the landfill surface. Methane was detected in only three of the nine boreholes sampled, and these concentrations were all below the LEL for methane of 53,000 ppm. Methane concentrations in the boreholes have decreased from previous sampling of these boreholes in 1988 and 1989. The presence of methane is indicative of the biological decomposition of the organic material (i.e., cafeteria waste) that was disposed to the landfills, and the concentrations detected are in compliance with EPA solid waste disposal facility criteria, where (a) the concentration of methane gas generated by the landfill does not exceed 25% of the LEL for methane at facility structures, and (b) the concentration of methane gas does not exceed the LEL for methane at the facility property boundary.

5.3.4 Leachate Migration

Analysis of salinity probe data collected from January 1988 to January 1991 at Landfills II and III was also conducted. During December 1987, a shallow drilling program was implemented at CFA Landfills II and III. The objectives of the program included monitoring hydraulic behavior of the landfill soil to quantify the amounts and rates of water movement into and through the soil profile. Nine boreholes (four at Landfill II and five at Landfill III) were drilled and instrumented with a total of 16 salinity probes. Salinity probes are used to measure the electrical conductance of soil water. Conductance is proportional to the dissolved solids or salts in the water. Leachate (water that has contacted the waste) from landfills is expected to be much higher in dissolved solids than natural soils. Therefore, the salinity probes were used to monitor for migration of leachate from the landfill. Data from these probes were collected on roughly a monthly basis from January 1988 to January 1991.

An evaluation of the salinity probe data indicated that the probes underwent a period of equilibration with the soil lasting until late summer of 1988. Data from salinity sensors in two boreholes at CFA Landfill III indicate that leachate migration may have occurred at these locations. Unfortunately, neither soil moisture content nor soil matric potential (also monitored at the landfills as part of this program) was measured in the vicinity of these boreholes. The additional data could have provided supporting evidence for leachate migration in the form of soil moisture levels and drainage amounts. Thirteen salinity sensors at the other seven borehole

locations provided little or no indication of leachate migration. Readings were within the range of values typical for saline desert soils. It was concluded that none of the probes at Landfill II indicated migration of leachates with high dissolved solids, and three of the probes (two at the same borehole) at Landfill III indicated potential migration of leachates with high dissolved solids. Soil moisture and potential leachate migration appears to be a spatially variable, localized phenomenon at the landfills.

A program was initiated under the RI to drill seven boreholes into Landfill II through the waste unit to the underlying basalt to determine if leachate is present in or below the landfill. A saturated leachate-bearing layer or perched water body was not encountered during the drilling and sampling of these boreholes, or during the previous (1987) RCRA drilling investigation at Landfills II and III. There is no record of a saturated leachate-bearing layer or perched water body being encountered during any drilling investigation conducted at these landfills at any time.

Weekly toe slope investigations of CFA Landfill II were initiated in June of 1993 and continued through September 1993, and then intermittently through October, November, and December. The investigation involved walking the slope of the landfill to check for moisture and free liquids. At no time was the visible presence of leachate observed anywhere on the landfill or the toe slope of the landfill.

5.3.5 Groundwater

Three rounds of groundwater samples were collected and analyzed from a network of 9 to 10 monitoring wells located both upgradient and downgradient from the CFA landfills and from two production wells used for drinking water at CFA. The samples were analyzed for volatile organic compounds, inorganic compounds, nitrate, sulfate, chloride, fluoride, and alkalinity.

All volatile organic compounds detected during the three phases of sampling are well below maximum contaminant levels (MCLs). No specific source of volatile organic compounds can be identified because concentrations are generally low (near or below instrument detection limits) or detected in both upgradient and downgradicnt wells. Slight differences in upgradient and downgradient concentrations noted include low concentrations (<1 Fg/L) of trichloroethylene detected in downgradient wells only and chloroform detected in downgradient wells only, but attributed to sample contamination.

Most inorganic compounds detected in the groundwater were below the inorganics' MCL with the exception of beryllium, cadmium, and lead. Beryllium was detected above the MCL of 4 Fg/L in groundwater collected from three downgradient wells during Phase I sampling at concentrations ranging from 5.8 to 9.3 Fg/L However, duplicate samples collected from two of these downgradient wells at the same time were nondetects for beryllium. Beryllium was not detected in groundwater collected from any of the wells during the Phase II sampling. Beryllium was again detected in groundwater collected from one downgradient well during the Phase III sampling at a concentration of 4.6 Fg/L However, a duplicate sample collected from this same well at the same time was also a nondetect for beryllium. The inconsistency in the data suggest that the beryllium results are possibly false positives or potential anomalies. Some possible explanations for the inconsistent beryllium data include problem with sample collection, preservation, and laboratory analysis, or possible seasonal (spring) influence on groundwater

quality. Since the samples are unfiltered, the positive beryllium results may be representative of the original metallic ion content of the silt or clay particles present in the formation and any sorption of ions to the particles from friction-related wear of the pump rather than introduced from a potential waste source, such as the landfills.

Cadmium was detected above the MCL of 5 Fg/L in groundwater collected from upgradient wells at concentrations ranging from 8 to 106 Fg/L and downgradient wells at concentrations ranging from 5.3 to 17 Fg/L during all three phases of sampling. The distribution of cadmium in both upgradient and downgradient wells, coupled with the fact that concentrations of cadmium are not significantly higher in the downgradient wells, suggests that the landfills may not be the source of cadmium in the groundwater. Background concentrations of cadmium in water from the SRPA generally are less than 1 Fg/L. Given the uncertainty of the cadmium and beryllium data, these contaminants were identified as potential contaminants of concern and were quantitatively assessed in the human health risk assessment.

Lead was detected above the action level of 15 Fg/L in groundwater collected from upgradient well LF 3-11 at a concentration of 56.7 Fg/L during the Phase II sampling. Detections of lead in downgradient wells were below the action level. Prior to 1984, approximately 340 lb of lead was disposed to wastewater discharged at ICPP, a facility upgradient of the landfills. The wastewater was discharged to the ICPP injection/disposal well. (The source of this information on lead disposal, as cited in the Remedial Investigation report, is "Orr, B.R. and L.D. Cecil, 1991, Hydrologic Conditions and Distribution of Selected Chemical Constituents in Water, Snake River Plain Aquifer, INEL, Idaho 1986 to 1988, U.S. Geological Survey Water-Resources Investigations Report 91-4047, DOE/ID-22096, p. 44.") Because lead was detected in upgradient wells and not significantly higher in downgradient wells, and a known upgradient source exists, its presence in the groundwater is considered to be unrelated to the CFA landfills.

Nickel was detected above the risk-based screening concentration of 70 Fg/L in upgradient well LF2-11 at a concentration of 99 Fg/L during Phase II sampling and in downgradient well LF2-12 at a concentration of 117 Fg/L during Phase III sampling. However, the filtered sample collected from this downgradient well was a nondetect for nickel, and it was not detected in groundwater collected from this well during the Phase I and II sampling. The inconsistency in the data suggests that the nickel result is possibly a false positive or potential anomaly. For example, particulate nickel may have been introduced into the water pumped from this well due to friction related wear inside the pump.

Zinc was detected in one upgradient well and one downgradient well at concentrations of 35,500 and 1,380 Fg/L, respectively, during Phase II sampling, and in one upgradient and one downgradient well at concentrations of 1,050 and 2,370 Fg/L, respectively, during the Phase III sampling. These concentrations are above the risk-based screening concentration of 1,000 Fg/L

The chloride, fluoride, nitrate, and sulfate concentrations during Phase I, II, and III sampling events were all below their respective primary or secondary MCLs and within the range of background concentrations common to the SRPA under the INEL

5.3.6 Air

Volatile organic compound emission-rate measurements were taken from the surface of all three landfills using a surface flux chamber and sorbent cartridges. Emissions are very low (0.0089 to 1.6 Fg/m^2/min and similar in terms of type and level of emissions for the locations tested on all three landfills. Methane was not detected in air emanating from the surface of these landfills. Volatile organic compounds measured at Landfill I include acetone, benzene, methylene chloride, 1,1-dichloroethene, 1,1,1-trichloroethane, toluene, tetrachloroethene, and trichloroethene. Volatile organic compounds measured it Landfill II include acetone and dichlorodifluoromethane. Volatile organic compounds measured at Landfill III include acetone, dichlorodifluoromethane, and toluene. The emissions from the landfills are well below risk-based screening levels and do not pose a health hazard to the public or workers.

6. SUMMARY OF SITE RISKS

The human health risk assessment for the CFA landfills evaluated potential adverse health effects associated with exposure to contaminants of concern detected at the landfills under the no-action alternative for both present workers and potential future residents. The risk assessment was conducted in accordance with EPA *Risk Assessment Guidance for Superfund, Volume I: Human Health EvaluationManual and Volume II: Environmental Assessment Manual* and other EPA guidance. The risk assessment methods and results are summarized in the following sections. More detailed information may be found in the "Remedial Investigation/Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory."

6.1 Human Health Risks

The human health risk assessment consisted of identifying contaminants of potential concern, an exposure assessment, a toxicity assessment, a risk characterization, and an uncertainty analysis. Contaminants of concern were identified based on field investigations, which were conducted to characterize surface soil, groundwater, and air emissions for the landfills, and waste inventory records. The exposure assessment detailed the exposure pathways that exist at the site for current workers and potential future residents. The toxicity assessment documented the adverse health effects to an individual as a result of exposure to a site contaminant. The human health risk assessment evaluated both noncarcinogenic health effects and carcinogenic risks associated with exposure to site contaminants. Although this risk assessment was performed, uncertainties (see Section 6.1.4) in the source term and the inability to fully characterize the landfills were the primary factors in considering remedial action to be taken at these landfills.

6.1.1 Identification of Contaminants of Concern

Chemical contaminant data from field investigations conducted for the CFA landfills surface soil, groundwater, and air emissions were evaluated to determine the most significant site-related contaminants of potential concern for use in the quantitative risk assessment. Contaminants of concern identified in the surface soft from the cover of Landfill I include beryllium, benzo(a)pyrene, and cobalt-60. Contaminants of concern identified in the surface soil from

Landfill II include the PAHs benzo(a)anthracene, benzo(a)pyrene, chrysenc, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. No contaminants of concern were identified in the surface soil from the cover of Landfill III.

Three rounds of groundwater samples were collected from the landfill monitoring wells and two production wells used as a drinking water source at CFA. Beryllium, cadmium, and zinc were identified as contaminants of concern for the groundwater pathway. Future groundwater concerns, as a result of potential future leaching of the source term to the groundwater, were addressed through modeling and indicated no unacceptable groundwater health risk to potential future residents. Therefore, no additional contaminants of concern were included with the groundwater pathway. However, uncertainties exist in the modeling due to limited field data and incomplete source term inventory information.

Volatile organic compound emission rate measurements were taken at the surface of all three landfills. The emissions from CFA Landfills I, II and III are very low and do not pose a health threat to the public or workers. No contaminants of concern were identified for the air pathway.

6.1.2 Exposure Assessment

The objective of the exposure assessment was to estimate the type and magnitude of exposures to the contaminants of concern identified for the media associated with the CFA landfills. The exposure assessment identified potentially exposed populations and exposure pathways, estimates of exposure concentrations, and estimates of contaminant intakes for exposure pathways.

6.1.2.1 Potentially Exposed Populations. The potentially exposed populations identified include current site worker and potential future residents that may inhabit the site when DOE relinquishes control of the site (approximately 30- and 100-year scenarios).

6.1.2.2 Exposure Pathways. An exposure pathway describes the course a contaminant takes from the source to the exposed individual. The current land use scenario evaluated the exposure of workers to the incidental ingestion of soil from the cover of CFA Landfills I and II external exposure to cover soil at CFA Landfill I, and ingestion of groundwater pumped from the CFA production wells. The future land use senario evaluated the exposure of potential future residents to the incidental ingestion of soil from the cover of CFA Landfills I and II, external gamma radiation exposure to cover soil at CFA Landfill I, and ingestion of groundwater pumped from the downgradient monitoring wells and the CFA production wells. Exposure to inhalation of dust was not evaluated because it is not considered a viable pathway due to the depth of the contaminants.

6.1.2.3 Exposure Concentrations. The validated analytical results of soil collected from the cover of CFA Landfill I and II were used to estimate the reasonable maximum exposure (RME), which is the greatest exposure that could reasonably be expected to occur at the site. Tbe RME concentration was determined by the 95% upper confidence limit (UCL) on the arithmetic mean of the measured contaminant concentrations from the CFA Landfill I and II cover soil. Exposure concentrations in groundwater for the current industrial scenario were based on the three phases of 1993 validated water quality data for the CFA production wells, whereas

exposure concentrations in groundwater for future residents were based on the three phases of 1993 validated water quality data for the downgrading monitoring wells and the CFA production wells. The RME concentration for workers was determined by the 95% UCL on the arithmetic mean of the measured contaminant concentrations for the CFA production wells. The RME concentration for future residents was determined by the 95% UCL on the arithmetic mean of the measured contaminant concentrations for the downgradient monitoring wells and CFA production wells. The RME factors used in the risk assessment can be found in Table 6-16 of the Remedial Investigation report.

6.1.3 Risk Characterization

The objective of the risk characterization, the final step in the overall risk assessment process, is to integrate the results of the exposure assessment and the toxicity assessment to estimate risk to humans from exposure to site contaminants. The toxicity and exposure assessments are summarized and integrated into quantitative expressions of risk. The carcinogenic effects or probability that an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response relationships. Noncarcinogenic effects are characterized by comparing projected intakes of substances to toxicity values.

The calculation of health risks from the potential exposure to carcinogenic contaminants involves multiplying the pathway-specific slope factor (SF) for each carcinogen by the estimated chronic intake value. The risk is expressed probabilistically and is compared to the acceptable NCP risk range of 1 in 10,000 to 1 in 1,000,000 (i.e., 1×10^{-4} to 1×10^{-6}). An excess lifetime cancer risk of 1 in 10,000 indicates that an individual has one excess chance in ten thousand of developing cancer over a lifetime of exposure to a site-related contaminant.

The chronic reference dose (RfD) is used to compare toxic effects of noncarcinogenic contaminants. The hazard potential from toxic effects is computed as the ratio of estimated chronic intake to the pathway-specific RfD, and is referred to as the hazard quotient. Hazard quotients less than 1.0 indicate that intake is less than the RfD. The sum of the hazard quotients is equal to the hazard index. The hazard quotient or index should be interpreted as an index of relative health hazard and does not provide a probabilistic expression of risk. A value less than or equal to 1.0 indicates that it is unlikely for even sensitive subpopulations to experience adverse health effects. A value greater than one requires further considerations and risk management decisions.

6.1.3.1 Current Industrial Use. Health risks were calculated for a current industrial scenario where the workers incidentally ingest soil from the cover of CFA Landfills I and II, external gamma radiation exposure to soil at CFA Landfill I, and ingest water from the CFA production wells. As shown in Table 7, the potential risk for incidental ingestion of soil contaminated with benzo(a)pyrene and beryllium is 3×10^{-7} and 1×10^{-6}, respectively. The external gamma radiation exposure of cobalt-60 contaminated soil at CFA Landfill I is 5×10^{-6}. The ingestion of groundwater contaminated with beryllium is 7×10^{-5}. All potential risks are within or below the accepted risk range of 1×10^{-4} to 1×10^{-6}. As shown in Table 7, the hazard quotient for toxic effects from ingesting groundwater contaminated with cadmium and zinc is 0.1 and 0.0008, respectively. These values and the total hazard index are much less than 1.0, indicating that it is unlikely that workers will experience adverse health effects.

Table 7. Summary of potential carcinogenic risks and noncarcinogenic hazard quotients for CFA Landfills I, II, and III.

Exposure pathway	Contaminant of concern	Current worker risk	Future resident risk[b]
Landfill I			
External exposure	Cobalt-60	5×10^{-6}	5×10^{-11}
Soil ingestion	Beryllium	1×10^{-6}	1×10^{-5}
	Benzo(a)pyrene	4×10^{-7}	4×10^{-6}
Groundwater ingestion	Cadmium	0.1[a]	0.4[a]
	Zinc	0.0008[a]	0.04[a]
Landfill II			
Soil ingestion	Benzo(a)pyrene	3×10^{-7}	7×10^{-7} (adult) 2×10^{-6} (child)
Groundwater ingestion	Beryllium	7×10^{-5}	2×10^{-4}
	Cadmium	0.1[a]	0.4[a]
	Zinc	0.0008[a]	0.04[a]
Landfill III			
Groundwater ingestion	Cadmium	0.1[a]	0.4[a]
	Zinc	0.0008[a]	0.04[a]

a. Estimates of noncarcinogenic risks, in the form of hazard quotients, are all less than 1, indicating that it is unlikely even for sensitive subpopulations to experience adverse health effects.

b. The future resident (both 30- and 100-year) RME concentrations were determined by the 95% UCL on the arithmetic mean of the measured contaminant concentrations from the landfill cover soil and the downgradient wells and the CFA production wells.

Note: Even though the risk assessment indicates that the landfills do not currently present an unacceptable risk to human health, a remedial action of containment is warranted at the site due to the uncertainty associated with the waste regarding the types and amounts of potentially hazardous waste disposed.

6.1.3.2 Future Residential Use. Health risks were calculated for a future residential scenario (both 30- and 100-year) where the residents incidentally ingest soil from the cover of CFA Landfills I and II, external gamma radiation exposure to soil at CFA Landfill I, and ingest groundwater pumped from downgradient monitoring wells and CFA production wells. As shown in Table 7, the potential risk for incidental ingestion of soil contaminated with benzo(a)pyrene and beryllium is 2×10^{-6} and 1×10^{-5}, respectively. The external gamma radiation exposure risk of cobalt-60 contaminated soil at CFA Landfill I is 5×10^{-11}. The potential risk for ingestion of groundwater contaminated with beryllium is 2×10^{-4}. All potential future risks are within or below the accepted risk range of 1×10^{-4} to 1×10^{-6} with the exception of the potential future risk of 2×10^{-4} for the ingestion of groundwater contaminated with beryllium. It is important to note that this potential future risk is based on beryllium groundwater results that are considered false positives or potential anomalies and therefore is not considered a driver for action (see note in Table 7). As shown in Table 7, the hazard quotient for toxic effects from ingesting groundwater contaminated with cadmium and zinc is 0.4 and 0.04, respectively. These values and the total hazard index are much less than 1.0, indicating that it is unlikely residents will experience adverse health effects.

6.1.4 Uncertainty

In this risk assessment, methodologies are employed to evaluate the risks to human health from contaminants of concern detected in the groundwater and the soil cover of CFA Landfills I and II. It should be recognized that such risk assessment methodologies represent an inexact science, and their application is associated with uncertainties. Uncertainties arise because of the need to make assumptions and inferences to compensate for the unknowns or lack of data. Table 8 summarizes the major uncertainties in this risk assessment.

Although there are considerable sources of uncertainty in the risk assessment methodology, the consistent adoption of conservative assumptions and parameter values, and adherence to EPA guideline recommendations are considered to have provided reasonable estimates of risk that are currently posed by the site. However, due to the heterogeneous nature of the waste, complete characterization of the landfill contents was and is not expected. Therefore, future use of the landfills that may involve excavation of the landfill subsurface materials could increase risks of exposure to contaminants (via inhalation, ingestion, and dermal contact) for potential future construction workers and residents. Furthermore, uncertainty in the source term (i.e., waste inventory) used in the groundwater modeling contributes to uncertainty in the potential future groundwater health risk.

6.2 Environmental Risk Assessment

This environmental risk assessment is a qualitative appraisal of the potential effects of the CFA landfills on plants and animals other than people and domesticated species. A quantitative environmental assessment is scheduled to be performed as part of the INEL-wide comprehensive RI/FS tentatively scheduled for 1998 and may also be performed as part of the overall WAG 4 comprehensive RI/FS. This assessment is a cursory look at the potential impacts to ecological receptors from present conditions at the CFA landfills. The assessment identifies sensitive nonhuman and nondomesticated species and characterizes potential exposure pathways, including

Table 8. Summary of major uncertainty factors associated with the CFA Landfills baseline risk assessment.

Uncertainty factor	Effect on risk assessment[a]		
	Potential magnitude for over-estimating risk	Potential magnitude for under-estimating risk	Potential magnitude for over or under-estimating risk
Environmental sampling and analysis			
Sufficient samples may not have been taken to fully characterize the landfills		Med	
Systematic or random errors in the chemical analyses			Low
Representativeness of samples			Low
Field sampling errors			Low
Heterogeneity of sample matrix			Low
Estimating exposure parameter			
Use of EPA RME values	Low		
Exposure of INEL workers	Med		
Exposure of future residents			Med
Toxicity Assessment			
Use of EPA values	Low		
Lack of SFs for some contaminants		Low	

a. Uncertainty factors marked low may affect estimates of risk by less than one order of magnitude; assumptions marked moderate may affect estimates of risk between one and two orders of magnitude; and assumptions marked high may affect estimates of risk by more than two orders of magnitude. The qualitative ratings are based on best professional judgement and do not represent an actual quantitative analysis of uncertainty.

dermal contact with contaminated soil, inhalation of soil dust, and the ingestion of contaminated plants or animals in the study area. The data for this environmental assessment were developed from a review of existing literature. No site-specific field sampling or receptor study was performed for this assessment.

6.2.1 Contaminants of Concern

Contaminants of concern detected in cover soils at CFA Landfills I and II include PAHs such as benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These contaminants will be discussed from an ecological perspective.

6.2.2 Exposure Assessment

The three principal direct routes of exposure for terrestrial and avian species are ingestion, inhalation, and dermal contact. The major route of exposure to PAHs for ecological receptors at the landfills is likely dermal contact with subsurface contaminated soil. This exposure would be limited to burrowing animals such as Townsend's ground squirrel, deer mouse, and kangaroo rat. Subsequently, the species that use these burrowing animals as a food source, such as coyotes or birds of prey, would also be at risk from ingestion of contaminated food sources. Transport of pronghorn antelope or sage grouse is also possible; however, use of the area by game species is probably minimal due to poor vegetation cover and proximity to areas of human activity. Moreover, the small proportion of landfill acreage in comparison to typical game species total ranges and by the taking of prey outside the area of influence of the landfills would preclude significant bioconcentration in game species. Inhalation of contaminated fine soil particles, also by burrowing animals, may also be important. Another possible exposure route is ingestion of contaminated soil.

6.2.3 Risk Characterization

PAHs, compounds found in asphalt and petroleum distillates, are byproducts of the burning of organic material, and as such, are common in the environment. PAHs identified as contaminants of concern in this study are carcinogens, with a weight-of-evidence class of B2, probable human carcinogen with sufficient evidence of carcinogenicity in animals with inadequate or no evidence in humans. Benzo(a)anthracene produced tumors in mice at the site of application, and chrysene produced malignant tumors of the liver, lung, lymphatic system, and skin in mice. Since most PAHs are carcinogenic to a varying extent, they may present a risk of cancers to burrowing animails who come in contact with or ingest the PAHs.

6.2.4 Conclusions and Limitations

This environmental risk assessment provides a broad overview of possible exposure of the ecosystem to the potential contaminants of concern. The contaminants (PAHs) are limited in distribution; thus, any effect that could be identified would likely be in an individual organism and not a population or community. Moreover, PAHs are typically immobile in soils and are less likely to be transferred through the food chain. These factors, combined with the lack of water, vegetation, and habitat value for wildlife in the area of the CFA landfills, are likely to limit uptake and accumulation of contaminants in the food chain. There are no known endangered or

threatened species residing year-round at the INEL (although they may be found visiting the area), and no known critical habitats. In summary, the contaminants in the CFA landfills are not considered to have any significant disruptive effects on animal or plant populations or the local ecosystem.

Limitations to this qualitative ecological assessment include lack of site-specific information on the exposure frequency, duration, and routes of exposure for terrestrial species to potential contaminants of concern. Also, without adequate toxicity data, the ecological risk of PAHs in the CFA landfills cannot be quantitatively determined.

7. DESCRIPTION OF ALTERNATIVES

The remedial investigation of OU 4-12 indicated that the overall risk associated with the landfills is within the generally acceptable limits of CERCLA, however, due to the uncertainty associated with the landfill contents with regard to the types and amounts of potentially hazardous waste disposed and the need for containment of the landfill contents, a remedial action of containment is warranted for the site. Remedial action of containment is consistent with EPA's presumptive remedy guidance for CERCLA municipal landfills. As such, remedial action alternatives were developed and analyzed in detail for the CFA landfills. Prior to developing alternatives, remedial action objectives (RAOs) were established. These objectives and descriptions of developed alternatives are included in the following sections.

7.1 Remedial Action Objectives

The intent of the RAOs is to set goals for protection of human health and the environment that are consistent with EPA's presumptive remedy guidance. The goals for the CFA landfills are designed specifically to lessen the potential threat (i.e., maintain risk factors within acceptable limits) to human health and the environment posed by direct contact with and migration of contaminants disposed at the CFA landfills. The attainability of RAOs is addressed through the detailed evaluation of overall protectiveness afforded by each remedial action alternative.

In order to identify appropriate RAOs, risks associated with the landfills had to be evaluated. As indicated by the risk assessment presented in Section 6, the present risk associated with the CFA landfills is within the generally acceptable limits of CERCLA (i.e., the landffils do not pose a significant threat to human health and the environment), and the risk as quantified does not warrant an action at the CFA landfills. However, as is typical for landfills, there is a level of uncertainty in characterizing potential future risk, particularly related to the potential for contaminant migration via leachate generation and cover erosion. As such, the RAOs derived for the landfills focus on reducing concerns about potential risk that could not clearly be evaluated as part of the investigation of the landfills. The RAOs include:

- Prevent direct contact with the landfill contents.
- Minimize the potential for erosion and infiltration at the surface.

- Ensure that drinking water standards are not exceeded in the SRPA due to the migration of contaminants from the landfills.

These RAOs were developed to prevent future unacceptable risk from exposure to landfill contaminants, rather than to address any existing unacceptable risk. Adherence to these RAOs is consistent with a presumptive remedy approach that is typical for CERCLA municipal landfills.

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the Feasibility Study (FS) identified and evaluated alternatives in terms of achieving the stated RAOs. The alternatives evaluated in the FS for the CFA landfills were:

- Alternative 1 - No Action with Monitoring.

- Alternative 2 - Institutional Controls with Monitoring.

- Alternative 3 - Uniform Containment with Native Soil Cover, Institutional Controls, and Monitoring.

- Alternative 4 - Containment with Single-Barrier Cover, Institutional Controls, and Monitoring.

The remedial action alternatives were developed by combining process options evaluated in the FS in a manner that focused alternatives on institutional controls and components of a CERCLA municipal landfill presumptive remedy. The No Action alternative was developed to provide a baseline against which other alternatives could be compared.

Substantive Federal and state action-specific applicable or relevant and appropriate requirements (ARARs) have been identified for the alternatives. These ARARs and significant to-be-considered (TBC) criteria are listed in Table 9. The primary ARAR relates to landfill closure under RCRA, as implemented by the State of Idaho under the Idaho Hazardous Waste Management Act (hereinafter, this Idaho statute will be referred to as RCRA). These RCRA requirements were determined to be relevant and appropriate, rather than applicable, because there is no conclusive evidence that RCRA-hazardous; waste was disposed to the landfills after the promulgation of the RCRA Subtitle C requirements for hazardous waste. Consideration of the RCRA requirements as relevant and appropriate allows for a combination of requirements for landfill closure. The agencies have determined that, based on characteristics of the CFA landfills and potential remedial action alternatives, "hybrid" landfill closure procedures in CERCLA are suitable.

The substantive RCRA requirements identified as ARARs focus on cover design and include the following primary objectives:

- Provide long-term minimization of migration of liquids.

- Function with minimum maintenance.

Table 9. Summary of ARARs and TBC criteria for CFA landfill alternatives.

Statue	Regulation or Title	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3 Containment with Native Soil Cover	Alternative 4 Containment with Single Barrier Cover
Idaho Hazardous Waste Management Act, 1983 and as amended	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, IDAPA § 16.01.05.008 "Landfills, Closure and Post-Closure Care" (derived from 40 CFR 264.310)	R/No	R/No	R/Yes	R/Yes
Idaho Environmental Protection and Health Act, 1972 and as amended	Rules for the Control of Fugitive Dust and General Rules, IDAPA Sections 16.01.01.650 and .01.651	Not ARAR	Not ARAR	A/Yes	A/Yes
	Presumptive Remedy for CERCLA Municipal Landfill Sites, OSWER Directive 9355.0-49	TBC	TBC	TBC	TBC
	RCRA ARARs: Focus on Closure Requirements, OSWER Directive 9234.2-04FS	TBC	TBC	TBC	TBC
	Evaluating Cover Systems for Solid and Hazardous Waste (Revised), OSWER Directive 9476.00-1	TBC	TBC	TBC	TBC

Yes/No = meets or does not meet ARARs.
A = applicable.
R = relevant and appropriate.
TBC = to be considered.

- Promote drainage and minimize erosion.
- Accommodate settling and subsidence.
- Provide a hydraulic conductivity less than or equal to any bottom liner system or natural subsoils present.

In addition, RCRA monitoring requirements deemed by the agencies to be appropriate during remedial design will be met.

There were no chemical-specific ARARs identified for the considered alternatives. Regulations have not been promulgated specific to soil cleanup levels for contaminants that may be present in soils at the CFA landfills. Also, no location-specific ARARs were identified as there are no known threatened and endangered species, wetlands, rivers, or floodplains located in the area of potential remedial activities under the considered alternatives. Areas that may be impacted by the considered alternatives include soil borrow areas. Borrow areas at the INEL have been evaluated through an environmental assessment, which determined that these areas do not impact historical and cultural properties, nor do they impact archeological resources.

7.3 Alternative 1 - No Action with Monitoring

Consideration of the No Action alternative is required by the NCP [40 CFR 300.430(e)(6)] as a baseline against which other alternatives are compared. Under this alternative, no attempt would be made to contain the contents of the CFA landfills. The only action taken under this alternative would be groundwater monitoring. The agencies would review this action, including the need for continued monitoring and the frequency and scope thereof, within 5 years and every 5 years thereafter. A monitoring plan, developed by the agencies, would define the wells that would be monitored, parameters to be monitored, frequency of monitoring, and reporting requirements. Access to the site and possible exposure to site surface soils would not be prevented under this alternative beyond the period during which DOE maintains control of the landfill area (assumed to be 30 years).

Alternative 1 would not meet the substantive relevant and appropriate requirements of RCRA, as implemented by the State of Idaho, identified in Table 9. These requirements focus on cover design and are summarized in Section 7.2. Alternative 1 would not meet the requirement that the cover promote drainage and minimize erosion as it does not include measures to provide for even runoff of precipitation. Net present value costs for implementing groundwater monitoring (30 years assumed) under this alternative are estimated to be $968,000.

7.4 Alternative 2 - Institutional Controls with Monitoring

In addition to groundwater monitoring as described for Alternative 1, this alternative would consist of infiltration monitoring and institutional controls including fencing, which would be implemented after DOE's institutional control period (assumed to be 30 years) to prevent access to the site and future disturbance of the site soils. Potentially, enforcement of institutional controls may be by a party other than the DOE. Alternative 2 takes no steps to minimize the

potential for contaminant migration. Actual monitoring locations and frequency would be identified in a monitoring plan that would be developed as part of the design for this alternative. The need for continued infiltration monitoring would be reviewed along with the groundwater monitoring review as described for Alternative 1. For cost estimating purposes, it was assumed that neutron probe and lysimeter probe analyses would be performed monthly and semiannually, respectively, at 18 locations within the landfills. Five of the neutron probe boreholes already exist.

Alternative 2 would not meet the substantive relevant and appropriate requirements of RCRA, as implemented by the State of Idaho, identified in Table 9. These requirements focus on cover design and are summarized in Section 7.2. Alternative 2 would not meet the requirement that the cover promotes drainage and minimizes erosion as it does not include measures to provide for even runoff of precipitation. Net present value costs for implementing groundwater and infiltration monitoring (30 years assumed) and installing a fence around the landfills at the end of DOE's control of the site are estimated to be $1,940,000.

7.5 Alternative 3 - Uniform Containment with Native Soil Cover, Institutional Controls, and Monitoring

This alternative would ensure a minimum thickness of at least 2 ft of clean, compactable, native (i.e., found at or near the INEL) soils cover the entire surface area of the CFA landfills. This cover of native soil would prevent surface exposure to contaminants in the landfill areas. The cover would also be constructed to prevent migration of contaminants through dust emissions or runoff erosion and reduce infiltration and the potential for contaminant migration. The soil layer would be graded to allow efficient rainwater runoff, and natural vegetation would be planted to stabilize the soil surface and promote evapotranspiration. Existing soil cover material would be incorporated in the minimum 2-ft final cover thickness. It is expected that up to 55,000 yd^3 of native soil would have to be brought to the landfills from a source at the site in order to accomplish the appropriate grading and cover thickness. Grading activities would include measures to minimize dust generation. The volume of 55,000 yd^3 is an estimate based on data available from the remedial investigation. Also, the thickness of two feet is considered to provide an appropriate level of protection in conjunction with institutional controls against direct exposure at this site and is considered a typical native soil cover thickness for CERCIA municipal landfills (Design and Construction of RCRA/CERCLA Final Covers, EPA/625/4-91/025). This type of cover would not include an impermeable layer over the landfill contents; therefore, the accumulation of landfill gas is not likely to be a concern.

Administrative controls such as placing written notification of this remedial action in the facility land use master plan would also be required to ensure that potential future activities would not compromise the integrity of the cover. A copy of the notification would be given to the Bureau of Land Management (BLM) together with a request that a similar notification be placed in the BLM's property management records for this site. Borders would be delineated through the posting of signs warning of the landfills' existence and potentially contaminated soils.

Groundwater monitoring as described for Alternative 1 would be implemented under Alternative 3 after the placement of the native soft cover. Alternative 3 would also include

measures to monitor infiltration as described for Alternative 2. Routine maintenance of the cover would continue as needed. The agencies will review this action, including the need for continued monitoring and the frequency and scope thereof, within 5 years and every 5 years thereafter.

Alternative 3 would meet the substantive relevant and appropriate requirements of RCRA, as implemented by the State of Idaho, identified in Table 9. These requirements focus on cover design and are summarized in Section 7.2. This alternative would also meet the requirements for control of fugitive dust through engineered methods to minimize dust generation. Net present value costs for implementing all of the elements described above are estimated to be $3,500,000, which assumes a 30-year groundwater and infiltration monitoring period.

7.6 Alternative 4 - Containment with Single-Barrier Cover, Institutional Controls, and Monitoring

This alternative involves placing a single-barrier cover over the entire surface area of each of the CFA landfills. The cover would be constructed of either 2 ft of impermeable clay or a geomembrane layer (for purposes of evaluation, it was assumed that a clay layer would be used with the clay being a mixture of imported bentonite and native local soils). Two feet of clay is standard for impermeable covers at landfills (Design and Construction of RCRA/CERCLA Final Covers, EPA/625/4-91/025). The 2-ft thickness is necessary to maintain the clay layer's integrity over the long term. Prior to placement of the clay layer, the landfill area would be surveyed to ensure a minimum of 12 in. of compacted native soil bedding layer was in place. Thirty inches of native soil would be placed on top of the clay and the area revegetated with indigenous species. This impermeable type of cover would prevent surface exposure to contaminants in the landfill areas as well as greatly reduce water infiltration through the landfill contents. As with the native soil cover described for Alternative 3, this cover would prevent migration of contaminants via dust emissions or runoff erosion. The top native soil layer would be graded to allow efficient rainwater runoff. Grading activities would include measures to minimize dust generation. The total amount of bentonite that would be required is approximately 20,000 tons (based on a 10% blend with native soils), while the total amount of native soil required would be approximately 350,000 tons (approximately 260,000 yd^3).

It is common practice to manufacture a clayey material by blending local soils with imported bentonite when local clay soils are not available. In general, silt and silty sand soils with few gravel or cobble-sized particles are used in blending a clay cover. Poorly graded, sandy soils with abundant oversized particles are generally unsuitable for blending. Granular bentonite is typically imported by rail or truck from quarries in Wyoming.

Selected local soils can be mixed with approximately 10% granular bentonite and sufficient water to allow compaction. The specific proportions to be used at the CFA landfills would require determination by a laboratory testing program after the native soil site is identified. Blending can be achieved at the site with a pugmill or other specialized mixing equipment. The material would then be placed on a prepared subgrade and compacted with a sheepsfoot compactor or other equipment capable of providing "kneading" compaction.

Administrative controls and posting of signs would be included with this alternative as described for Alternative 3; groundwater monitoring would be implemented as described for Alternative 1; and infiltration monitoring would be implemented as described for Alternative 2. Soil vapor monitoring would also be a component of this alternative. Because the cover would include an impermeable layer over the landfill contents, landfill gas could potentially accumulate to unsafe levels. Soil vapor monitoring would provide early indication of such an accumulation of gas. This monitoring could be ceased over time if the landfill gas levels remain low. It was assumed that soil vapor monitoring would continue for 30 years after cap installation at five passive vents located at each landfill; however, the need for the soil vapor monitoring would be reviewed every 5 years. If gas was to accumulate to unsafe levels, then additional vents could be installed. Routine cover maintenance would continue as necessary. The agencies will review this action, including the need for continued monitoring and the frequency and scope thereof, within 5 years and every 5 years thereafter.

Alternative 4 would meet the substantive relevant and appropriate requirements of RCRA, as implemented by the State of Idaho, identified in Table 9. These requirements focus on cover design and are summarized in Section 7.2. This alternative would also meet the requirements for control of fugitive dust through engineered methods to minimize dust generation. Net present value costs for implementing all of the elements described above are estimated to be $15,200,000, which assumes 30 years of groundwater, infiltration, and soil vapor monitoring.

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires that each remedial alternative be compared according to nine evaluation criteria that have been developed to serve as a basis for conducting the detailed analyses of alternatives and selecting an appropriate remedial action. The evaluation criteria are divided into three categories: (1) threshold criteria that relate directly to statutory findings and must be satisfied by each chosen alternative. (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction of toxicity, mobility, and volume, and cost, and (3) modifying criteria that measure the acceptability of the alternatives to state agencies and the community. The following sections summarize the evaluation of the candidate remedial alternatives according to them criteria.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs.

8.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether an alternative provides protection of human health and the environment and includes an assessment of how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. As noted in Section 7.1, the remedial investigation of OU 4-12 indicated that the current risk associated with the landfills is within the generally acceptable limits of CERCLA;

however, there is a significant level of uncertainty in characterizing the landfill contents. Thus, an effort to reduce the potential for future unacceptable risks is the focus of RAOs for the landfills.

Alternatives 3 and 4 achieve the RAOs identified in Section 7.1, thus satisfying the criterion of overall protection of human health and the environment. The alternatives accomplish this by eliminating the direct exposure pathways (i.e., contact with landfill waste and/or contaminated soils) and reducing the potential for contaminant migration via mechanisms such as erosion at the surface and infiltration. Through institutional controls, Alternative 2 achieves the RAO to eliminate direct exposure pathways. However, Alternative 2 does not include measures to reduce the potential for contaminant migration at the surface or to the SRPA. Alternative 1, No Action, does not achieve the RAOs.

Overall, Alternatives 3 and 4 would significantly reduce the potential for unacceptable risk at the CFA landfills. As such, the residual risk associated with Alternatives 3 and 4 is believed to be acceptable (i.e., fall within or below the acceptable risk range of 10^{-4} to 10^{-6}). Under Alternative 2, there is a potential that unacceptable risk would remain because Alternative 2 takes no action to minimize contaminant migration; however, Alternative 2 does include measures to eliminate direct exposure pathways. Alternative 1, No Action, takes no steps to prevent erosion at the surface and possible subsequent infiltration, nor does it eliminate direct exposure pathways. Therefore, it does not reduce the potential for future unacceptable risks that may occur. Thus, Alternative 1 is not considered to be protective of human health and the environment.

8.1.2 Compliance with ARARs

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with identified substantive applicable requirements identified under Federal and state laws. Remedial actions must also comply with the substantive requirements of laws and regulations that are not directly applicable but are relevant and appropriate, in other words, requirements that pertain to situations sufficiently similar to those encountered at a Superfund site so that their use is well suited to the site. Combined, these are referred to as applicable or relevant and appropriate requirements or ARARs. State ARARs are limited to those requirements that are (1) promulgated, (2) uniformly applied, and (3) are more stringent than Federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, action-, and location-specific requirements.

Alternatives 3 and 4 meet all of the substantive relevant and appropriate requirements of RCRA identified in Table 9. The requirements considered relevant and appropriate are action-specific focusing on cover design and include-the following primary objectives:

- Provide long-term minimization of migration of liquids.
- Function with minimum maintenance.
- Promote drainage and minimize erosion.
- Accommodate settling and subsidence.

- Provide a hydraulic conductivity less than or equal to any bottom liner system or natural subsoils present.

Alternatives 1 and 2 do not meet the substantive relevant and appropriate requirements identified under RCRA as neither of these alternatives provide a cover designed to promote drainage and minimize infiltration. Alternatives 3 and 4 would meet applicable fugitive dust requirements through engineered controls.

8.2 Balancing Criteria

The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five-balancing criteria are (1) long-term effectiveness and permanence, (2) reduction of toxicity, mobility, or volume through treatment, (3) short-term effectiveness, (4) implementability, and (5) cost. Each criterion is further explained in the following sections.

8.2.1 Long-Term Effectiveness and Permanence

This criterion evaluates the long-tem effectiveness of alternatives in maintaining protection of human health and the environment.

Alternative 4 would provide the greatest level of long-term effectiveness and permanence because of its engineered cover that includes a clay layer. The single-barrier cover developed under Alternative 4 would minimize the potential for direct exposure to the landfill contents and the potential for contaminant migration over a longer period of time than the other alternatives considered. Alternative 3 would provide greater long-term effectiveness and permanence than Alternative 2. The grading and placement of native soil as a cover under Alternative 3 would increase the long-term effectiveness and permanence beyond that afforded by institutional controls only. Alternative 1, No Action, would provide the lowest level of long-term effectiveness and permanence relative to the other alternatives.

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives afford any reduction of toxicity, mobility, or volume through treatment as no elements of treatment are included in any of the alternatives.

8.2.3 Short-Term Effectiveness

In general, the alternatives requiring the least amount of on-site worker activity (e.g., construction) would provide the greatest degree of short-term effectiveness because they pose the least amount of risk to site personnel and the public during remediation activities. On this basis, since the landfills in their current condition pose no immediate threat to human health or the environment, Alternative 1, No Action, ranks the highest of the alternatives considered. Alternative 4 includes activities that pose the most significant risk to worker and public health during implementation (e.g., trucking operations to transport clay materials to the INEL). Activities associated with Alternative 3 would pose less risk to worker and public health than Alternative 4 but more risk than Alternative 2.

8.2.4 Implementability

Each of the alternatives considered is implementable. Alternative 1, No Action, is the most readily implementable as it would require no activities other than groundwater monitoring (an element of each of the developed alternatives). Alternative 4 is the least implementable because it has the most complex construction requirements, and materials needed for the clay layer must be obtained from off-site resources. Alternative 3 is more readily implementable than Alternative 4 but less implementable than Alternative 2.

8.2.5 Cost

In evaluating project costs, an estimation of the net present value of capital costs and post-closure costs is required. In accordance with CERCLA guidance (Superfund Decision Document, EPA, 1992), the costs presented are estimates (i.e., -30% to +50%). Actual costs could vary based on the final design and detailed cost itemization. The cost estimates for the alternatives analyzed for the CFA landfills are presented in Table 10. Capital costs include materials and construction; post-closure costs include monitoring. While Alternative 4 slightly increases overall protection of human health and the environment, Alternative 3 achieves the RAOs at a significantly lower cost.

8.3 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. For both of these criteria, the factors that are considered include the elements of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

8.3.1 State Acceptance

The IDHW concurs with the selected remedial alternative, Containment with a Native Soil Cover, Institutional Controls, and Monitoring. The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, this ROD, and other project activities such as public meetings.

8.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the Proposed Plan. Specific comments received during the public comment period on the Proposed Plan are responded to in the attached Responsiveness Summary portion of this document. Generally, comments reflected a broad range of views, from strong support for the selected alternative to opposition and support for the No Action alternative.

Table 10. CFA landfills alternative cost estimates[a] (net present value).

Cost element	Alternative 1 (no action)	Alternative 2	Alternative 3	Alternative 4
Capital	$338,785	$521,711	$2,016,821	$11,918,186
Post-closure	$628,898	$1,418,545	$1,484,290	$3,293,898
Total (rounded)	$968,000	$1,940,000	$3,500,000	$15,212,000

a. Cost estimates assume 30 years of monitoring and maintenance. Relatively intensive monitoring is anticipated in the first few years in order to establish the baseline data. Because it is not known precisely what level of monitoring will be needed after the first few years, the cost estimate assumes that the intensive monitoring continues for the entire 30 years. The actual monitoring costs are expected to be lower than estimated. The estimates also assume installation of one additional groundwater monitoring well ($215,000), the need for this well will be determined during the remedial design phase.

9. SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE, EPA, and IDHW have selected Alternative 3 - Uniform Containment with Native Soil Cover, Institutional Controls, and Monitoring as the most appropriate remedy for the OU 4-12 CFA landfills. Containment with a native soil cover is believed to be the best alternative for minimizing public risk and providing long-term protection of the SRPA.

9.1 Uniform Containment with Native Soil Cover - Description

The major components of Alternative 3 - Uniform Containment with Native Soil Cover, Institutional Controls, and Monitoring include (1) the placement of a uniform native soil cover over Landfills I, II, and III, (2) the implementation of institutional controls, and (3) the periodic monitoring of groundwater, infiltration, and/or vadose zone. The selected alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the nine CERCLA evaluation criteria. DOE, EPA, and IDHW believe the preferred alternative is protective of human health and the environment, complies with ARARs, and is the most costeffective of the alternatives evaluated.

Alternative 3 ensures that a thickness of at least 2 ft of a combination of existing soil cover and clean, compacted, native soils cover the landfills' waste. Overall design criteria for the cover will be specified by the agencies in the RD/RA work plan. These criteria will include requirements for hydraulic conductivity, as-built cover thickness and tolerances, erosion control, and revegetation. The permeability of coversoils at Landfills II and III are 2×10^{-3} cm/sec and 2×10^{-5} cm/sec, respectively, as shown in Table 3-11 of the RI/FS. No information is currently available for the permeability of cover soils at Landfill I as no investigation pertaining to this

parameter was made during the Track 2 investigation. The existing landfills will be surveyed and measures will be taken to provide a cover that is graded to promote efficient runoff and eliminate "low spots" where precipitation could accumulate and potentially infiltrate into the landfill contents. Routine maintenance of the cover will include placement of soils as needed to eliminate low spots that may form due to landfill content subsidence. Long-term stability of the cover will be enhanced by promoting the growth of natural vegetation at the cover's surface. The cover will be installed using conventional earth moving equipment and measures will be taken to minimize dust generation. The existing soils covering the CFA landfills will be supplemented as necessary with native soils from a borrow site located in the southwestern portion of the INEL. These borrow site soils have been examined and meet the permeability requirements for use as landfill cover material. It is expected that approximately 55,000 yd^3 of native soil will be brought to the landfills.

In addition to the placement of a native soil cover, Alternative 3 will include institutional controls. These institutional controls will include administrative controls such as placing written notification of this remedial action in the facility land use master plan to ensure that potential future activities would not compromise the integrity of the cover. A copy of the notification will be given to the BLM together with a request that a similar notification be placed in the BLM's property management records for this site. Borders will be delineated through the posting of signs warning of the landfill existence and potentially contaminated soils.

Groundwater, infiltration, and/or vadose zone monitoring will be conducted under Alternative 3. Groundwater monitoring would be conducted in order to (1) establish a baseline of potential contaminant concentrations in the aquifer against which future data could be compared, and (2) ensure that drinking water standards are not exceeded in the SRPA due to the migration of contaminants from the landfills. Infiltration and/or vadose zone monitoring would be conducted in order to evaluate the effectiveness of the native soil cover and/or migration of potential contaminants from the landfills.

The agencies will review this action, including the need for continued monitoring and the frequency and scope thereof, within 5 years and every 5 years thereafter.

9.2 Estimated Costs for the Selected Remedy

A summary cost breakdown for Alternative 3 is presented in Table 10. These costs were annualized where appropriate (e.g., monitoring costs) and summarized in net present value (1994) using a 5% annual discount rate.

10. STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA, as amended by SAPA and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and compliance with ARARs. CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action must be cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly

reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 8.1.1, the selected remedy satisfies the criterion of overall protection of human health and the environment by minimizing the risk of potential contaminant migration and by preventing direct contact with the landfill waste materials. The remedy will ensure that cumulative risks are maintained within or below the acceptable risk range of 10^{-4} to 10^{-6}.

10.2 Compliance with ARARs

The selected remedy will be designed to meet all ARARs of Federal and state regulations. The ARARs that will be achieved by the selected remedy are noted in Section 7.2, particularly Table 9.

10-..1 Chemical-Specific ARARs

There were no chemical-specific ARARs identified for the CFA landfills. Regulations have not been promulgated specific to soil cleanup levels for contaminants that may be present in soils at the CFA landfills.

10.2.2 Action-Specific ARARs

The selected remedy triggers the applicable or relevant and appropriate requirements of those regulations listed in Table 9. As noted in Section 7.2, these ARARs focus primarily on landfill closure under RCRA as implemented by the State of Idaho under the Idaho Hazardous Waste Management Act. Additionally, Rules for the Control of Fugitive Dust and General Rules under IDAPA 16.01.01.650 and .01.651 apply to the selected remedy.

10.2.3 Location-Specific ARARs

There were no location-specific ARARs identified for the selected remedy as there are no known threatened and endangered species, wetlands, rivers, or floodplains located in the area of potential remedial activities under the selected remedy. This includes those areas identified as soil borrow areas at the INEL Borrow areas at the INEL have been evaluated through an environmental assessment, which determined that these areas do not impact historical and cultural properties, nor do they impact archeological resources.

10.2.4 To-be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to consider a number of procedures or guidance documents that are not legally binding. The following list of documents are to be considered as guidance documents:

- OSWER 9355.049FS, September 1993, *Presumptive Remedy for CERCLA Municipal Landfill Sites.*

- OSWER 9234.2-04FS, October 1989, *RCRA ARARs: Focus on Closure Requirements*.

- OSWER 9476.00-1, September 1982, *Evaluating Cover Systems for Solid and Hazardous Waste* (Revised).

These OSWER directives provide additional guidance on the design specifications for constructing and maintaining a cover system.

10.3 Cost-Effectiveness

Based on expected performance, the selected remedy is considered to be cost-effective. This is evident when considering the cost of Alternative 4, Containment with a Single-Barrier Cover, which is estimated to be over four times the estimated cost of the selected remedy, yet it is believed that Alternative 4 would not provide significant additional benefits in term of protectiveness.

10.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner. The selected remedy provides protection by minimizing the risk of contaminant migration to the aquifer and limiting access to the landfill contents. The selected remedy for the CFA landfills contains elements of EPA's presumptive remedy for CERCLA municipal landfills. The presumptive remedy is based on historical patterns of remedy selection and scientific and engineering evaluation of performance data on technology implementation at similar sites.

Implementation of the selected cover remedy will reduce the mobility of hazardous substances, pollutants, and contaminants from the CFA landfills. The selected remedy does not employ alternative treatment or resource recovery technologies. The use of alternative treatment technologies was determined to be impracticable because no on-site hot spots were identified that could be excavated and treated effectively, and because the wastes can be reliably controlled in place.

10.5 Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element will not be met. Extraction and treatment of the landfill contents is not considered a cost-effective means of reducing the risks to human health and the environment. The identified risks will be reduced to acceptable levels by implementing the selected remedy. The remedy, which includes containment, monitoring, and land use controls, is based on experience from remedies implemented at other CERCLA municipal landfills and is consistent with EPA's presumptive remedy.

11. NO ACTION SITES IN OPERABLE UNIT 4-03

This section of the ROD summarizes information on 19 Track 1 investigations (consisting of underground storage tank sites) designated as “no further action” and documents the “no further action” decision for these sites. These sites were identified in the FFA/CO for the Track 1 investigation process because they were considered low probability hazard sites and are included in OU 4-03. Low probability hazard sites typically contain low or unknown quantities of residual contamination. The 19 sites discussed in further detail below were identified by DOE, EPA, and IDHW as posing no unacceptable risk to human health.

In accordance with the FFA/CO, the Track 1 process evaluates existing data and information on the Track 1 site to determine whether the site poses an unacceptable risk to human health. The information is assembled into a decision documentation package involving questions about possible past containment releases and qualitative risk evaluation. The Track 1 approach is an efficient yet rigorous process to evaluate risks. The evaluation process is used to determine if (a) the site poses a clear risk that requires interim action, (b) the site should be further investigated under CERCLA, or (c) the source does not appear to pose a risk to human health or the environment and therefore requires no further action.

Except where noted, all of the tanks, their contents, and associated piping were removed. All of the tank sites were backfilled with soil and restored for unrestricted use. In many cases, the tank and associated piping were recycled as scrap metal. Several of the tank sites had petroleum-related organic contamination in the soil in the bottom of the excavation. In each case, a risk evaluation determined that the soil concentration for these contaminants did not exceed the 1 in 1,000,000 risk-based concentrations for inhalation of volatile organic compounds and dust, ingestion of soil, and ingestion of groundwater. A short discussion of each of the 19 underground storage tank sites follows.

CFA-18, Fire Department Training Area Gasoline Storage Tank. This is a 500-gal gasoline tank installed in 1952, which is still in use (and is thus subject to appropriate rules and regulations for ongoing operations). No leakage was observed from the tank during tightness testing performed in March 1993. Also, no contaminants have been observed near the tank. Based on this investigation of potential past release from the tank, no further action is recommended.

CFA-19, Fuel Tanks at CFA-606. This is the site of two former 10,000-gal fuel tanks installed in 1948 and last used in 1950. Tanks CFA 606-E1 and -E2 were used to store gasoline and diesel fuel, respectively, for unknown purposes. All attempts to locate the tanks and associated piping (with ground-penetrating radar and metal detector) were unsuccessful, and there was no visible evidence of excavated areas or piping to the tanks. It is believed that the tanks have been removed and the areas have been backfilled. According to records, no tank content or soil samples were collected at this site because the tanks were not located.

***CFA-20, Fuel Oil Tank at former CFA-609 (near current CFA-612)*.** This is the site of a former 275-gal fuel tank installed in 1952 and last used in 1985. The tank was used to store fuel oil for heating building CFA-609, which was demolished and replaced by the current CFA-612 and

an adjacent asphalt parking lot. Although no written record of removal was found, there was reference to a letter stating that the tank had been excavated. Also, an equipment operator who worked on demolition of the old CFA-609 indicated that the tank had been removed and the excavation backfilled about 1985 or 1986. No efforts could be made in the field to locate the original tank site because the tank site has been covered with a parking lot and a building. No tank content sampling or soil sampling records could be found.

CFA-21, Fuel Tank at Nevada Circle 1 (South by CFA-629). This is a former 500-gal gasoline tank installed in 1958 and last used in 1970. The tank and associated piping were excavated and removed from the ground in May 1991. During removal operations, the tank was inadvertently punctured by excavation equipment resulting in a spill of approximately 75 gal of diesel fuel in the excavation. Contaminated soil was removed from the excavation and treated. Approximately 60 gal of spilled fuel was retrieved and 15 gal absorbed into soil resulting in high concentrations of total petroleum hydrocarbons in two soil samples (20,000 and 54,000 mg/kg). However, because the volume of spilled fuel is low and total petroleum hydrocarbons are relatively immobile in the soil, further sampling was not conducted. All other contaminants detected in the excavation beneath the tank were below the 1 in 1,000,000 risk-based concentrations.

CFA-23, Fuel Oil Tank at CFA-641. This is a former 55-gal fuel oil tank installed in 1949 and last used in 1975. The tank and associated piping were excavated and removed from the ground in October 1990. No holes in the tank or piping or other evidence of leakage were observed during removal operations. No contaminants were detected at levels that exceed the 1 in 1,000,000 risk-based concentrations.

CFA-24, Heating Fuel Tank near CFA-629. This is a former 500-gal heating fuel tank installed in 1958 and last used in 1970. The tank (no associated piping was found) was excavated and removed from the ground in May 1991. No holes in the tank or other evidence of leakage was observed during removal operations. No contaminants were detected at levels that exceed the 1 in 1,000,000 risk-based concentrations.

CFA-25, Fuel Oil Tank at CFA-656. This is a former 500-gal fuel oil tank installed in 1944 and last used in 1960. The tank and associated piping were excavated and removed from the ground in October 1990. No evidence of leakage was observed from the tank or associated piping during removal operations. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-27, Fuel Oil Tank at CFA-669 (CFA-740). This is a former 15,000-gal fuel oil tank installed in 1953 and last used in 1981. The tank and associated piping were excavated and removed from the ground in October 1990. Evidence of leakage from the piping was observed during removal operations; however, there was no evidence of leakage from the tank. Contaminated soil was removed and treated. No contaminants were detected in the excavation beneath the former tank or piping above the 1 in 1,000,000 risk-based concentrations.

CFA-28, Fuel Oil Tank at CFA-674 (West). This is a former 1,000-gal fuel oil tank installed in 1956 and last used in 1968. The tank was excavated and removed from the ground in September 1992. No evidence of leakage was observed from the tank during removal operations.

No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-29, Waste Oil Tank at CFA-664. This is a former 1,000-gal waste oil tank installed in 1951 and last used in 1989. The tank and associated piping were excavated and removed from the ground in October 1990 after it failed a tightness test. Soil contamination observed in the excavation was removed and treated. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-30, Waste Oil Tank at CFA-665. This is a former 1,000-gal waste oil tank installed in 1960 and last used in 1989. The tank and associated piping were excavated and removed from the ground in September 1989 after it failed a tightness test. Soil contamination observed in the excavation was removed and treated. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-31, Waste Oil Tank at CFA-754. This is a former 15,000-gal tank used as bulk storage of waste oil. The date of installation is unknown; however, it was last used in 1985. The tank and associated piping were excavated and removed from the ground in May 1992. Contaminated soil observed in the excavation during removal operations was removed and treated. After removal of contaminated soil, no contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-32, Fuel Off Tank at CFA-667 (North Side). This is a former 180-gal fuel oil tank last used in 1986. The date of installation of this tank is unknown. The tank and associated piping were excavated and removed from the ground in October 1990. No evidence of leakage from the tank or piping was observed during removal operations. No contaminants were detected in the excavation beneath the former tank or piping.

CFA-33, Fuel Tank at CFA-667 (South Side). This is a former 4,000-gal diesel fuel tank installed in 1951 and last used in 1986. The tank and associated piping were excavated and removed from the ground in October 1990. Soil contamination observed near the filling port of the tank was removed and treated. No evidence of leakage was observed from the tank or associated piping during removal operations. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-34, Diesel Tank at CFA-674 (South). This is a former 260-gal diesel fuel tank installed in the early 1950s and last used in 1976. The tank and associated piping were excavated and removed from the ground in October 1990. The tank contained several holes and leaked some of its contents into the surrounding soil. Soil contamination observed in the excavation was removed and treated. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk based concentrations.

CFA-35, Sulfuric Acid Tank at CFA-674 (West Side). This is a former 1,000-gal sulfuric acid storage tank installed in 1953 and last used in 1965. The tank and associated piping were excavated and removed from the ground in June and July 1989. No evidence of leakage was observed from the tank or associated piping during removal operations. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-36, Gasoline Tank at Building CFA-680. This is a former 55-gal gasoline tank installed in 1951 and last used in 1983. The tank and associated piping were excavated and removed from the ground in October 1990. No evidence of leakage was observed from the tank or associated piping during removal operations. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-37, Fuel Oil Tank at CFA-681 (South Side). This is a former 500-gal fuel oil tank installed in 1949 and last used in 1978. The tank and associated piping were excavated and removed from the ground in October 1990. Small holes and rust were observed in the tank during removal operations. Contaminated soil was removed from the excavation and treated. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

CFA-38, Fuel Oil Tank at CFA-663. This is a former 500-gal fuel oil tank installed in 1949 or 1950 and last used in 1980. The tank and associated piping were excavated and removed from the ground in May 1992. No evidence of leakage was observed from the tank or associated piping during removal operations. No contaminants were detected in the excavation beneath the tank above the 1 in 1,000,000 risk-based concentrations.

12. DOCUMENTATION OF SIGNIFICANT CHANGES

The proposed plan for the CFA landfills was released for public comment in April 1995. The proposed plan identified Alternative 3-uniform containment with native soft cover, institutional controls, and monitoring as the preferred alternative. The agencies reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments and preparation of the ROD, it was determined that no significant changes to the remedy would be required.

Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

A.1 OVERVIEW

Operable Unit (OU) 4-12 is an OU within Waste Area Group (WAG) 4 of the Central Facilities Area (CFA) at the Idaho National Engineering Laboratory (INEL). The unit comprises CFA Landfills I, II, and III, as described in the Record of Decision (ROD) to which this Responsiveness Summary is attached. A Proposed Plan was released April 24, 1995, with a public comment period from April 26 to May 26, 1995. The preferred alternative recommended includes uniform containment of the landfills with a native soil cover, institutional controls, and monitoring. This Responsiveness Summary recaps and responds to the eight comments received during the comment period. Generally, the comments reflected a broad range of views, from strong support for the selected alternative to opposition and support for the no action alternative.

A.2 BACKGROUND ON COMMUNITY INVOLVEMENT

To initiate the CFA Landfills investigation, public information meetings were held in August 1993 in Boise, Moscow, Twin Falls, Pocatello, and Idaho Falls. The information meetings were designed to involve the public early in the investigation; explain the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process; allow representatives from DOE and INEL to discuss the project; answer both written and verbal questions; and receive ideas and suggestions from the public.

Copies of the proposed plan for the CFA landfills were mailed to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list on April 24, 1995 urging citizens to comment on the proposed plan and to attend public meetings. Opportunities for public involvement in the decision process for the CFA landfills were provided during the 30-day comment period from April 26 to May 26, 1995. For the public, the activities ranged from receiving the proposed plan, conducting one teleconference call, and attending open houses and public meetings to informally discuss the issues and offer verbal and written comments to the agencies during this 30-day public comment period.

Written comment forms, including a postage-paid business reply form, were made available to those attending the meetings. The forms were used to turn in written comments at the meeting, and by some, to mail in comments later. For those who did not attend the public meetings but wanted to make formal written comments, a written comment form was attached to the Proposed Plan. A total of about ten people attended the CFA landfills public meetings. Overall, eight provided formal comment; of these eight people, three provided oral comments and five provided written comments.

This Responsiveness Summary has been prepared as part of the ROD. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment. The ROD presents the preferred alternative for the CFA landfills, selected in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). All comments received on the proposed plan were considered during the development of this ROD. The decision for this OU is based on infomation contained in the Administrative Record.

A.3 SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

Comments and questions raised during the public comment period on the CFA Landfills Proposed Plan are summarized below. The public meetings were divided into an informal question-and-answer session and a formal public comment session. The meeting format was described in published announcements and meeting attendees were reminded of the format at the beginning of each meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal question-and-answer period during the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during that part of the public meeting. However, the Administrative Record contains complete transcripts of these meetings, which contain the agencies' responses to these informal questions.

Comments received during the formal comment session of the meeting were responded to by the agencies in this Responsiveness Summary. The public was requested to provide their formal comments on the Proposed Plan either during the formal comment session of the meeting or in writing before the close of the public comment period. This Responsiveness Summary responds to those public comments that were recorded by the court reporter during the formal comment portion of the public meeting or that were submitted in writing before the close of the public comment period.

1. **Comment**: Alternative 3 seems to be the most logical choice.

   Response: Thank you for your comment. Alternative 3 is the preferred alternative by the agencies and will provide the appropriate level of protection for the public health and welfare and the environment.

2. **Comment**: There is too much time, money, and energy spent on the cleanup process to try to satisfy the anti-nukes. Most people aren't concerned until the news media gives time to the anti-nukes and continue to spread their propaganda. Left alone, it will deteriorate and cause no problems. Disturbing it stirs up more problems. I favor alternative 1.

Response: Thank you for your comment. Alternative 1 was not preferred because it does not meet the state's requirements for closing landfills such as minimizing erosion and infiltration. The preferred alternative 3 will not disturb the existing waste since the waste will be left in place and native soil from the INEL will be brought to the landfills and placed over the existing soil covers to enhance the cover thickness and regraded to minimize erosion and infiltration. Furthermore, alternative 3 uses the collective experience from other CERCLA municipal landfills to address the uncertainty associated with wastes disposed and with potential risks by implementing elements of the presumptive remedy approach (i.e., containment and monitoring to ensure effectiveness of the remedy).

3. **Comment**: With regards to Landfills I, II, and III, I would want to save money by opting for something like alternative 2, while doing as much as possible on SL-1 and BORAX-I. My main concern is protection of the groundwater and continued importation of toxic wastes into Idaho. I am also concerned for the safety and health of workers engaged in cleanup operations.

   Response: Thank you for commenting. Alternative 2 was not preferred because it does not meet the state's requirements for closing landfills such as minimizing erosion and infiltration. Alternative 2 would save money, but would not be as protective to the groundwater as alternative 3, which reduces infiltration. The remedial action will be designed to ensure that the safety and health of workers will not be compromised at any time.

4. **Comment**: Alternative 3 seems adequate.

   Response: Thank you for commenting. Alternative 3 is the preferred alternative by the agencies and will provide the appropriate level of protection for the public health and welfare and the environment.

5. **Comment**: I am very concerned with the attitude of the DOE (the agencies) and those at INEL regarding the storage of hazardous waste near the area of our State's aquifer. Even if your plans for storage are temporary (translated as 100 years or less), how can we ever be assured that your "expertise" will not lead to the contamination of the soil, water supplies, and ultimately all who are affected by the water supply running through Southern Idaho? . . . Please do not participate in contaminating Idaho with nuclear waste!

   Response: Thank you for commenting. The CFA landfills are nonradioactive waste disposal facilities that were used for the disposal of INEL municipal type waste (i.e., cafeteria garbage, trash sweepings, weeds and grass, etc.). However, some low-level radioactive waste may have been inadvertently disposed to the landfills. Alternative 3 is the preferred alternative because it will minimize potential infiltration and possible subsequent leaching to the aquifer. Periodic monitoring will monitor the effectiveness of the cover and provide for the detection of contaminants in the groundwater if migration occurs.

6. **Comment**: My comments before somewhat apply, and I've got some additional ones. The risk here seems to be again for a residential scenario, and it's beryllium, two in 10,000. Let's get the land use for these things before we go off and spend a big bunch of money.

What are we going to do? Is this thing going to be industrial? Is this going to be farming? What's it going to be, so we really know what the risk is? I heard Alan say no risk, but due to the uncertainty we're going to spend $2 million more a year plus 60k a year more, I like action No. 1, which is No Action or Alternative No. 1, which happens to be No Action if we've got models and codes that can predict what's going on and have been benchmarked and validated.

Why spend the money if we've got the confidence? If we're just trying to cover ourselves because of uncertainties so we throw in this Alternative 3 here, it doesn't seem like the right thing, and I don't believe we're protecting the public.

This has been DOE's credibility problem from day one. Let's get it down to where we got confidence in what we're doing. And if it takes computer codes that are benchmarked and validated, let's do it. My suggestion is let's get the National Academy of Sciences out here. They were out here looking at some of this stuff before.

Let's specifically have them look at some of these codes and the way we're doing things so that we've got some confidence in it. If the risk is really less than one in 10,000, then let's go with the No Action on it. There's no need to go with the Alternative 3 and spend the additional money. If it's needed and warranted, certainly we want to do it. But let's get the risk down to where we really know what it is. And my suggestion is let's get an independent reviewer in here, and perhaps the National Academy of Sciences is the way to start.

Response: Thank you for commenting. The risk assessment is based on a current worker and a potential future resident scenario. It is common practice, based on EPA guidance, to examine a potential future residential land-use scenario. We do not know at this time what actual land uses of the INEL will be in the future. Therefore, it is important to use a conservative land-use scenario, i.e., residential scenario to fully assess potential future impacts for decision-making purposes.

Alternative 1 was not the preferred alternative because it does not meet the applicable or relevant and appropriate requirements such as minimizing erosion and infiltration. Alternative 3 is the preferred alternative by the agencies and will meet the applicable or relevant and appropriate requirements and provide the appropriate level of protection for the public health and welfare and the environment.

The computer code GWSCREEN, validated and accepted by the agencies, was used during the remedial investigation of the landfills to address future groundwater concerns, as a result of potential future leaching of the source term to the groundwater, and indicated no unacceptable groundwater health risk to potential future residents. However, uncertainties in the landfill waste inventory (source term) lead to uncertainties in the modeled groundwater health risk. The Site-Specific Advisory Board provides some independent review of CERCLA investigations and cleanup at the INEL

Due to the heterogeneous nature of the waste and incomplete inventory of waste disposal, complete characterization of the landfill contents was and is not expected. Therefore, future use of the landfills that may involve excavation of the landfill subsurface materials could

increase risks of exposure to contaminants (via inhalation, ingestion, and dermal contact) for potential future construction workers and residents.

7. **Comment**: I like the preferred alternative. I think that I'm not opposed to it in any way, shape, or form. I think it's not much different than any other waste site as far as a dump site that would be in an urban area. I think that in my opinion that the Area 1, because of the uncertainty of what was put in there, I think that there needs to be a little more work done on that particular area in those trenches. And I think that we need to be a little more -- I would like to be a little more sure what is in there is not in 50-gallon barrels decaying as we speak and that we're just closing our eyes to it.

   But I think I would like to congratulate everybody on this work that has been done all night. I think all the work that has been done is really exemplary. And once again, the preferred Alternative No. 3, that's the only alternative I can see that makes sense.

   The No. 4, I think that would just slow down the decay process and cause it -- and maybe that would be a question as to whether or not we'd have an erosion problem or sooner or later down the road and we would have -- for the problems 50 years from now, I think its better to let it decay in a natural way. It needs some water. I think that we need to use the flora that's indigenous to the area in case this area is abandoned for budgetary reasons. And I think that we need to have guarantees as to the native soil at least 4 to 6 inches of topsoil.

   Being a horticulturist, I know that it would take at least 4 inches to establish a decent plant growth on top of it. I wouldn't ask that all 2 feet be topsoil, because that would be ludicrous, but the top 4 to 6 inches, I think we need to maintain that. That's all I want to say.

   Response: Thank you for commenting. Alternative 3 is the preferred alternative by the agencies and will meet the applicable or relevant and appropriate requirements and provide the appropriate level of protection for the public health and welfare and the environment.

   During the remedial investigation phase of the project, an extensive source term investigation was conducted by compiling and reviewing available waste disposal records, documents, databases, and process knowledge, and by conducting interviews with personnel knowledgeable in CFA landfill operations to determine the waste types and volume disposed to the landfills. It was not common practice.to dispose of 55-gallon drums full of oil or any liquid in the landfills. Drums disposed to the landfill were typically empty, or if liquid was present, it was absorbed onto diatomaceous earth or rags. In some instances, waste oil was disposed to the landfill directly by dumping it over the solid waste and mixing with a layer of soil. In some instances, the oil was used to burn paper wastes in trenches. The use of the incinerator at Landfill I to burn waste, coupled with the open burning of wastes in the trenches, would have greatly reduced the volume and the potentially hazardous components present in waste oil or solvents.

   Experience from other CERCLA municipal landfills shows that it is more cost-effective to implement the presumptive remedy of containment because it is impossible to fully characterize the landfill contents. Periodic environmental monitoring will monitor the

effectiveness of the cover and provide for the detection of contaminants in the groundwater if migration occurs.

The remedial design of the cover will allow for 6 inches of topsoil to ensure the establishment of a vegetative top layer.

8. **Comment**: I might suggest that you try some kind of meeting in the Twin Falls area because of the huge amount of interest there is in that area about the groundwater. It might be good to have one more in that.southern part of the state.

   Response: Thank you for your suggestion. In the past, the agencies have had informal briefing meetings in Twin Falls. The feedback from the residents of this area who attended past meetings is that they don't want any more meetings. Public relations representatives were also available for an afternoon at the public library to answer any questions the public had concerning the project. Due to the lack of interest from the public in this area and budget cuts, a public meeting was not scheduled for the Twin Falls area. However, public meetings may be held in the future in the Twin Falls area, as has been done in the past.

Appendix B

Public Comment/Response List Index

Appendix B

Public Comment/Response List Index

The Public Comment/Response List (Table B-1) was created to enable commenters and other interested persons to locate the agencies' responses to individual public comments. Each comment had been assigned a comment code. The codes indicate whether the comment was either written (W code) or taken from the public meeting transcript (T code). Five people submitted written comments (comments W1-W5) and three others gave oral comments at the public meetings (comments T1-T3). Copies of oral and written comments annotated with their respective comment codes are located in the Administrative Record.

To locate a response to a specific individual's comments, look up the last name of the individual, then turn to the response number or page indicated in the Responsiveness Summary (Appendix A). If, after reviewing the annotated comments in the administrative record, you wish to locate a response to a specific comment, you can use the comment code to locate a response as well. Identify the comment code in the index, look up the page number of the response, then turn to that page of the Responsiveness Summary.

Table B-1. Public comments received on the CFA landfills during the April 26 through May 26, 1995 comment period.

Comment code	Response number	Commenter	Page number for response
W-1	5	Jim Sommer	A-5
W-2	1	D. R. Mix	A-4
W-3	2	Dorothy Strait	A-4
W-4	4	Albert Taylor	A-5
W-5	3	George Lukes	A-5
T-1	6	Robert Wadkins	A-5
T-2	7	Bruce Allen	A-7
T-3	8	Twila Hornbeck	A-8

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/01/1995
Operable Unit: 24
ROD ID: EPA/ROD/R10-96/132

Media: soil

Contaminant: Radionuclides, Cesium-137, Strontium-90, Uranium-234, -235, Cobalt-60, Europium-154, Thorium-228, -230, -232

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (USDOE). The main security gate in the southern portion of the site is located 44 miles west of Idaho Falls, Idaho. The INEL occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approximately 38 and 52 miles west of Idaho Falls.

The SL-1 site is located about 1,600 feet northeast of the Auxiliary Reactor Area II and includes the surface-soil area surrounding a 600- by 300-foot fenced burial ground. Approximately 99,000 cubic feet of radionuclide contaminated debris, soil, and gravel are disposed of in the burial ground. An estimated 2 feet of soil with a thick grass cover lies over the waste.

The BORAX-I burial ground is located about 2,730 feet northwest of

the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a surface-soil contamination area surrounding the fenced burial ground. The area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then.

The INEL was originally established as the National Reactor Testing Station by the U.S. Atomic Energy Commission in 1949. The National Reactor Testing Station's mission was to build, test, and operate nuclear reactors, fuel processing plants, and support facilities. The INEL's current mission is the integration of engineering, applied science, and operations in an environmentally conscious, safe, and cost-effective manner.

The SL-1 and BORAX-I burial grounds are historical disposal areas and do not host any current programs. Current activities are limited to periodic observations for maintenance of the fences and grounds and monitoring for radioactivity.

Of the 11,700 people employed at the INEL, none work full-time at either burial ground. There are no residential communities within the INEL boundaries. The nearest residential community is 1 mile south of INEL and has a population of 25.

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location.

The SL-1 was a small nuclear power plant designed for the military to generate electric power and heat for remote arctic installations. The reactor was operated from 1958 to 1961 as a test, demonstration, and training facility. On the evening of January 3, 1961, the SL-1 reactor accidentally achieved a prompt critical nuclear reaction which caused a steam explosion that destroyed the reactor and resulted in the deaths of the three operators on duty. The reactor vessel and building were severely damaged and highly contaminated, and a massive cleanup operation ensued to dismantle and dispose of the reactor and building.

A burial ground was constructed approximately 1,600 feet northeast of the original site of the reactor. This was done to minimize radiation exposure to the public and site workers that would have resulted from transport of contaminated debris from SL-1 to the Radioactive Waste Management Complex over 16 miles of public highway. Original cleanup of the site took about 18 months. The entire reactor building, contaminated materials from nearby

buildings, and soil and gravel contaminated during cleanup operations were disposed of in the burial ground. The majority of buried materials consists of soils and gravel.

At present the SL-1 burial ground is defined by a three-strand, barbed-wire exclusion fence posted with radiological control signs. Inside the burial ground the ends of the excavations are identified by concrete markers. The surface of the burial ground is covered with various grass species. The two mounds and several minor depressions due to subsidence are visible within the fenced area.

The BORAX-I reactor was a small experimental reactor used in the summer months of 1954 and 1954 for testing boiling-water reactor technology. In 1954, the design mission of BORAX-I was completed, and the decision was made to make one final test, which resulted in the international destruction of the reactor. The destruction of the reactor contaminated approximately 84,000 square feet of the surrounding terrain. Immediately following the final test of the BORAX-I reactor, much of the radioactive debris, including some fuel residue was sent to the Idaho Chemical Processing Plant and Oak Ridge National Laboratory. Reusable equipment associated with the reactor was successfully decontaminated and used in the construction of BORAX-II. However, the cleanup did not sufficiently reduce the radioactivity at the site. The 84,000-square foot contaminated area was covered with approximately 6 inches of gravel to reduce radiation levels at the ground surface.

Buried materials at the site consist of unrecovered uranium fuel residue, irradiated metal scrap, and contaminated soil and debris. Part of the waste was buried in the bottom half of the shield tank; the top half of the tank was collapsed into the bottom and the void space was filled with debris.

At this time, the ground surface at the site looks very much like the surrounding terrain. Abundant native vegetation has grown over the mound and surrounding area. A large stake about 5 feet tall marks the reactor location. A chain link fence surrounds the burial ground. The contaminated surface soil area outside of the chain-link fence is bounded by a two-wire exclusion fence. The fences, posted with radiological-control signs, and restricted access protect INEL workers and the public from unacceptable exposures.

Remedy: The selected remedy includes: containment by capping with an engineered barrier constructed primarily of native materials; for BORAX-I,implementation will include consolidation of surrounding contaminated surface soils for containment under the engineered cover; contouring and grading of surrounding terrain to direct surface water runoff away from the caps; periodic above-ground radiological surveys following completion of the caps to assess the effectiveness of the remedial action; periodic inspection and maintenance following completion of the caps to ensure cap integrity and surface drainage away from the barriers; access restrictions consisting of fences, posted signs, and permanent markers; and restrictions limiting land use to industrial applications for at least 100 years following completion of the caps.

Text: Full-text ROD document follows on next page.

Text:

Declaration of the Record of Decision

Site Name and Location

Stationary Low-Power Reactor-1 Burial Ground, Boiling Water Reactor Experiment-I Burial Ground, and 10 No Action Sites Within the Auxiliary Reactor Area and the Power Burst Facility

Idaho National Engineering Laboratory Idaho Falls, Idaho

Statement of Basis and Purpose

This document presents the selected remedial action for the Stationary Low-Power Reactor-1 (SL-1) burial ground, the Boiling Water Reactor Experiment-I (BORAX-I) burial ground, and 10 no action sites in Waste Area Group 5. The remedial actions were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) (hereafter referred to collectively as "CERCLA"), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan. Information sup- porting the selection of the remedies for the burial grounds is contained in the Administrative Record for the SL-1 and BORAX-I burial grounds (Operable Units 5-05 and 6-01). The Administrative Record for Track 1 sites in Waste Area Group 5 contains information regarding the 10 no action sites (Operable Units 5-01, 5-03, 5-04, and 5-11).

The U.S. Department of Energy (DOE) is the lead agency for this decision. The U.S. Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare (IDHW) have participated in the evaluation of the final action alternatives. The EPA and IDHW both concur with the selection of the preferred remedy for the SL-1 and BORAX-I burial grounds and with the no action determinations for the 10 Track 1 sites.

Assessment of the Sites

Actual or threatened releases of hazardous substances from the SL-1 and BORAX-I burial grounds, if not addressed by implementing the response action selected in this Record of Decision, may present a current or potential threat to public health, welfare, or the environment.

The 10 no action sites do not present a threat to human health or the environment.

Description of the Selected Remedy

The Idaho National Engineering Laboratory (INEL) has been subdivided into 10 waste area groups for investigation pursuant to the Federal Facility Agreement and Consent Order between the DOE, EPA, and IDHW. The SL-1 burial ground is designated Operable Unit 5-05, one of 13 operable units in Waste Area Group 5; the BORAX-I burial ground is Operable Unit 6-01, one of five operable units in Waste Area Group 6. The major components of th selected remedy for both sites are:

- Containment by capping with an engineered barrier constructed primarily of native materials

- For BORAX-I implementation will include consolidation of surrounding contaminated surface soils for contaminment under the engineered cover

- Contouring and grading for surrounding terrain to direct surface water runoff away from the caps

- Periodic above-ground radiological surveys following completion of the caps to assess the effectiveness of the remedial action

- Periodic inspection and maintenance following completion of the caps to ensure cap integrity and surface drainage away from the barriers

- Access restrictions consisting of fences, posted signs, and permanent markers

- Restrictions limiting land use to industrial applications for at least 100 years following comple- tion of the caps

- Review of the remedy no less often than every five years until determined by the regulatory agencies to be unnecessary.

The selected remedy addresses the principal threats posed by the burial grounds by providing shielding from ionizing radiation, a barrier to inhibit ecological and human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

Statutory Determination

The selected remedies are protective o human health and the environment, comply with federal and state requirements that are legally applicable or relevant and appropriate requirements (ARARs) to the remedial actions, and are cost effective. These remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because treatment of the princi- pal threats of the two burial grounds was not found to practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The EPA's preference for sites that pose relatively low long-term threats or where treatment is impracticable is engineering controls, such as containment. The radioactivity at each burial ground precludes a remedy in which contami- nants could be readily excavated and treated without unacceptable exposures to workers. The primary contributor to

risk is a short half-lived radionuclide more effectively managed by providing engineered containment while allowing the radionuclide to decay naturally.

Because these remedies will result in radionuclide-contaminated substances remaining on site at the burial grounds in excess of health-based levels, reviews will be conducted within five years after com- mencement for the remedial actions. Subsequent reviews will be conducted no less often than every five years thereafter to ensure that the remedies continue to provide adequate protection of human health and environment. The periodic reviews will be discontinued when the regulatory agencies determine the sites on longer pose an unacceptable risk to human health or the environment.

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment-I Burial Ground, and 10 no further action sites in Waste Area Group 5 at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096132>

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment I Burial Ground, and 10 no further action sites in Waste Area Group 5 at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096132A>

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment I Burial Ground, and 10 no future action sites in Waste Area Group 5 at the Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096132B>

Acronyms and Abbreviations

ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirements
BORAX-I	Boiling Water Reactor Experiment-I
øC	degree(s) Celsius
CERCLA Act	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
cm	centimeter(s)
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EPA	U.S. Protection Agency
øF	degrees Fahrenheit
g	gram(s)
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
INEL	Idoha National Engineering Laboratory
km	kilometer(s)
m	meter(s)
m2	square meter(s)
mg	milligram(s)
mR	milliroentgen
ærem/hr	microroentgen equivalent man per hour
nCi	nanocurie(s)
PBF	Power Burst Facility
pCi	picocurie(s)
RI/FS	Remedial Investigation/Feasibility Study

SARA	Superfund Amendments and Reauthorization Act
sec	second
SL-1	Stationary Low-Power Reactor-1
TBC	To-Be-Considered
WAG	Waste Area Group
yr	year

Decision Summary

1. Site Name, Location, and Description

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE). The main security gate in the southern portion of the site is located 44 miles (71 km) west of Idaho Falls, Idaho. The INEL occupies 890 square miles (2,305 km2) of the northeastern portion of the Eastern Snake River Plain. The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approximately 38 and 52 miles (61 and 84 km) west of Idaho Falls (Figure 1).

The SL-1 site is located about 1,600 feet (488 m) northeast of the Auxiliary Reactor Area II and includes the surface-soil area surrounding a 600-by 300-foot (182.9- by 91.4-m) fenced burial ground (Figure 2). Approximately 99,000 cubic feet (2,800 m3) of radionuclide-contaminated debris, soil, and gravel are disposed of in the burial ground. An estimated 2 feet (0.6 m) of soil with a thick grass cover lies over the waste.

The BORAX-I burial ground is located about 2,730 feet (832 m) northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a 200-by 420-foot (61-by 128-m) surface-soil contamination area surrounding the 100-by 100 foot (30-by 30-m) fenced burial ground (Figure 3). The volume of buried radionuclide-contaminated soil and debris is approximately 6,336 cubic feet (180 m3). The 84,000-square foot (7,800-m2) area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then.

The INEL was originally established as the National Reactor Testing Station by the U.S. Atomic Energy Commission in 1949. The National Reactor Testing Station's mission was to build, test, and operate nuclear reactors, fuel processing plants, and support facilities. The INEL's current mission, as directed by the DOE, is the integration of engineering, applied science, and operations in an environ- mentally conscious, safe, and cost-effective manner.

The SL-1 and BORAX-I burial grounds are historical disposal areas and do not

host any current programs. Current activities are limited to periodic observations for maintenance of the fences and grounds and monitoring for radioactivity.

Of the approximately 11,700 people employed at the INEL, none work full time at either burial ground. There are no residential communities within the INEL boundaries. The nearest residential community is Atomic City, located approximately 1 mile (1.6 km) south of the INEL boundary, with a population of 25. Larger communities near the INEL include Idaho Falls, located approximately 44 miles (71 km) to the east of the main gate, with a population of 43,973; Blackfoot, located approxi- mately 37 miles (60 km) to the southeast, with a population of 9,646; and Arco, located approximately 19 miles (31 Km) to the west, with a population of 1,016.

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Most of the area surrounding the INEL is either unimproved rangeland or farmland, and approxi- mately 330,000 acres (1,300 km2) of the INEL are open to grazing by permit. However, grazing is prohibited within 2 miles (3 km) of any nuclear facility, and no dairy cows are allowed. Approximately 95% of the INEL site has been withdrawn from the pubic domain by land transfer from the U.S. Bureau of Land Management to the DOE.

The climate of the region is arid to semiarid. Average annual precipitation is 8.71 inches (22 cm), wind is generally from the southwest with average speeds of 5 to 9 miles per hour (8 to 15 km/hour), and average air temperatures are 64.6øF (18.1øC) in the summer and 18.8øF (-7.3øC) in the winter.

The INEL lies in the Pioneer Basin, a closed topographic depression located on the Eastern Snake River Plain. Elevations range from approximately 4,800 to 5,400 feet (1,463 to 1,646 m) with a total relief of about 600 feet (183 m). The area receives surface water from rainfall, snowmelt, and stream- flow. The streamflow sources are the Big Lost River, the Little Lost River, and Birch Creek. Streamflow that reaches the INEL goes to the Big Lost River playa or the Birch Creek playa and is lost to evaporation and infiltration. Consequently, there is little available surface water within the INEL site boundaries and non available at the SL-1 and BORAX-I sites.

The Eastern Snake River Plain is a broad, flat plain composed to thick basaltic flows covering rhy- olitic calderas. The flows occur as layers of lava, ranging from a few inches to a few feet thick, inter- spersed with cinders, breccia, and unconsolidated sediments. Much of the INEL's land surface consists of basalt flows. The western and central portions of the INEL lie within the floodplain of the Big Lost River, which extends across the site from the southwest to the northeast. Alluvial deposits from the Big Lost River grade

into lacustrine (lake) deposits in the northern portion of the INEL where the Big Lost River enters a series of playa lakes. Loses deposits (wind-deposited silts) can be found covering the basalt bedrock over much of the rest of the INEL to thicknesses up to 20 feet (6 m). The loess deposits are the source of the soil typically found in the southern portion of the INEL. This soil is generally shallow, poorly developed, and has a sandy-loam or loamy texture.

The Snake River Plain Aquifer, the largest potable water aquifer in Idaho, underlies the Eastern Snake River Plain and the INEL. The aquifer is approximately 200 miles (322 km) long, 20 to 60 miles (32.2 to 96.5 km) wide, and covers an area of approximately 9,600 square miles (24,853 km2). The depth to the Snake River Plain Aquifer varies from approximately 200 feet (61 m) in the northeastern corner of the INEL to approximately 900 feet (274 m) in the southeastern corner, a distance of 42 miles (67.6 km). Depth to groundwater is approximately 667 feet (203 m) in the vicini- ty of the SL-1 burial ground and approximately 596 feet (181 m) near BORAX-I.

The INEL is a flat, semiarid sagebrush desert with plants typical of such ecologies. Important shrubs include big sagebrush, rabbitbrush, winterfat, shadscale saltbush, nuttall saltbush, and gray horsebrush. The most abundant vegetation types are big sagebrush, green rabbitbrush, bluebunch wheatgrass, thickpike wheatgrass, horsebrush, dwarf sagebrush, saltbush, and crested wheatgrass.

The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Ten reptiles, including the short-horned lizard, the gopher snake, the sagebrush lizard, and the western rat- tlesnake, and one amphibian species, the Great Basin spadefoot toad, have been observed on the site. A total of 164 species of birds inhabit the INEL, including sparrows, raptors, waterfowl, swallows, American kestrels, killdeers, American robins, sage thrashers, sage sparrows, western meadowlarks, house sparrows, and mallards during the breeding season and sage grouse, rock doves, horned larks, and black-billed magpies year-round. The 37 species of mammals found on the site include 18 species of rodents, four species of leporids, and six species carnivores. The most common rodents are the Townsend's ground squirrel, the least chipmunk, the Great Basin pocket mouse, and Ord's kangaroo rat; the dominant leporid is the rabbit; common carnivores are the coyote and the long-tailed weasel. Pronghorn antelope and mule deer are frequently observed.

Only two species have been identified at the INEL that are classified as endangered or threatened: the bald eagle and the American peregrine falcon. The bald eagle has been seen in the winter months at or around the INEL, and the peregrine falcon has been observed in the northern portion of the INEL on rate occasions.

2. Site History and Enforcement Activities

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-I bur- ial ground was established

in 1954; the SL-1 burial ground was established in 1961. Both sites were identified in the Consent Order and Compliance Agreement which was signed by the EPA and the DOE and promulgated in 1987 puruant to the Resource Conservation and Recovery Act Section 3008 (h). Under this agreement, the DOE initially assessed and screened the identified as solid waste man- agement units. The INEL was proposed for listing on the National Priorities List in July 1989. The listing was proposed by the EPA under authorities granted by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. This act is also referenced by the acronym "CERCLA" or as the "Superfund." The act was amended by the Superfund Amendments and Reauthorization Act of 1986. References to CERCLA include the amendments of 1986. The National Priorities List identifies the highest risk sites, as determined by a screening and ranking process, which are to be remediated via the CERCLA process. The INEL was officially placed on the National Priorities List in November 1989.

Subsequent to the CERCLA listing, the DOE, the EPA, and the IDHW (collectively referred to as the agencies) negotiated a Federal Facility Agreement and Consent Order and an Action Plan for reme- diation of the INEL. The documents were signed in December 1991. Both burial grounds were classi- fied as Track 2 operable units, described in the Action Plan as operable units that may require field data collection before a remedial decision could be reached. A Track 2 investigation would determine if no further action, an interim action, or a remedial investigation/feasibility study was warranted.

Results of the 1993 Track 2 preliminary scoping for the SL-1 burial ground led the agencies to con- clude that the evaluation of the site should be elevated to a remedial investigation/feasibility study. The scope of the investigation was limited to existing data, considered sufficient by the agencies to deter- mine a remedial action for the site, and a feasibility study focused on examining remedial alternatives selected in other Records of Decision for similar sites. In addition, because of the similarities of the BORAX-I burial ground to the SL-1 burial ground, the agencies determined that both sites would be assessed in the same remedial investigation/feasibility study.

This Record of Decision documents the remedy selected based on the results of the remedial inves- tigation/feasibility study and additional information contained in the Administrative Record for Operable Units 5-05 and 6-01. Additional details concerning the history of each of the two burial grounds follow in the next subsections.

2.1 SL-1

The SL-1 was a small nuclear power plant designed for the military to generate electric power and heat for remote arctic installations. The reactor was operated from August 1958 until January 3, 1961, as a test, demonstration, and training facility. On the evening January 3, 1961, the SL-1 reactor accidentally achieved a prompt critical nuclear reaction, which caused a steam explosion that destroyed the reactor and resulted in the deaths of the three operators of duty. The reactor vessel and building were severely damaged and highly contaminated, and a massive cleanup operation ensued to dismantle and

dispose of the reactor and building.

A burial ground was constructed approximately 1,600 feet (488 m) northeast of the original site of the reactor. This was done to minimize radiation exposure to the public and site workers that would have resulted from transport of contaminated debris from SL-1 to the Radioactive Waste Management Complex over 16 miles (26 km) of public highway. Original cleanup of the site took about 18 months. The entire reactor building, contaminated materials from nearby buildings, and soil and gravel contami- nated during cleanup operations were disposed of in the burial ground. The majority of buried materi- als consists of soils and gravel.

Recovered portions of the reactor core, including the fuel and all other parts of the reactor that were important to the accident investigation, were taken to the INEL's Test Area North for study. After the accident investigation was complete, the reactor fuel was sent to the Idaho Chemical Processing Plant for reprocessing. The reactor core minus the fuel, along with the other components sent Test Area North for study, was eventually disposed of at the Radioactive Waste Management Complex.

The SL-1 burial ground consists of three excavations, in which a total volume of 99,000 cubic feet (2,800 m3) of contaminated material was deposited. The excavations were dug as close to basalt as the equipment used would allow and ranged from 8 to 14 feet (2.4 to 4.3 m) in depth. At least 2 feet (0.6 m) of clean backfill was placed over each excavation. Shallow mounds of soil over the excava- tions were added at the completion of cleanup activities in September 1962. Operable Unit 5-05 is

defined as the surface and subsurface soils and debris within the 600- by 300-foot (183- by 91-m) SL-1 burial ground exclusion fence and the surface area surrounding the burial ground (see Figure 2). Other residual surface contamination from the SL-1 accident is being investigated in Waste Area Group 5 under Operable Unit 5-12, site code Auxiliary Reactor Area (ARA)-23, which is southwest of and adja- cent to Operable Unit 5-05 (see Figure 2). ARA-23 includes the original location of the SL-1 reactor.

Numerous radiation surveys and cleanup of the surface of the burial ground and surrounding area have been performed in the years since the SL-1 accident. Aerial surveys were performed by EG&G Las Vegas in 1974, 1982, 1990, and 1993. The Radiological and Environmental Sciences Laboratory conducted gamma radiation surveys every 3 to 4 years between 1973 and 1987 and every year between 1987 and 1994. Particle-picking at the site was performed in 1985 and 1993. Results from the surveys indicate that cesium-137 and its progeny (decay product) are the primary surface-soil contaminants. During a survey of surface soil in June 1994, "hot spots," areas of higher radioactivity, were found within the burial ground with activities ranging from 0.1 to 50 milliroentgen (mR)/hour. On November 17, 1994, the highest radiation reading measured at 2.5 feet (0.75 m) above the surface at the SL-1 burial ground was 0.5 mR/hour; local background radiation was 0.2 mR/hour. A dose equiva- lent rate survey was conducted in 1995; all locations surveyed within Operable Unit 5-05 yielded read- ings at or below the background value of 20 ærem/hr.

Today the SL-1 burial ground is defined by a three-strand, barbed-wire exclusion fence posted with radiological control signs. Inside the burial ground the ends of the excavations are identified by con- crete markers. The surface of the burial ground is covered with various grass species. The two mounds and several minor depressions due to subsidence are visible within the fenced area. A second radiological-control fence encompasses the burial ground, a large contaminated surface soil area, and the Auxiliary Reactor Area I and II facilities. The fences, posted with radiological-control signs, and restricted access protect INEL workers and the public from exposure.

2.2 BORAX-I

The BORAX-I reactor was a small experimental reactor used in the summer months of 1953 and 1954 for testing boiling-water reactor technology. In 1954, the design mission of BORAX-I was com- pleted, and the decision was made to make one final test, which resulted in the intentional destruction of the reactor. The destruction of the reactor contaminated approximately 84,000 square feet of the surrounding terrain. Immediately following the final test of the BORAX-I reactor, much of the radioactive debris, including some fuel residue, was collected and buried on site in the reactor shield tank. Recovered fuel fragments and fuel residue were sent to the Idaho Chemical Processing Plant and Oak Ridge National Laboratory in Tennessee. Reusable equipment associated with the reactor was successfully decontaminated and used in the construction of BORAX-I. However, the cleanup did not sufficiently reduce the radioactivity at the site; therefore, the 84,000-square foot (7,800-m2) contami- nated area was covered with approximately 6 inches (15 cm) of gravel to reduce radiation levels at the ground surface.

Buried materials at the site consist of unrecovered uranium fuel residue, irradiated metal scrape, and contaminated soil and debris. Part of the waste was buried in the bottom half of the shield tank; the top half of the tank was collapsed in the bottom and the void space was filled with debris. The burial ground is contained within the foundation of the BORAX-I installation, the dimensions of which are 18 by 32 by 11 feet (5.5 by 9.8 by 3.4 m). A mounded gravel and dirt cover approximately 5 feet (1.5 m) high and 30 feet (9 m) in diameter is centered over the buried shield tank. Operable Unit 6-01 includes the buried debris, as well as the 84,000-square feet (7,800-m2) of contaminated surface soil.

Field radiation surveys conducted in 1978 and 1980 detected radiation at about three times the background levels in the central portion of the gravel-covered 84,000-square foot (7,800-m2) area south-southeast of the buried reactor. Radiation in adjacent areas was at background levels. Surface and subsurface soil sampling of the 84,000-square foot (7,800-m2) gravel-covered area in 1978 and 1980 indicated that radioactive contamination exists and is highest at a depth of approximately 6 inches (15 cm) at the interface of the gravel cover and the original ground surface. Ongoing monitoring of the site through the use of radiation dosimeters shows that radiation levels are slightly

above background levels. On November 18, 1994, the radiological field measured at 2.5 feet (0.75 m) above the surface of the BORAX-I burial ground was 0.1 mR/hour; local background radiation was also 0.1 mR/hour.

Today, the ground surface at the site looks very much like the surrounding terrain. Abundant native vegetation has grown over the mound and surrounding area. A large stake about 5 feet (1.5 m) tall marks the reactor location. A 6-foot (1.8-m)-high chain-link fence surrounds the burial ground, forming an enclosed area approximately 100 feet (30 m) on each side. The contaminated surface soil area outside of the chain-link fence is bounded by a two-wire exclusion fence. The fences, posted with radiological-control signs, and restricted access protect INEL workers and the public and the public from unacceptable exposures.

3. Highlights of Community Participation

In accordance with the CERCLA 113(k)(2)(B)(i-v) and 117, a series of opportunities for public information and participation in the remedial investigation and decision process for the SL-1 and BORAX-I burial grounds was provided to the public from September 1994 through May 1995. For the public, notifications included fact sheets that briefly discussed the investigation to date, INEL Reporter articles and updates, a proposed plan, telephone briefings, and public meetings. The INEL Reporter is a periodic, public information publication of the INEL's Environmental Restoration Program.

In September 1994, a fact sheet concerning the SL-1 and BORAX-I remedial investigation/feasibil- ity study was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list.

The project was discussed at informal semiannual briefings in Twin Falls (October 11, 1994), Pocatello (October 13, 1994), Moscow (October 18, 1994), Boise (October 19, 1994), and Idaho Falls (October 20, 1994). During these briefings, representatives from the DOE and the INEL discussed the project, answered questions, and listened to public comments.

Regular reports concerning the status of the project were included in the INEL Reporter and were mailed to those were on the mailing list. Reports also appeared in two issues of Citizens' Guide (a supplement to the INEL Reporter).

In April 1195, another fact sheet concerning the project was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list. On April 11, 1995, the DOE issued a news release to more than 100 contacts concerning the beginning of a 30-day public com- ment period, which began May 3, 1995, and ended June 3, 1995, pertaining to the SL-1 and BORAX-I pro- posed plan. Many of the news releases resulted in a short note in community calendar sections of newspa- pers and in public service announcements on radio stations. Both the fact sheet and news release gave notice to the public that SL-1 and BORAX-I documents would be available before the beginning of the comment period in the Administrative Record section of the

INEL Information Repositories located in the INEL Technical Library of Idaho Falls, in the INEL Boise Office, and in public libraries in Idaho Falls, Fort Hall, Pocatello, Twin Falls, Boise, and Moscow. Also, table top displays were set up at the Grand Teton Mall in Idaho Falls (May 15-20), Burley Public Library (April 24-May 5), Twin Falls Public Library (May 5-26), Boise Towne Square Mall (April 29), and the Pocatello City Building (April 24-May 15).

Opportunities for public involvement in the decision process for SL-1 and BORAX-I project began in May 1995. For the public, the activities included receiving the proposed plan, receiving tele- phone calls, attending the availability sessions at public meetings to informally discuss the issues, and submitting verbal and written comments to the agencies during the 30-day public comment period.

Copies of the proposed plan for SL-1 and BORAX-I were mailed to about 6,700 members of the pub- lic and to 650 INEL employees on the INEL Community Relations Plan mailing list on April 28, 1995, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the same information and the locations of public meetings on May 16, 17, and 18, 1995, in Idaho Falls, Boise, Moscow, respectively, appeared in seven major Idaho newspapers. Large adver- tisements appeared in the following newspapers on April 26: the Post Register (Idaho Falls); the Idaho State Journal (Pocatello); the South Idaho Press (Burley); the Times News (Twin Falls); the Idaho Statesman (Boise); the Lewiston Morning Tribune (Lewiston); and the Daily News (Moscow).

Post cards were mailed on May 10, 1995, to about 6,700 members of the public and to 650 INEL employees on the INEL Community Relations Plan mailing list to encourage them to attend the public meetings and to provide verbal or written comments. News releases and newspaper advertisements gave public notice of public involvement activities. Offerings for briefings and the 30-day public com- ment period that was to begin May 3 and run through June 3, 1995 were also announced. Personal calls were made to stakeholders in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow the weeks of May 8 and 15 to remind individuals about the meetings.

Written comment forms, including a postage-paid business-rely form, were made available to those attending the public meetings. The forms were used to submit written comments either at a meeting or by mail. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep transcripts of discussions and public comments. The meeting transcripts were placed in the Administrative Record sections for SL-1 and BORAX-I, Operable Units 5-05 and 6-01, in five INEL Information Repositories. For those who could not attend the public meetings but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

A Responsiveness Summary has been prepared as part of the Record of Decision. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in Appendix A and in the

Administrative Record for Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

A total of about 10 people not associated with the project attended the SL-1/BORAX-I public meetings. Overall, 10 provided formal comment; ot these 10 people, three provided oral comments, and seven provided written comments. All comments received on the proposed plan were considered during the development of this Record of Decision. The decision for this action is based on the information in the Administrative Record for these operable units.

On August 2, 1995, the project manager form the Idaho Department of Health and Welfare Division of Environmental Quality gave a brief presentation on the projects ot the Environmental Management Site Specific Advisory Board -----Idaho National Engineering Laboratory. The advisory board is a group of individuals representing the citizens of Idaho, making recommendations to DOE, EPA, and the state of Idaho regarding environmental restoration activities at the INEL.

4. Scopes and Roles of Operable Units and Response Actions

Under the Federal Facility Agreement and Consent Order, the INEL is divided into ten waste area groups. Each waste area group is further subdivided into operable units, each of which may contain one or more sites. The first nine waste area groups correspond to particular operating facilities on the INEL; the tenth waste area group represents the entire INEL and the Snake River Plain Aquifer. The SL-1 site is part of Waste Area Group 5, which contains 13 operable units and is the only site in Operable Unit 5-05. The BORAX-I site is in Waste Area Group 6 and is the only site in Operable Unit 6-01. A complete evaluation of all cumulative risks associated with CERCLA action in Waste Area Groups 5 and 6 will be addressed in the respective comprehensive remedial investigation/feasibility study for each waste area group. Cumulative risks for the entire INEL will be addressed in the Waste Area Group 10 risk assessment.

Existing data from past operating and disposal activities were available to expedite the evaluation of these sites. Therefore, the scope of the remedial investigation for the SL-1 and BORAX-I burial grounds did not include any sampling or acquisition of new data, and a Work Plan was not produced. A focused feasibility study, one that examined only those alternatives that had been previously selected in Records of Decision for similar sites, was performed.

The SL-1 site is defined as the buried waste in the SL-1 burial ground plus the surface soils in the sur- rounding area shown in Figure 2. The BORAX-I site is defined as the buried waste in the BORAX-I burial ground plus the surface soil in the surrounding 84,000-square foot (7,800-m2) area illustrated in Figure 3. This Record of Decision addresses the contaminated surface soils and buried wastes at both burial grounds. Both of these sites pose unacceptable risk to human health and the environment, primarily because of the risks from direct exposure to ionizing radiation from the buried wastes. There is also a lesser but still unac- ceptable risk due to soil ingestion. The purpose of this response is to inhibit current or future exposure to the buried waste and to reduce risks from soil ingestion.

5. Site Characteristics

This section summarizes the historical data used to evaluate contamination at the SL-1 and BORAX-I burial grounds. The agencies determined that sufficient data exist to recommend a remedial action for each site, therefore, no sampling was conducted for the remedial investigation. A complete discussion of the site characteristics for the SL-1 and BORAX-I burial grounds can be found in the remedial investiga- tion/feasibility study and the Administrative Record for Operable Units 5-05 and 6-01.

5.1 SL-1

On January 3, 1961, the SL-1 reactor was destroyed by an accidental nuclear excursion that resulted in a steam explosion. Very little contamination was released to the environment at the time of the accident due to the containment provided by the reactor building; however, demolition and cleanup activities result- ed in the spread of contamination over surface soils from Auxiliary Reactor Area II to the SL-1 burial ground. Numerous radiological surveys, surficial soil sampling, and particle-picking activities have been conducted in the years since the accident. The following section summarizes the results of these activities.

5.1.1 Previous Investigations

The DOE's Radiological and Environmental Sciences Laboratory conducted gamma radiation sur- veys in the vicinity of Auxiliary Reactor Areas I and II and the SL-1 burial ground every 3 to 4 years between 1973 and 1991. The areas north of Auxiliary Reactor Areas I and II and northeast of the SL-1 burial ground had the highest gamma radiation intensities. Soil sampling in 1977 found that cesium-137 was the primary contaminant.

The INEL's Waste Management Group surveyed areas in the vicinity of Auxiliary Reactor Area II and outside of the SL-1 burial-ground fence in 1985. The survey identified and mapped 236 radioactive particles, of which 219 had maximum surface readings of 20 mR/hour or greater. Of these, 16 had read- ings greater than 200 mR/hour (the maximum reading possible for the instruments used in the survey). A total of 44 of the particles were removed. Particles with readings greater than 200 mR/hour that were located on the road between Auxiliary Reactor Area II and the burial ground or were located in the dis- turbed are across Fillmore Boulevard from Auxiliary Reactor Area II were removed.

The INEL's Environmental Monitoring Unit conducted annual radiological surveys of surface soils within the SL-1 burial ground fence from 1987 through 1992. One-thrid of the area was surveyed each

year; at the end of each three-year period, the entire area had been surveyed. From 1987 to 1989, read- ings ranged from 0.05 to 11.0 mR/hour measured at

contact. From 1990 to 1992, readings ranged from 0.04 to 4.42 mR/hour measured at contact.

In 1993, the Environmental Monitoring Unit performed a surface-soil radiological survey and parti- cle-picking at the SL-1 burial ground. There were 874 particles identified with readings from 0.01 to 200 mR/hour at contact. Particles reading greater than 0.15 mR/hour were removed if they were locat- ed in the top 3 inches (7.6 cm) of soil. Of the 874 particles, 709 were removed for disposal at the Radioactive Waste Management Complex. Activity levels of the particles deeper than 3 inches (7.6 cm) and left in place ranged from 0.01 to 50 mR/hour.

As part of the 1993 effort, an area immediately adjacent and northeast of the burial ground was investigated. Of the 163 particles identified, 66 were removed. The remaining particles were located at a depth of greater than 3 inches (7.6 cm) and had activities ranging from 1.0 to 250 mR/hour. Three soil samples were collected from a depth of 0 to 1 foot (0 to 0.3 m).

Four soil samples were collected from the vicinity of the SL-1 burial ground in a separate, unrelat- ed sampling effort conducted in 1993 as part of the Waste Area Group 3 and Waste Area Group 10 soil treatability study. The soil samples were analyzed for gross alpha, gross beta, and cesium-137.

A surface-soil survey in June 1994 found 217 particles within the burial-ground fence, with activi- ties ranging from 0.1 to 50 mR/hour. There were 51 particles identified in the area just northeast of the burial ground, with activities ranging from 0.2 to 250 mR/hour. In November 1994, a survey was con- ducted to determine radiation levels within the burial ground at a height of 2.5 feet (0.8 m). A maxi- mum of 0.5 mR/hour was detected at two locations; the remainder of the area was at the local back- ground of 0.2 mR/hour.

Aerial surveys of the SL-1 burial ground were conducted in 1974, 1982, 1990, and 1993. The sur- veys detected gamma radiation from man-made sources in the area, with cesium-137 the primary con- tributor. The 1990 survey, which was used to define the site boundary, is illustrated in Figure 4. A risk assessment was completed in August 1995 on the basis of soil samples and dose equivalent rate mea- surements within the isopleth defined by the 1990 aerial survey (see Section 11.1).

5.1.2 Nature and Extent

5.1.2.1 Surface Contamination. Operable Unit 5-05 comprises the area illustrated in Figure 2. Based on the original source of surface contamination (aerial distribution of contaminant during demolition and cleanup of the SL-1 reactor) and the limited mobility of radionuclides in the soil at the INEL, it is believed that contamination is restricted to the upper 0.5 foot (0.15 m) of soil. For the remedial investigation, identification of the contaminants of concern associated with surface soils at SL-1 was based on comparison of analytical data with background concentrations. Concentrations of

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the contaminants of concern for surface soils were based on the 95% upper

confidence limit of the ana- lytical data, and the assumption was made that each contaminant is uniformly distributed across the site. Table 1 presents the contaminants of concern for surface soils.

An assessment of the surface soils surrounding the SL-1 burial ground was concluded in August 1995 subsequent to the remedial investigation and proposed plan. Based on the results of this assess- ment, all dose equivalent rates within the Operable Unit are at or below the background value of 20 ærem/hr.

Table 1. Contaminants of concern and surface soil concentrations at SL-1.

Radionuclide	Concentration (pCi/g) 95% upper confidence limit	INEL Background
Cobalt-60	0.36	No data available
Cesium-137	904	1.28
Europium-154	2.68	No data available
Strontium-90	1,370	0.76
Thorium-228	1.6	2.1b
Thorium-230 and/or uranium-234	2.7	1.88, 1.95
Thorium-232	1.4	2.1b

a. 95%/95% upper tolerance limit, grab sample background concentrations from Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory, INEL-94/02550, S.M. Rood, G.A. Harris, G.J. White, February 1995.

b. Thorium-228 and -232 were retained for evaluation based on background data that were available when the remedial investig- tion was prepared; the above-referenced background document was released after the remedial investigation was finalized.

5.1.2.2 Subsurface Contamination. Subsurface contamination at the SL-1 burial ground is restricted to the excavations that received contaminated building debris, equipment, and gravel and soil from the demolition and cleanup following the SL-1 reactor accident. The estimated volume of buried contaminated material is 99,000 cubic feet (2,800 m3).

The inventory and activities of radionuclides in the subsurface of the SL-1 burial ground were estimated using the computer model ORIGEN2. Because 93% of the uranium-235 fuel was recovered during the acci- dent investigation and cleanup, it was assumed that only 7% of the original quantity of fuel was disposed of in the SL-1 burial ground. Inventories of radionuclide activities were generated for 1961, 1994, 2024, and 2094 and were utilized in the baseline risk assessment to calculate risks for current, 30-year future, and 100-year future scenarios. Inventories were calculated for specific times to account for the decay (decrease through time) of parent radionuclides and the ingrowth (an increase through time) of radioactive progenies. The con- centration of each contaminant of concern for each time evaluated was estimated using the assumption that 7% of the model-generated activity for each contaminant of concern was uniformly distributed throughout the source volume. Table 2 presents contaminants of concern for the subsurface and estimated

concentrations.

Table 2. Potential contaminants of concern and estimated subsurface concentrations at SL-1 for non-groundwater pathways.

Radionuclide	Concentration (pCi/g) July 1994	July 2024	July 2094
Cesium-137	2.29E+04	1.14E+04	2.27E+03
Strontium-90	2.15E+04	1.05E+04	1.99E+03
Krypton-85	6.91E+02	9.94E+01	1.08E+00
Samarium-151	5.20E+02	4.13E+02	2.41E+02
Promethium-147	2.62E+01	9.46E+03	8.78E-11
Plutonium-241	1.96E+01	4.62E+00	1.59E-01
Europium-154	1.84E+01	1.64E+00	5.80E-03
Europium-155	1.24E+01	1.87E-01	1.05E-05
Plutonium-239	1.04E+01	1.04E+01	1.04E-01
Technetium-99	6.85E+00	6.85E+00	6.85E+00
Plutonium-238	6.72E+00	5.30E+00	3.05E+00
Americium-241	2.57E+00	2.93E+00	2.76E+00
Plutonium-240	1.56E+00	1.56E+00	1.55E+00
Zirconium-93	1.04E+00	1.04E+00	1.04E+00
Niobium-93m	8.09E-01	9.46E-01	9.83E-01
Antimony-125	7.30E-01	4.10E-04	9.89E-12
Europium-152	7.11E-01	1.54E-01	4.35E-03
Uranium-235	4.60E-01	4.60E-01	4.60E-01
Cesium-135	4.34E-01	4.34E-01	4.34E-01
Uranium-236	2.32E-01	2.32E-01	2.32E-01
Tellurium-125m	1.78E-01	9.78E-05	2.41E-12
Antimony-126m	1.78E-01	1.78E-01	1.78E-01
Tin-126	1.78E-01	1.78E-01	1.78E-01
Cesium-134	9.12E-02	3.81E-06	2.30E-16
Tin-121m	2.70E-02	1.78E-02	6.76E-03
Antimony-126	2.49E-02	2.49E-02	2.49E-02
Neptunium-237	2.14E-02	2.14E-02	2.15E-02
Iodine-129	1.12E-02	1.12E-02	1.12E-02
Palladium-107	7.38E-03	7.38E-03	7.38E-03
Uranium-234	6.28E-03	6.79E-03	7.60E-03
Uranium-238	5.64E-03	5.64E-03	5.64E-03
Protactinium-231	3.34E-04	6.26E-04	1.31E-03
Americium-242m	2.40E-04	2.09E-04	1.52E-04
Actinium-227	1.31E-04	3.60E-04	1.00E-03
Americium-243	3.55E-05	3.54E-05	3.52E-05
Protactinium-234	7.33E-06	7.33E-06	7.33E-06
Curium-243	6.83E-06	3.29E-06	6.00E-07
Francium-223	1.81E-06	4.96E-06	1.39E-05

5.1.3 Fate Transport

Potential pathways for contaminant migration at the SL-1 burial ground are limited by site condi- tions. The SL-1 site is fairly isolated, is gently sloped, is in a desert climate, and has a great depth to groundwater [approximately 667 feet (203 m)]. Although there is surface contamination at the site, the majority of contamination is subsurface. In general, the potential pathways for contaminant migration include atmospheric transport via surface water and groundwater.

There is a potential for windblown migration of radionuclides present in the surface soil at the SL-1 burial ground, although the presence of a thick grass cover minimizes mobilization of dust and its dis- persion by wind.

No surface-water migration pathway exists at the site, and there are no surface-water features. The SL-1 burial ground is in a topographic low, minimizing the chance for significant erosion due to sur- face water but increasing infiltration from precipitation. Flooding of the Big Lost River is not a con- cern at SL-1 because of topography, distance from the river, and the INEL's flood diversion system.

No groundwater sampling data are available for the SL-1 burial ground, therefore the groundwater pathway was evaluated using the GWSCREEN (version 2.02) computer model. Concentrations in the groundwater were modeled for three hypothetical locations: the edge of th burial grounds, the down- gradient boundary of the waste area group (Figure 2), and the nearest downgradient INEL site-bound- ary (Figure 1). Groundwater flow is generally from northeast to southwest. The groundwater model- ing performed in support of the remedial investigation indicates that vertical migration of contaminants from the SL-1 burial ground is limited. The tendency of the contaminants to chemically react with nat- urally occurring minerals in the soil and low annual precipitation result in long transit times within the vadose zone (typically hundreds of years or more). It is assumed that no lateral migration of contami- nants has occurred within the subsurface because there is no mechanism or driving force to move cont- aminants horizontally. Infiltration of precipitation is primarily vertical within the vadose zone and therefore would not contribute significantly to the horizontal migration of radionuclides.

5.2 BORAX-I

In 1954, the design mission ot the BORAX-I reactor was completed and the decision was made to conduct one final experiment that would result in the destruction of the reactor. The excursion contam- inated approximately 84,000 square feet (7,800-m2) of ground, in a strip approximately 200 feet (61 m) wide and 420 feet (128 m) long, extending south-southeast from the reactor. Following cleanup, the contaminated area of approximately 84,000 square feet (7,800-m2) was covered with gravel to a depth of 6 inches (15 cm). Soil sampling of the 84,000-square foot (7,800-m2) area of surface contamination was conducted in 1978 and 1980. Results of these activities are summarized in the following section.

5.2.1 Previous Investigations

In 1978, the Radiological and Environmental Sciences Laboratory performed a multiphase study to assess the distribution of radioactivity at the BORAX-I reactor burial ground. Exposure rates at 3 feet (1 m) above the ground were determined.

A portable gamma-ray spectroscopy system was used to identify gamma-emitting radionuclides. In situ gamma-ray spectrums were obtained from nine locations. Surface-soil samples were also collected at nine locations outside of the graveled area in order to assess the extent of contamination. The col- lection locations were chosen to include samples down range of the major debris and surface deposi- tion zones. Soil samples were collected from five locations within the gravel-covered area and were analyzed by gamma ray spectroscopy in order to assess the deposition and migration activity. Analyses of the soil samples showed the cesium-137 and uranium-235 were the only detecable gamma-emitting radionuclides present. Samples collected from the gravel covering showed that 98% of the radioactive contamination was located within 2 inches (5 cm) of the gravel/soil interface.

An investigation of the BORAX-I reactor area was conducted in June and November 1980. The investigation consisted of a gridded radiation survey of the BORAX-I site, including high-resolution gamma spectrometer measurements of the surface soil, soil samples from trenches, and sodium-iodide gamma spectrometer profiles of selected boreholes. The purpose of the radiological characterization was to identify the radionuclides present within the area and to specify their concentrations and distrib- utions. Cesium-137 was the only man-made gamma emitter detected during the radiological surveys. Soil-sample analyses detected cesium-137, strontium-90, uranium-235, and plutonium-239. Results indicate that surface contamination was limited to relatively small areas, mainly along a south-south- east line from the reactor location.

Aerial surveys of the BORAX-I burial ground were conducted in 1974, 1982, 1990, and 1993. The surveys detected gamma radiation from man-made sources in the area cesium-137 being the pri- mary contributor. Figure 5 illustrates the results of the 1990 survey.

5.2.2 Nature and Extent

5.2.2.1 Surface Contamination. Operable Unit 6-01 comprises and area approximately 200 by 420 feet (61 by 128 m). Based on the original source of surface contamination (aerial distribution of conta- minants resulting from the final experiment of the BORAX-I reactor) and the limited mobility of radionuclides in the soil at the INEL, it is believed that contamination is restricted to the upper 1 foot (0.3 m) including 0.5 foot (0.15 m) of contaminated soil and 0.5 foot (0.15 m) of gravel cover.

Identification of the contaminants of concern associated with surface soils a BORAX-I was based on comparison of analytical data with background concentrations. Concentrations of the contaminants of concern for surface soils were based on the 95% upper confidence limit of the analytical data, and the assumption was made that each contaminant is uniformly distributed throughout the 200-by 420-foot (61- by 128-m) area. Table 3 presents the contaminants of concern for surface soils.

Table 3. Contaminants of concern and surface soil concentrations at BORAX-I.

Radionuclide	Concentration (pCi/g)	95% upper confidence limit	INEL Background
Cesium-137	1,817	1.28	Strontium-90
2.0	0.76	Uranium-235	68.6
0.055-0.059b			

a. 95%/95% upper tolerance limit, grab sample background concentrations for cesium-137 and strontium-90 from Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory, INEL-94/0250, S.M. Rood, G.A. Harris, G.J. White, February 1995.

b. Range of background for uranium-235 from the remedial investigation/feasibility study, Attachment 1 of Appendix B.

5.2.2.2 Subsurface Contamination. Subsurface contamination at the BORAX-I burial ground is restricted to the contaminated soil and materials deposited in the concrete foundation of the reactor structure. The estimated volume contaminated material in the subsurface is 6,336 cubic feet (180 m3).

The BORAX-I inventory and activities of buried radionuclides were estimated using the computer model RSAC-5. Decontamination documents prepared after the cleanup of the BORAX-I facility in 1954 reported that 12% of the uranium-235 fuel had been recovered. Based on this figure, it was assumed that 88% of each of the associated radionuclides remained unrecovered and was disposed of in the burial ground. Inventories of radionuclides were generated for 1954, 1994, 2024, and 2094 and were used in the baseline risks assessment to calculate risks for current, 30-year future, and 100-year future scenarios. Inventories were calculated for specific times to account for the decay (a decrease through time) of parent radionuclides and for ingrowth (an increase through time) of radioactive proge- nies. The concentration of each contaminant of concern for each time evaluated was estimated using the assumption that 88% of the model-generated activity for each contaminant concern was uniform- ly distributed throughout the source volume. Table 4 presents the contaminants of concern for the sub- surface.

Table 4. Potential contaminants of concern and estimated subsurface concentrations at BORAX-I for non-groundwater pathways.

Radionuclide	Concentration (pCi/g)	July 1994	July 2024	July 2094

Cesium-137 1.20E+03 6.02E+02
1.19E+02 Strontium-90 1.10E+03 5.39E+02
1.01E+02 Uranium-234 9.29E+02 9.29E+02
9.29E+02 Samarium-151 5.05E+01 4.01E+01
2.34E+01 Uranium-235 2.94E+01 2.94E+01
2.94E+01 Krypton-85 1.90E+01 2.73E+00
2.95E-02 Technetium-99 4.27E-01 4.27E-01
4.27E-01 Thorium-230 3.34E-01 5.83E-01
1.17E+00 Promethium-147 2.77E-01 1.00E-04
9.25E-13 Uranium-238 1.91E-01 1.91E-01
1.91E-01 Zirconium-93 6.35E-02 6.35E-02
6.35E-02 Niobium-93m 5.57E-02 6.21E-02
6.35E-02 Protactinium-231 2.18E-02 3.83E-02
7.65E-02 Tin-126 1.10E=02 1.10E-02
1.10E-02 Actinium-227 9.51E-03 2.29E-02
5.95E-02 Cesium-135 8.29E-03 8.29E-03
8.29E-03 Antimony-125 8.14E-03 4.46E-06
1.10E-13 Radium-226 2.88E-03 8.77E-03
3.48E-02 Lead-210 8.99E-04 4.01E-03
2.25E-02 Iodine-129 6.02E-04 6.02E-04
6.02E-04 Protactinium-234 2.48E-04 2.48E-04
2.48E-04 Europium-154 1.12E-04 9.96E-06
3.53E-08 Niobium-94 6.35E-07 6.32E-07
6.32E-07

5.2.3 Fate and Transport

Potential pathway for contaminant migration at the BORAX-I burial ground are limited by condi- tions at the site. The site is fairly isolated, is gently sloped, is in a desert climate, and has a great depth to groundwater [approximately 596 feet (181 m)]. Although there is surface contamination at the site, the majority of contamination is in the subsurface. In general, the potential pathways for contaminant migration include atmospheric transport and transport by surface water and groundwater.

There is a potential for windblown migration of radionuclides present in the surface soil at the BORAX-I burial ground, although the existing vegetative cover minimizes the mobilization of dust and its dispersion by wind.

No surface-water migration pathway exists at the site and there are no surface-water features. Although the BORAX-I burial ground is location on a slight rise, the slope of the ground immediately adjacent to the site is fairly gentle, minimizing the likelihood of erosion. Flooding of the Big Lost River is not a concern at BORAX-I because of topography, distance from the river, and the INEL's flood diversion system.

No groundwater sampling data area available for the BORAX-I burial ground, therefore the ground- water pathway was evaluated using the GWSCREEN (version

2.02) computer model. Concentrations in the groundwater were modeled for three hypothetical locations: the edge of the burial grounds, the downgradient boundary of the waste area group (Figure 3), and the nearest downgradient INEL site- boundary (Figure 1). Regional groundwater flow is generally from northeast to southwest. Results of the modeling indicate that vertical migration of contaminants from the BORAX-I burial ground is lim- ited. The tendency of the contaminants to chemically react with naturally occurring minerals in the soil and low annual precipitation result in long transit times within the vadose zone (typically hundreds of years or more). It is assumed that no lateral migration of contaminants has occurred within the subsur- face because there is no mechanism or driving force to move contaminants horizontally. Infiltration of precipitation is primarily vertical within the vadose zone and therefore would not contribute significant- ly to the horizontal migration of radionuclides.

6. Summary of Site Risks

A baseline risk assessment was conducted to evaluate current and future potential risks to human health. The risk assessments were conducted in accordance with the EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual and other EPA guidance. Risk scenarios and default parameters used in the risk assessment were selected with the concurrence of the agencies.

Radionuclides are the only contaminants of concern at the SL-1 and BORAX-I burial grounds. Although nonradioactive contaminants may be present at either site, it was determined that, if present, they probably represent an insignificant contribution to the total risk. Radionuclides present in surface soils at BORAX-I and subsurface soils at both sites pose potential carcinogenic (cancer causing) risks to occupa- tional workers and future residents. Carcinogenic risks are generally a much greater concern than noncar- cinogenic risks from radionuclides. Therefore, the baseline risk assessment focused on a quantitative assessment of carcinogenic risks. Noncarcinogenic risks were subjected to a qualitative evaluation and were eliminated from further assessment. The assessment considered the carcinogenic health effects that could result from exposure to the contaminants under current occupational and future occupational and residential land use scenarios. The health effects differ depending on whether the sites are used for light industry or residential development. Effects could result from direct exposure to radioation, from inhalation of contami- nated dust, or from ingestion of contaminated soil or groundwater. Section 6.1 summarizes the results of the baseline risk assessment.

The baseline risk assessment for Operable Unit 5-05 evaluated potentially contaminated surface soils in an area 1,200 by 1,500 feet (366 by 457 m). Subsequent to finalization of the remedial investi- gation/feasibility study report and the proposed plan, an evaluation of new data in conjunction with his

torical sampling and survey data determined that surface soils within Operable Unit 5-05 do not pose an unacceptable risk to human health or the environment

(see Section 11.1). Support documentation for this determination can be found in the Administrative Record for Operable Units 5-05 and 6-01.

A qualitative ecological risk assessment was preformed to evaluate potential risks to the environ- ment due to contamination at the SL-1 and BORAX-I burial grounds. Section 6.2 summarizes results of the ecological risk assessment.

6.1 Human Health Risks

A baseline risk assessment was performed to evaluate the risks associated with taking no further action at a site. Thus, it was assumed in the assessment, as instructed in EPA guidance, that no remedi- ation will take place. Potential risks for specified land use scenarios were assessed.

The risk assessment consisted of contaminant identification, exposure assessment, toxicity assess- ment, and human health risk characterization. The contaminants identified at the SL-1 and BORAX-I burial grounds were based on historical soil-sampling data and radionuclide inventories calculated using computer models. The exposure assessment identified the potential exposure pathways for cur- rent workers and for future workers and residents. The toxicity assessment evaluated the potential health effects to an individual as a result of exposure to contaminants. Exposure scenarios were chosen to reflect a range of potential future land uses. Industrial land use is assured for the next 100 years, after which residential use is considered possible. Specifically, scenarios included the current use of the SL-1 and BORAX-I burial grounds (current occupational land use) and potential future land use scenarios (occupational and residential land use) in which the onset of exposures are delayed for 30 and 100 years.

The baseline risk assessment was presented in two parts: (1) and evaluation of deterministic risk based on standard EPA methodology and (2) an evaluation of the uncertainly associated with the mean risk using probabilistic risk assessment. The first quantity (deterministic risk) is a point estimate that represents a quantified upper bound of risk. Deterministic risks are used by decision makers to define the estimated excess risk that must be addressed in remedial decisions. Probabilistic methods are used in the second evaluation to quantify the uncertainty associated with the deterministic risk. These meth- ods provide a more complete understanding of the excess risk potential at a site by examining the like- lihood of over-or under-estimation of risk.

6.1.1 Contaminant Identification

Historical soil sampling analytical data were used to identify radionuclides present in surface soils at both sites. The lists of radionuclides were screened based on comparison with background concen- trations determined for the INEL. The range of sample concentrations was compared to the range of background concentrations. If the maximum sample concentration exceeded the maximum background concentration, the radionuclide was retained and assessed in the risk assessment (Table 1 and 3).

Computer models were used to generate lists of radionuclides with estimated activities for the sub- surface at each site. The radionuclides were screened based on availability of toxicological data and potential for posing a significant risk. Radionuclides evaluated in the risk assessment for subsur- face are presented in Table 2 and 4.

6.1.2 Exposure Assessment

The objective of the exposure assessment was to estimate the magnitude of exposure to contami- nants of concern at SL-1 and BORAX-I. The magnitude of exposure was determined by measuring or estimating the quantities of the contaminants available for contact at an exposure point during a speci fied time period. The results of the exposure assessment were then combined with contaminant-specif- ic toxicity information to characterize potential risks.

6.1.2.1 Exposure Scenarios. Only those exposure pathways where a plausible route of exposure can be demonstrated from the site to an individual were quantitatively evaluated in risk assessment. The populations at risk due to exposure from waste at the SL-1 and BORAX-I burial grounds were identified by considering both current and future land use scenarios. For each of the sites, 10 potential exposure scenarios (five residential scenarios and five occupational scenarios) were examined in the baseline risk assessment.

The residential scenarios model a person living on the site 350 days a year for 30 years, beginning in 2024 and 2094 (30 and 100 years from 1994). The intrusive scenarios reflect conditions if the buried waste is exposed. The nonintrusive scenarios model the risk to an individual who lives on the surface above the wastes in 2024 and 2094 and to a subsistence farmer on the site beginning in 2094.

The five occupational scenarios model nonintrusive daily industrial use without restrictions in 1994, two 1994 site-specific evaluations reflecting occupational activities over the last few years, and daily industrial use 30 and 100 years in the future in the years 2024 and 2094. Section 6.1.2.3 lists exposure parameters for each scenario.

6.1.2.2 Media Concentrations. Limited sampling and analytical data were available regarding contaminants present in the surface and subsurface soil at the SL-1 and BORAX-I sites. Surface-soil samples from the burial grounds and adjacent areas were used to evaluate the risk for soil ingestion, inhalation of dust, and ingestion o crops, meat, and milk for the nonintrusion scenarios. Surface-sam- ple data were also used to evaluate the external exposure pathways for the subsistence farmer scenarios. Subsurface contamination was evaluate based on radionuclide inventories and activities estimated using computer models. All pathways for the intrusion scenarios and the groundwater and external exposure pathways for the nonintrusion scenarios were evaluated using the computer-generated radionuclide inventories and activities. The radionuclides and concentrations evaluated in the baseline risk assessment are listed in Table 1 through 4.

To provide an understanding of the external exposure risk present at the

surface at the two sites, risk attributable to the radiological field measurements taken within the fence at each burial grounds was also evaluated. A radiological field survey conducted in November 1994 found levels of 0.5 mR/hour at the SL-1 burial ground and 0.1 mR/hour at the BORAX-I burial ground. Measurements were taken at 2.5 feet (0.8 m) above the ground surface. Local backgrounds were 0.2 mR/hour for SL-1 and 0.1 mR/hour at BORAX-I. However, dose equivalent rates measurements taken in 1995 in the area around SL-1 yielded readings at or below the background value of 20 ærem/hr.

6.1.2.3 Quantification of Exposure. The following exposure pathways were considered applica- ble to the evaluation of human exposure to contaminants at the sites: ingestion of soil; inhalation of fugitive dust; ingestion of groundwater (residential scenarios only); ingestion of crops, meat, and milk (subsistence farmer scenario only); and external exposure from radionuclides. The future residential setting included a hypothetical well, which could provide contaminated groundwater for use as drink- ing water. For the subsistence farmer scenario, the resident was also assumed to consume home grown produce, meat, and milk produced on site.

Adult exposures were evaluated for all scenarios and pathways (external exposure; inhalation of dust; and ingestion of soil, groundwater, and foods); child exposure (0 to 6 years old) were considered separately only for the soil ingestion pathway in the residential scenarios. Children were included because children ingest more soil than adults, significantly increasing their exposure rate.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reason- able maximum exposure at a site. The EPA defines reasonable maximum exposure as the highest exposure at a site. Use of this approach makes under-estimation of the actual cancer risk highly unlike- ly. Concentrations of the radionuclides evaluated in the baseline risk assessment are listed in Tables 1 through 4. The exposure parameters used in the risk assessment were:

All pathways

-Exposure frequency, residential: 350 days/year

-Exposure frequency, occupational, current: 250 days/year

-Exposure frequency, occupational, site-specific #1: 30 days/year

-Exposure frequency, occupational, site-specific #2: 5 days/year

-Exposure frequency, occupational, current: 25 years

-Exposure frequency, occupational, site-specific #1 and #2: 3 years

External exposure pathway

-Exposure time, residential: 24 hour/day

-Exposure time, occupational: 8 hour/day

-Exposure duration, residential: 30 years

Soil ingestion pathway

- Soil ingestion rate, residential, adult: 100 mg/day

- Soil ingestion rate, residential, child: 200 mg/day

- Soil ingestion rate, occupational: 50 mg/day

- Exposure duration, residential, adult: 24 years

- Exposure duration, residential, child: 6 years

Dust inhalation pathway

- Inhalation rate: 20 m3 of air/day

- Exposure duration, residential: 30 years

Groundwater ingestion rate pathway

- Groundwater ingestion rate, residential: 2 liters/day

- Exposure duration, residential: 30 years

The parameters and distributions used in the probabilistic risk assessment are presented in Tables 6-9 through 6-11 of the Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6- 01 (SL-1 and BORAX-I Burial Grounds), INEL-95/0027 (K.J. Holdren, R.G. Filemyr, D.W. Vetter, Idaho National Engineering Laboratory, March 1995), which is included in the Administrative Record for Operable Units 5-05 and 6-01.

6.1.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at SL-1 and BORAX-I. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Carcinogenic values (slope factors) for the sites were obtained from EPA's Health Effects Assessment Summary Tables: Annual FY-93, ECAO-CIN-909, 1993. The slope factors selected for the soil ingestion,

inhalation of dust, and external exposure pathways include progenies when available. Slope factors used to evaluate the groundwater pathways do not always include daughters because the groundwater model GWSCREEN specifically accounts for up to five daughters.

Slope factors have been developed by the EPA for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Slope factors for radionuclides are expressed in units of risk/pCi for ingestion and inhalation and risk/year per pCi/gram for external exposure. Slope factors are multiplied by the estimated intake of a potential carcinogen, in pCi (pCi-year/gram for external exposure), to provide an upper-bound estimate of the excess lifetime cancer risk associated with the exposure at that intake level. Slope factors are derived from the results of human epidemio- logical studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

6.1.4 Human Health Risk Characterization

Excess lifetime cancer risks are estimated by multiplying the intake level, developed using the exposure assumptions, by the slope factor (see Section 6.1.3). These risks are probabilities that are generally expressed in either scientific notation (1x10-6) or exponential notation (1E-06). An excess lifetime cancer risk of 1E-06 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. Excess cancer risks estimated below 1E-06 typically indicate that no further action is appropriate. Risks estimated in the range of 1E-04 to 1E-06 (1 in 10,000 to 1 in 1,000,000) indicate that further investigation or remediation may be needed, and risks estimated above 1E-04 typically indicate that further action is appropriate. However, the upper boundary of the risk range is not a discrete line at 1E-04, although EPA generally uses 1E-04 in mak- ing risk management decisions. A specific risk estimate around 1E-04 may be considered acceptable if justified based on site-specific conditions.

6.1.4.1 Deterministic and Probabilistic Risk Summary. The results of the deterministic and probabilistic risk calculations are summarized in Table 5 for SL-1 and the Table 6 for BORAX-I and presented graphically in Figures 6 and 7. For the probabilistic simulations, the risk summary tables and figures present the 50th percentile, representing the average individual risk, and the 95th percentile, representing the reasonable maximum exposure individual risk.

The probabilistic risk assessment showed that the greatest contributors to uncertainly in the overall risk for the site (that is, the risk due to external exposure) are associated with the exposure duration, concentration of cesium-137, and the external exposure slope factor for cesium-137. A number of sce- narios and pathways utilized source terms estimated from computer models. Because of the lack of a sample population from which to estimate statistical parameters for use in the amount of actual data used for input into the probabilistic assessment would result in increased value and usefulness of the results.

At both sites, the primary contributor to risk is cesium-137 (plus progeny) in the external exposure pathway. Cesium-137 had a half-life of about 30 years. The decreasing concentration through time results in decreased risk through time. External exposure risk will remain above 1E-04 for approxi- mately the next 400 years at the SL-1 burial ground and will decrease to 2E-04 after approximately 320 years at the BORAX-I burial ground. Due to the long half-life of uranium-235 (7E+08 years), the external exposure risk at BORAX-I will essentially never decrease below 2E-04.

For SL-1, the only radionuclides predicted to reach the aquifer in concentrations of potential con- cern were tritium and technetium-99, with associated risks of 2E-07 and 6E-07, respectively. Summed with the risks from the remaining radionuclides, the total risk due to groundwater ingestion associated with the SL-1 burial ground is 1E-06. For BORAX-I, uranium-234 and its progenies were the only radionuclides predicted to reach the aquifer in concentrations of potential concern, with a risk sum of

2E-06. Summed with the risks from the remaining radionuclides, the total risk due to groundwater ingestion associated with BORAX-I is 3E-06.

For SL-1, an evaluation of risks due to surface soils defined by the 1990 aerial survey isopleth was performed. It was determined that there are no unacceptable risks via the soil ingestion, inhalation of dust, groundwater ingestion, or external exposure pathways within Operable Unit 5-05. Section 11.1 contains specific references contained in the Administrative Record in support of this assessment.

6.1.4.2 Radiological Field Risk. Surface radiological field measurements taken within the fences at the burial grounds provide exposure levels that account for shielding of radiation provided by the soil cover. Based on the reported maximum, single point radiological field measurements of 0.5 mR/hour at SL-1 and 0.1 mR/hour for BORAX-I, the 30-year residential risk at the surface was esti- mated at 9E-02 for SL-1 and 2E-02 for BORAX-I. The risk associated with local background is 3E-02 at SL-1 and 2E-02 at BORAX-I. The risk associated with the average background radiological field at the INEL is 3E-03 (0.02 mR/hour). The 30-year residential risk form national average natural back- ground radiation ranges from 2E-03 (0.011 mR/hour) to 6E-03 (0.034 mR/hour). Risks based on radio- logical field measurements taken within the fences are shown graphically in Figure 8.

A more comprehensive data set for SL-1 was acquired in 1995 and an assessment of the surface soils within Operable Unit 5-05 was completed in August 1995. Dose equivalent rate measurements, all below the background value of 20 ærem/hr, indicate no unacceptable external exposure risks due to surface soils within Operable Unit 5-05.

Table 5. Summary of risks for the potential exposure scenarios and pathways at

SL-1

Scenario Probabilistic
Deterministic 50th percentile
95th percentile Pathway
risk risk

Residential (30-year, intrusive) External exposure
5E-01 1E-01 6E-01 Ingestion of soil
9E-04 4E-05 1E-04 Inhalation of dust
8E-07 2E-07 9E-07 Ingestion of groundwater
1E-06 NCb NCb Total scenario risk
5E-01a 1E-01 6E-01

Residential (30-year, nonintrusive) External exposure
5E-01 1E-01 6E-01 Ingestion of soil
5E-05 3E-07 8E-07 Inhalation of dust
4E-07 7E-08 2E-07 Ingestion of
groundwater 1E-06 NCb
NCb Total scenario risk 5E-01a
1E-01 6E-01

Residential (100-year, intrusive) External exposure
1E-01 3E-02 2E-01 Ingestion of soil
2E-04 8E-06 2E-05 Inhalation of dust
4E-07 1E-07 5E-07 Ingestion of
groundwater 1E-06 NCb
NCb Total scenario risk 1E-01a 3E-02
2E-01

Residential (100-year, nonintrusive) External exposure
1E-01 3E-02 2E-01 Ingestion of soil
9E-06 6E-08 2E-07 Inhalation of dust
3E-07 7E-08 2E-07 Ingestion of groundwater
1E-06 NCb NCb Total scenario risk
1E-01a 3E-02 2E-01

Subsistence farmer (100-year) (water independent pathways) External exposure
1E-03 NCc NCc Ingestion of soil
4E-07 NCc NCc Inhalation of dust
2E-06 NCc NCc Ingestion of plants
1E-05 NCc NCc Ingestion of meat
4E-05 NCc NCc Ingestion of milk
1E-05 NCc NCc Total scenario risk
1E-03a NCc NCc

Occupational (current) External exposure 2E-01
8E-02 4E-01 Ingestion of soil
2E-05 8E-08 4E-07 Inhalation of dust
4E-07 9E-08 3E-07 Total scenario risk
2E-01a 6E-02 3E-01

Refer to footnotes at end of table.

Table 5. (continued)

Scenario	Probabilistic Deterministic	50th percentile	95th percentile	Probabilistic Pathway
risk	risk	risk		
Occupational (site-specific #1) External exposure				4E-03
	2E-03	1E-02	Ingestion of soil	3E-07
	2E-09	5E-09	Inhalation of dust	6E-09
	NCd	NCd	Total scenario risk	4E-03a
	2E-03	1E-02		
Occupational (site-specific #2) External exposure				6E-04
	3E-04	2E-03	Ingestion of soil	6E-08
	3E-10	9E-10	Inhalation of dust	9E-10
	NCd	NCd	Total scenario risk	6E-04a
	3E-04	2E-03		
Occupational (future-30 year) External exposure				1E-01
	4E-02	3E-01	Ingestion of soil	1E-05
	4E-08	2E-07	Inhalation of dust	2E-07
	5E-08	2E-07	Total scenario risk	1E-01a
	4E-02	3E-01	Occupational (future- 100 years) External exposure	
	3E-02	9E-03	6E-02 Ingestion of soil	
	2E-06	8E-09	3E-08 Inhalation of dust	
	2E-07	5E-08	2E-07 Total scenario risk	
	3E-02a	9E-03	6E-02	

a. Cesium-137 (plus barium-137m) is the primary contributing radionuclide.

b. A probabilistic risk assessment was not performed for the groundwater pathway due to its small contribution to total risk and to the absence of published probability distribution functions for input parameters.

c. A probabilistic risk assessment was not performed for the subsistence farmer scenario due to the absence of published probability distribution functions for input parameters.

d. A probabilistic risk assessment was not performed due to its small contribution to total risk.

NC = Not calculated.

Table 6. Summary of risks for the potential exposure scenarios and pathways at

BORAX-I.

Sceanario	Probabilistic risk	Deterministic risk	50th percentile risk	95th percentile risk	Pathway
Residential (30-year, intrusive) External exposure					3E-02
	7E-03	5E-02	Ingestion of soil	7E-05	
	3E-06	8E-06	Inhalation of dust	9E-07	
	2E-07	1E-06	Ingestion of groundwater	3E-06	
	NCb	NCb	Total scenario risk	3E-02a	
	7E-03	5E-02			
Residential (30-year, nonintrusive) External exposure					
	3E-02	7E-03	5E-02 Ingestion of soil		
	3E-05	4E-09	1E-08 Inhalation of dust		
	8E-07	5E-09	5E-08 Ingestion of groundwater		
	3E-06	NCb	NCb Total scenario risk		3E-02a
	7E-03	5E-02			
Residential (100-year, intrusive) External exposure					
	7E-03	1E-03	1E-02 Ingestion of soil		
	3E-05	1E-06	4E-06 Inhalation of dust		
	9E-07	2E-07	1E-06 Ingestion of groundwater		
	3E-06	NCb	NCb Total scenario risk		7E-03a
	1E-03	1E-02			
Residential (100-year, nonintrusive) External exposure					
	7E-03	1E-03	1E-02 Ingestion of soil		
	8E-06	2E-09	1E-08 Inhalation of dust		
	8E-07	5E-09	5E-08 Ingestion of groundwater		
	3E-06	NCb	NCb Total scenario risk		7E-03a
	1E-03	1E-02			
Subsistence farmer (100-years) (water independent pathways) External exposure					
	5E-03	NCc	NCc Ingestion of soil		
	2E-06	NCc	NCc Inhalation of dust		
	4E-06	NCc	NCc Ingestion of plants		
	1E-04	NCc	NCc Ingestion of meat		
	1E-04	NCc	NCc Ingestion of milk		
	4E-05	NCc	NCc Total scenario risk		
	6E-03a	NCc	NCc		
Occupational (current) External exposure					1E-02
	4E-03	3E-02	Ingestion of soil	2E-05	
	1E-09	4E-09	Inhalation of dust	5E-07	
	4E-09	3E-08	Total scenario risk	1E-02a	
	4E-03	3E-02			

Refer to footnotes at end of table.

Table 6. (continued)

Scenario	Probabilistic Deterministic risk	Probabilistic 50th percentile risk	95th percentile risk	Pathway
Occupational (site-specific #1) External exposure				
	2E-04	9E-05	5E-04	Ingestion of soil
	2E-07	1E-11	4E-11	Inhalation of dust
	7E-09	NCd	NCd	Total scenario risk
	2E-04a	9E-05	5E-04	
Occupational (site-specific #2) External exposure				
	3E-05	2E-05	8E-05	Ingestion of soil
	4E-08	2E-12	6E-12	Inhalation of dust
	1E-09	NCd	NCd	Total scenario risk
	3E-05a	2E-05	8E-05	
Occupational (future-30 years) External exposure				
	7E-03	2E-03	2E-02	Ingestion of soil
	8E-06	6E-10	3E-09	Inhalation of dust
	5E-07	4E-09	4E-08	Total scenario risk
	7E-03a	2E-03	2E-02	
Occupational (future-100 years) External exposure				
	1E-03	5E-04	3E-03	Ingestion of soil
	2E-06	3E-10	2E-09	Inhalation of dust
	5E-07	4E-09	4E-08	Total scenario risk
	1E-03a	5E-04	3E-03	

a. Cesium-137 (plus barium-137m) is the primary contributing radionuclide.

b. A probabilistic risk assessment was not performed for the groundwater pathway due to its small contribution to total risk and to the absence of published probability distribution functions for input parameters.

c. A probabilistic risk assessment was not performed for the subsistence farmer scenario due to the absence of published probability distribution functions for input parameters.

d. A probabilistic risk assessment was not performed due to its small contribution to total risk.

NC = Not calculated.

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The residential risk (30-year duration) estimated from radiological field measurements at the SL-1 burial ground, 9E-02, is only slightly higher than the risk due to the local background of 3E-02. At BORAX-I, the risk based on radiological field measurements is equal to local background (2E-02) and is only slightly higher than the national average natural background, which ranges from 2E-03 to 6E-03).

6.1.5 Uncertainty

Risk assessments are subject ot uncertainty from assumptions about inventory estimates, fate and transport estimation, exposure estimation, and radiotoxicity data. Uncertainty was addressed by using health-protective assumptions that systematically overstate the magnitude of health risks. This process bounds the plausible upper limit of risk and facilitates an informed risk management decision. Table 7 is a summary of risk assessment assumptions and associated uncertainties.

In addition to uncertainty directly associated with the baseline risk assessment, two other issues were considered. The first was estimation of risk associated with the radiological field actually mea- sured at the sites to evaluate the effectiveness of the soil shielding currently on the sites (the baseline risk assessment requires exposure of the receptor directly to the waste). The second issue was explored as a result of public comment received on the proposed plan and involved estimating the soil concetra- tion of uranium-235 based on the quantity of unrecovered fuel.

Table 7. Summary of risk assessment assumptions and associated uncertainties.

Assumption	Description of uncertainty	Effect of uncertainty on risk estimates

Soil sample analytical results Many samples at both sites were collected Results in higher are representative of surface from hot spots, as opposed to a strictly estimated concentrations contamination. random sampling strategy. Concentrations in surface soils and thus based on the 95% upper confidence limit increased risk. (Not that of these biased results were assumed uniformly Operable Unit 5-05 surface distribute throughout surface soil. soils were found to not present an unacceptable risk subsequent to the base-line risk assessment in the remedial investigation.)

Computer-modeled radionuclide Radionuclide inventories were assumed uniformly The actual nature and inventories (curies) converted distributed throughout the reported volumes at a density of buried materials to subsurface concentrations of material density of 1.5 g/cm3. is not homogeneous. Areas radionuclides (pCi/g) are of both higher and lower representative of subsurface concentrations (and thus contamination. risk) within the waste are expected.

Modeled inventories reduced by The reduced quantities are upper-bound estimates Results in higher estimated percent of uranium-235 recovered of inventories originally deposited on each site. concentrations is the sub are representative of actual surface and thus increased concentrations. risk.

No migration of contaminants has Maximizes concentrations (no dilution) and Results in higher estimated occurred. minimizes volume. concentrations in the sub surface and thus increased risk.

Significant quantities of If any nonradioactive contaminants are present, May underestimate risk nonradioactive contaminants are they would represent an insignificant contribution slightly. not present at either site. to the total risk at each site.

Modeled receptor is in direct Shielding provided by existing soil cover is Results in substantially contact with the surface or excluded from consideration; the EPA-default time higher exposure subsurface contamination for time and duration of exposure values are formulated values for all receptors, periods specified in the remedial for sensitive individuals. and thus higher risks. Investigation report.

Groundwater modeling parameters Parameters and assumptions were selected to Results in overestimation of and assumptions generic to the maximize concentrations of contaminants in the concentrations in aquifer INEL are adequate to model groundwater. and minimizes vadose zone groundwater impacts. travel times, resulting in higher estimated risk.

The uncertainties related to the measurement of radiological data in the field can lead to an under- or over-estimation of risk. Field measurements are accurate at the time and location the reading is taken. However, factors such as detection limits, correlation of field measurements to specific radionu- clide concentrations, and perturbations resulting from radioactive fragments or particles add significant uncertainty to these risk estimates.

To address remarks received during the public comment period, hypothetical soil concentrations of uranium-235 were estimated for the surface soil at BORAX-I using the assumption that the entire 3.7 kg of uranium-235 unrecovered at the site was uniformly distributed through two soil volumes. The first, 84,000 cubic feet (2,400 m3) was based on the extent of gravel-covered area and a depth of one foot. A second volume, 14,700 cubic feet (416 m3) by one foot deep, was based on the portion of the gravel-covered area which had a radiological field greater than 0.02 mR/hour during a survey conduct- ed in 1980. Concentrations resulting from these calculations were 2.2 pCi/g (1 mg uranium-235/kg soil) and 13 pCi/g (6 mg uranium-235/kg soil). Although, these estimates were developed under the assumption that the entire 3.7 kg or uranium-235 was distribute in the surface soil, historical docu- mentation indicates that some of the fuel remaining at the site was buried in the reactor structure foun- dation. In the risk assessment, the 95% upper confidence limit for uranium-235 (68.6 pCi/g), based on analytical results of biased samples, was used to represent surface soil concentrations. This concentra- tion is much higher than either 2.2 or 13 pCi/g, demonstrating that use of the 95% upper confidence limit of biased sampling can result in over-estimation of actual soil concentrations, and therefore over- estimation of risk.

6.1.6 Conclusions

An inspection of the risk values shows several important facets of the investigation:

At the SL-1 burial ground, scenario total risks range from 6E-04 ot 5E-01. At BORAX-I the scenario risks range from 3E-05 to 3E-02. The risks are dominated by cesium-137 plus its daughter barium-137m in the external exposure pathway for both sites.

The risks due to external exposures estimated by deterministic or probabilistic methods are all greater than 1E-06, and in nearly all scenarios, greater than 1E-04; the only exception was the occupational site-specific #2 scenario for BORAX-I. Values greater than 1E-04 are considered indicative of conditions that may pose a threat to human health and the environment if no addressed by a response action.

The risks attributable to soil ingestion for all radionuclides are generally one more orders of magnitude lower than the risks from external exposure and considered a secondary concern; however, for the residential intrusion scenarios at SL-1, the risk from the soil ingestion pathway exceeds 1E-04.

The risks of soil inhalation and groundwater ingestion for all scenarios

are less than 1E-05 and generally less than 1E-06, and thus negligible.

Decay of cesium-137 (plus its progeny) will result in a decrease of risk through time at both sites. After about 400 years, the risk will reach 1E-04 at SL-1; after 320 years, the risk at

BORAX-I will be dominated by the long-lived uranium-235 in the external exposure pathway, and the risk will not drop below 2E-04.

The external radiation exposure risks estimated using deterministic and probabilistic methods dominate the total risk. Although this calculated upper limit of the risk notably exceeds the 1E-04 risk value, the external exposure risks estimated from radiological field measurements were not much greater than the risk due to background radiation. The primary difference is that the baseline risk assessment was based on the assumption that the individual is exposed directly to the waste; that is, the dose that the individual receives is not adjusted to account for the shielding provided by the soil cover. The risk estimated form the field measurements was based on the actual measured dose that an individual at the surface receives.

Although Operable Unit 5-05 surface soils were evaluated in the baseline risk assessment pre- sented in the remedial investigation/feasibility study report and summarized in this section, a subsequent determination found the surface soils do not present an unacceptable risk to human health or the environment (see Section 11.1).

The main contributor to the deterministic and probabilistic risk is from external exposure to cesium-137 plus its daughter barium-137m. All other contributions to the total risk are very small, usu- ally two, three, or more orders of magnitude below the risk due to external exposure to ionizing radia- tion and generally below the acceptable risk level of 1E-04.

6.2 Ecological Concerns

The ecological assessment to the SL-1 and BORAX-I burial grounds is a qualitative evaluation of the potential effects of the sites on the plants and animals other than people and domesticated species. A quantitative ecological assessment is planned in conjunction with the INEL-wide comprehensive reme- dial investigation/feasibility study tentatively scheduled for 1998. There are no critical or sensitive habitats on or nearby the burial grounds, and no endangered species or habitats of endangered species are known to exist on either site. Based on the present contaminant and ecological information and the qualitative eco-evaluation performed for this Record of Decision, the preferred alternative remedial action presented herein will serve to further reduce the ecological risks posed by these sites. It is unlikely the 1998 INEL-wide comprehensive remedial investigation/feasibility study quantitative eco- logical assessment will result in the need for any additional actions at these sites.

6.2.1 Species of Concern

The only federally listed endangered species known to frequent the INEL is the peregrine falcon. The status of the bald eagle in the lower 48 United States was changed from endangered to threatened in July 1995. Several other species observed on the INEL are the focus of varying levels of concern by either federal or state agencies. Animal and avian species include the ferruginous hawk, the northern goshawk, the sharp-tailed grouse, the loggerhead shrike, the Townsend's big-eared bat, the pygmy rab- bit, the gyrfalcon, the boreal owl, the flammulated owl, the Swainson's hawk, the merlin, and the bur- rowing owl. Plant species classified as sensitive include Lemhi milkvetch, plains milkvetch, wing-seed evening primrose, nipple cactus, and oxytheca.

6.2.2 Exposure Assessment

Three potential routes of exposure were identified for terrestrial and avian species: ingestion of soil, vegetation, or prey; inhalation of fugitive dust; and external exposure to radiation. Ingestion of contaminated water was not considered because there are no surface-water features on either burial ground and because groundwater is not accessible to ecological receptors. For plants, the uptake of contaminant through roots systems was considered.

The amount of exposure is directly related to the amount to time spent and the fraction of diet taken on the sites. Therefore exposures are greatest for permanent ecological resident, particularly plants and small burrowing animals . The small size of the burial grounds minimizes the exposures received by migratory species, which include most avain and large mammal species that inhabit the INEL.

6.2.3 Risk Characterization

The contaminants of concern at the burial grounds consist of radionuclide-contaminated soil and debris, most of which is buried beneath a minimum of 2 feet (0.6 m) of soil. Both sites are relatively small. Some amounts of contamination may be brought to the surface through plant uptake and bur- rowing animals and insects, be ingested by herbivores and animals who take prey from the sites, and enter the food web. Individuals representing a small portion of the total population of burrowing and ground-dwelling animals may also receive direct exposures. However, risks due to these exposures would be limited to a small number of individual ecological receptors and would have little impact on total populations. As a result, the potential for risk to ecological receptors is very small. In addition, the inaccessibility of contamination supports the conclusion that the sites do not present a significant risk to plant and animal life.

The small areas of the sites will not support sizable populations relative to the area and popula- tions of the entire INEL. The potential for cumulative effects throughout each waste area group and INEL-wide are of much greater concern than the effects from the individual burial grounds. These issues will be addressed in the comprehensive remedial investigation/feasibility studies for each waste area group and for the entire INEL.

6.3 Basis for Response

Actual or threatened releases of contaminants from these burial grounds, if not addressed by imple- menting the response action selected in this Record of Decision, present a potential threat to public health, welfare, or the environment.

The results of the baseline risk assessment indicate that unacceptable risk exists at both burial grounds. The primary risk at both sites is from external exposure to cesium-137 and its daughter bari- um-137m. Decay of cesium-137m (plus its daughter) will result in a decrease of risk to acceptable levels after about 400 years at SL-1, and after 320 years at BORAX-I. Risk at both sites results from direct exposure to the contaminants. The shielding and control of intrusion can be accomplished through construction of a long-term engineered cap at each site designed to contain the radionuclides as they decay with time.

The risk to ecological receptors at both sites is associated with intrusion into the wastes. This risk will decrease through time as the radionuclides decay. Long-term engineered caps can inhibit intrusion by plant roots, insects, and burrowing animals.

7. Description of Alternatives

7.1. Remedial Action Objectives and Applicable or Relevant and Appropriate Requirements

The description of alternatives includes discussion of how remediation goals are satisfied by the actions undertaken. Similarly, the descriptions explain how compliance with federal and state environ- mental laws is achieved. The remedial action objectives and environmental laws associated with the alternatives considered in the remedial investigation/feasibility study for the SL-1 and BORAX-I burial grounds are summarized below to support the description of alternatives.

7.1.1. Remedial Action Objectives

As part of the remedial investigation/feasibility study process, remedial action objectives were developed in accordance with the National Contingency Plan and EPA guidance. The intent of the remedial action objectives is to set goals for protecting human health and the environmental. The goals are designed specifically to mitigate the potential adverse effects associated with the burial grounds.

Results of the remedial investigation and baseline risk assessment indicate that exposure to pene- trating radiation from contaminated soils and materials within the burial grounds presents the most sig- nificant future risk to human health. Therefore, the primary remedial action objectives and the focus of the remedial action alternative development are to inhibit exposure to radioactive materials. Remedial action objectives established for protection of human health are:

Inhibit exposure to radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

Inhibit ingestion of radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

Inhibit inhalation of suspended radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

Inhibit degradation of the burial grounds that could result in exposure of buried wastes or migration of contaminants to the surface that would pose a total excess cancer risk (for all cont- aminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06).

The remedial action objective for protection of the environment focuses on preservation of the local ecology by inhibiting the potential for contaminant migration. The remedial action objective estab- lished for protection of the environment is:

Inhibit adverse effects to resident species from exposure to contaminants at the burial grounds.

7.1.2. Applicable or Relevant and Appropriate Requirements

CERCLA requires that remedial actions comply with federal and state laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regula- tions that are not directly applicable but are relevant and appropriate; in other words, the requirements pertain to situations sufficiently similar to those encountered at a CERCLA site so that-their use in well-suited to the site. Combined, these are referred to as applicable or relevant and appropriate requirements (ARARs). State ARARs are limited to those requirements that are (a) promulgated, (b) uniformly applied, and (c) are more stringent than federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, location-, and action- specfic ARARs or justification for a waiver.

During the remedial investigation/feasibility study for SL-1 and BORAX-I, ARARs were specified for the remedial action alternatives under consideration. Potential ARARs intially identified were screened on the basis of review by the DOE-ID, the EPA, and the IDHW. Table 8 provides a summary of the ARARs for the three alternatives considered. These regulations focus on protection of the public from radiation and control of emissions that may result from any remediation activities. As ARARs, these regulations govern potential radionuclide emissions and dust-generating activities (such as exca- vation, earth-moving, and heavy-equipment operation). Although DOE orders are not ARARs, estab- lished DOE orders would be considered to ensure radiation

protection for the environment and the pub- lic. Such DOE orders are identified as "To-Be-Considered" (TBC) criteria. Currently no EPA or State of Idaho regulations exist that establish cleanup levels for radionuclide contaminants in soil. Based on the contaminants of concern at SL-1 and BORAX-I, the location of the burial grounds, and the remedi- al actions evaluated, no other ARARs were identified.

Table 8. Summary of ARARs and criteria to be considered for alternatives.

Statue	Regulations	Alternative 1 No Action	Alternative 2 Containment	Alternative 3 Removal
NESHAP	National Emissions Standards for Radionuclide Emissions Other than Radon from DOE Facilities (40 CFR 61.90)	NA	NA	A
IDAPA	Idaho Rules for Control of Fugitive Dust A (IDAPA 16.01.01.650 and .651)	NA	A	
IDAPA	Idaho Rules for Toxic Air Pollutants A (IDAPA 16.01.01.585 and .586)	NA	NA	
	DOE Order 5400.5, "Radiation Protection of the Public and Environment"	TBC	TBC	TBC
	DOE Order 5820.2A, "Radioactive Waste Management"	TBC	TBC	TBC

A=Applicable; NA=Not applicable or relevant and appropriate; R= Relevant and appropriate; TBC=To be considered

7.2 Summary of Alternatives

The three types of alternatives submitted to detailed analysis include:

Alternative 1: No action

Alternative 2: Containment by capping with an enginerred long-term barrier comprised primarily of natural materials

Alternative 3: Removal by conventional excavation with disposal at the Radioactive Waste Management Complex.

The no action alternative and the two alternatives that passed the screening criteria are described below. Remedial action at BORAX-I is expected to include management of contaminated surface soils. Surface soils presenting a potential human health excess risk of over 1 in 10,000 will be included in the remedial action. Action levels for the radionuclides of concern in BORAX-I soils are

based on the Remedial Investigation/Feasibility Study for Operable Unit 10-06 (Radionuclide-Contaiminated Soils at the INEL) and are identified as 16.7 pCi/g for cesium-137, 10.8 pCi/g for strontium-90, and 13.2 pCi/g for uranium-235. These activity concentrations correspond to a 1 in 10,000 risk level based on the external exposure and ingestion pathways and a residential scenario beginning in 100-years. Costs pre- sented for remedial actions at BORAX-I are based on the assumption that all potentially contaminated surface soils will be included in the remedial action. A surface area as large as 84,000 square feet (7,800m2) would require management as part of the remedial action at the BORAX-I. As presented in the proposed plan, remedial action at the SL-1 operable unit may have also required management of poten- tially contaminated surface soils. An assessment of those soils has since been completed that supports a no action decision for the surface soils within Operable Unit 5-05 outside of the exclusion fence. Section 11 contains more details regarding this assessment.

7.2.1 No Action

Under Alternative 1, no attempt would be made to contain, treat in place, or remove contaminated materials. Instead, environmental monitoring would be performed to assess contaminant migration from the burial grounds. Environmental monitoring would consist of those methods used to identify contaminant migration within environmental media (air, groundwater, and soil) and to identify exposure resulting from those contaminated media. Monitoring results would be used to determine the need for any future remedial actions necessary to protect human health and the environment. Environmental monitoring would be conducted until future reviews of the remedial action determine such activities are no longer necessary. There were no ARARs identified for the no action alternative.

The estimated cost for implementing environmental monitoring for 30 years under this alternative is $188,000 at SL-1 and $180,000 at BORAX-I. Environmental monitoring may be required beyond 30 years, however CERCLA guidance specifies costing such activities for only 30 years.

To the extent practicable, environmental monitoring activities would be performed under WAG- wide and INEL-wide comprehensive monitoring programs. Radiological surveys would be performed at both SL-1 and BORAX-I as part of this remedial action until WAG-wide comprehensive environ- mental monitoring programs are in place. Groundwater monitoring needs would be identified in the WAG 5 Comprehensive RI/FS and the WAG 10 Comprehensive RI/FS (which encompasses WAG 6). Air monitoring at both sites would be conducted as part of the INEL-wide air monitoring program.

7.2.2 Containment

Alternative 2 is a contaminant action that consists of installing a long-term engineered barrier (cap) over a burial site to provide shielding from penetrating radioation, to inhibit contaminant migration, and to limit intrusion. Barrier technology is currently in use at several waste sites to provide long-term iso- lation of radioactive wastes that are disposed of in

place, as is the case for both burial grounds. The cap can be designed for longevity and would be of sufficient thickness to provide a shield from pene- tration radiation, inhibit intrusion by burrowing animals and insects into the waste, and discourage human intrusion. Contaminant migration would be inhibited by reducing erosion by wind and water.

The barrier would be designed to provide shielding from penetrating radiation for at least 400 years at SL-1 and 320 years at BORAX-I. A multiple-layer cap comprised primarily of natural materials would be designed during the remedial design phase of the remedial action. Cap layers would likely consist of a combination of sand, gravel, silt, basalt, cobbles, or native soil. Construction details for the engineered barrier would be identified during the remedial design phase. The barrier design would be based on site- specific considerations, such as annual precipitation, frost depth, and anticipated soil erosion, would be used to design the optimum barrier configuration for application at the SL-1 and BORAX-I burial grounds during the remedial action phase. Each cap system would also include surface-water diversion controls to direct runoff away from the burial grounds.

The capping system would be combined with institutional controls consisting of access and land use restrictions to prevent intrusion into the SL-1 and BORAX-I burial grounds. The DOE would be responsible for establishing and maintaining land use and access restrictions for at least 100 years. Access restrictions in the form of fences, warning signs, and permanent markers would be used to determine unauthorized entry into the burial grounds. Institutional controls would include placing writ- ten notification of the remedial action in the facility land use master plan; the notification would pro- hibit any activities that would interfere with the remedial activity. A copy of the notification would be given to the Bureau of Land Management, together with a respect that a similar notification be placed in the Bureau of Land Management property management records. The DOE would provide EPA and IDHW with written verification that notification, including Bureau of Land Management notification, have been fully implemented.

Cap integrity monitoring and radiological survey programs would be established to verify the con- tinued functionality of the containment systems and provide early detection of potential contaminant migration. Cap integrity monitoring for cracks, erosion, and other observable degradation would be

conducted to identify maintenance requirements. Institutional controls and monitoring requirements would be the responsibility of the DOE and would be evaluated for adequacy, effectiveness, and neces- sity during each five-year review of the remedial actions.

The area requiring containment at SL-1 is the region extending from the trench to pit in Figure 2. The area requiring containment at BORAX-I is based on the assumption that consolidation of all conta- minated surface soil is necessary. The minimum area requiring containment at BORAX-I is the 100- by 100-foot (30-by 30-m) fenced area of the burial ground, or 10,000 square feet (929 m2). The maxi- mum area of containment required at BORAX-I is based on the assumption that the entire 84,000 square foot (7,800 m2) area of contaminated

surface soil would require containment. Although protec- tive covers over this entire area feasible, consolidation of contaminated surface soil to a location near the existing buried waste is proposed. Consolidation of contaminated surface soil would ensure that the size of a protective cover is limited to the area containing the majority of contamination (e.g., the reactor foundation).

The ARAR identified for this alternative is the Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.650 and .651). This ARAR would be met during soil consolidation activities at BORAX-I and construction of a barrier at either site by application of appropriate engineering controls to minimize generation of airborne contamination and dust.

The estimated cost of Alternative 2 is $1.9 million at SL-1 and $1.5 million at BORAX-I. These costs are based on refinements to the estimates presented in the proposed plan for Alternative 2. The primary refinements include a cap design specific to the INEL and elimination of groundwater monitor- ing requirement . The cap design is based on research performed at the INEL by the Environmental Science and Research Foundation. Environmental monitoring has been specified by the agencies to consist of radiological surveys. Groundwater monitoring costs have not been included because ground- water monitoring needs will be determined by the WAG 5 Comprehensive RI/FS for WAG 5 as a whole and the WAG 10 Comprehensive RI/FS for WAG 6. Responsibility for radiological surveys at SL-1 will be assumed by the WAG 5 Comprehensive RI/FS once the comprehensive program is in place. Similarly, responsibility for radiological surveys at BORAX-I will be assumed by the WAG 10-04 Comprehensive RI/FS once the comprehensive program is in place. The cost estimates include 30 years of radiological surveys at SL-1 and BORAX-I. (Air monitoring at both sites would be conducted as part of the INEL- wide air monitoring program to eliminate that cost component from this remedial action.)

Direct costs for equipment and construction are approximately $0.90 million at SL-1 and $0.61 million at BORAX-I (including soil consolidation). Indirect costs for engineering design and manage- ment, construction management, and contractor overhead and profit are approximately $0.47 million at SL-1 and $0.45 million at BORAX-I. A contingency cost to account for the conceptual level of design for Alternative 2 is approximately $0.27 million at SL-1 and $0.18 million at BORAX-I. Net present value cost to perform post-closure monitoring and maintenance activities for 30 years are approximately

$0.33 million at SL-1 and $0.21 million at BORAX-I. Monitoring and maintenance may be required beyond 30 years, however CERCLA guidance specifics costing such activities for no more than 30 years.

7.2.3 Removal and Disposal

Alternative 3 is the complete removal of all contaminated materials from the burial grounds using conventional excavation techniques, with cleanup levels established on the basis of excess risk at the INEL. Conventional excavation techniques utilize commercially available earth-moving equipment.

The volume of contaminated media at the SL-1 is approximately 265,182 cubic

feet (7,509 m3). The total volume of contaminated media at the BORAX-I is approximately 93,421 cubic feet (2,645 m3). These estimates are based on the volumes of buried waste, backfill, and potentially conta- minated surface soils at BORAX-I. Once removed, contaminated materials would be packaged and transported to the Radioactive Waste Management Complex for disposal.

Following the removal of contaminated soil and solid waste, the excavated area would be backfilled with clean fill material and compacted to prevent future subsidence or settling. A layer of topsoil would be placed over the compacted backfill, contoured to match the surrounding landscape, and seed- ed with an appropriate mixture of native grasses and shrubs to facilitate revegetation.

The ARARs identified for this alternative include the National Emissions Standards for Radionuclide Emissions Other than Radon from DOE Facilities (40 CFR 61.90), Idaho Rules for Toxic Air Pollutants (IDAPA 16.01.01.585 and .586), and Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.650 and .651). All three ARARs would be met by conducting excavation activities within an enclosed structure fitted with a filtered ventilation system and by implementing dust-suppres- sion measures.

The estimated costs of Alternative 3 are approximately $68.9 million at SL-1 and $20.5 million at BORAX-I. The estimated cost for SL-1 is based on the no action decision for soils outside of the 600- by 300-foot (182.9-by 91.4-m) exclusion fence but inside the boundary of Operable Unit 5-05. The lower end of the cost range presented in the proposed plan for Alternative 3 at SL-1 reflects this situation. The estimated cost for BORAX-I is based on the anticipated need to include up to 84,00 square feet (7,800 m2) of contaminated surface soil in the remedial action. The upper end of the cost range presented in the proposed plan for Alternative 3 at BORAX-I is representative of this scenario.

The estimates include an assumption that no additional costs are incurred once the contaminated materials are removed from the sites and disposed at the Radioactive Waste Management Complex. Therefore, post-closure activities such as monitoring are not required. Direct costs for equipment, con- struction, and disposal at the Radioactive Waste Management Complex are approximately $34.0 mil- lion at SL-1 and $10.1 million at BORAX-I. Indirect costs for engineering design and management, construction management, and contractor overhead and profit are approximately $24.7 million at SL-1

and $7.4 million at BORAX-I. The contingency cost to account for the conceptual level of design for Alternative 3 is approximately $10.2 million at SL-1 and $3.0 million at BORAX-I.

8. Summary of Comparative Analysis of Alternatives

Each of the three alternatives subjected to the detailed analysis were evaluated against the nine evalu- ation criteria identified under CERCLA. The criteria are subdivided into three categories: (a) threshold criteria that mandate overall protection of human health and the environment and compliance

with ARARs; (b) primary balancing criteria that include long-and short-term effectiveness, implementability, reduction in toxicity, mobility or volume through treatment, and cost; and (c) modifying criteria that mea- sure the acceptability if alternatives to state agencies and the community. The following sections sum- marize the evaluations of the three alternatives against the nine evaluation criteria.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment, and compliance with ARARs. The selected remedial action must meet the threshold criteria. Although the no action alternative does not meet the threshold crite- ria, this alternative was used in the detailed analysis as a baseline against which the other alternatives were compared, as directed by EPA guidance.

8.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Results of the baseline risk assessment indicate that upper limit of exposure risk will decrease to below 1 in 10,000 after approximately 400 years at SL-1. This upper limit will further decrease to 3 in 1,000,000 after approximately 650 years and remain constant thereafter. The upper limit of exposure risk at BORAX-I will decrease to approximately 2 in 10,000 after 320 years, then remain essentially unchanged far into the future.

Alternative 1 (no action) would not satisfy the criterion of overall protection of human health and the environment because access to the site and contact with the waste is not prevented. The contain- ment alternative, Alternative 2, would provide overall protection of human health and the environment. A protective cover would provide shielding from penetrating radiation, limit contaminant migration, and inhibit inadvertent intrusion into the wastes by humans, insects, and animals. Consolidated surface soil at BORAX-I would also be contained beneath the protective cover. Long-term protection would be ensured by incorporating design features engineered to last a minimum of 400 years at SL-1 and 320 years at BORAX-I. Alternative 3 (removal by conventional excavation with disposal at the Radioactive Waste Management Complex) would provide effective long-term protection of human health and the environment but could result in potentially significant short-term exposures for workers removing the radionuclide-contaminated waste during the remedial action.

Both of the action alternatives would result in a reduction of excess lifetime cancer risk. Alternative 2 would result in an excess lifetime cancer risk of less than 1 in 1,000,000 for as long as the cap remains functional. A cap minimizes potential risks by shielding, limiting migration of contamination,

and inhibit- ing intrusion into the waste. Alternative 3, the removal action, would reduce risk by managing contaminat- ed materials removed from the burial grounds within an operating radioactive waste disposal facility.

8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

There are no ARARs identified for the no action alternative. The two action alternatives meet the identified ARARs through engineering controls and operating procedures. Section 7.2, Summary of Alternatives, discusses the primary ARARs considered in this study. These ARARs focus on control- ling exposures to the public and air emissions that may result from remediation activities at the SL-1 and BORAX-I operable units.

8.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the remedial alternatives and weigh major trade-offs among alternatives. The balancing cri- teria are used in refining the selection of the candidate alternatives for the site. The five balancing cri- teria are: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

8.2.1 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternative 1 (no action) provides the least possible level of long-term effectiveness and permanence because unacceptable risk would remain at both burial grounds. The long-term effectiveness and perma- nence of containment, Alternative 2, depends on the design-life of each protective cover. As described pre- viously, the cover can be designed to last for the period of time required to allow radionuclide decay to decrease exposure risks to acceptable levels. Risks at SL-1 will fall below the 1 in 10,000 risk range in about 400 years. Risks at BORAX-I will decrease to about 2 in 10,000 in approximately 320 years and will remain constant, essentially forever, due to the presence of long-lived uranium-235. The alternative 3 removal action provides the highest degree of long-term effectiveness and permanence because contami- nated materials would be completely removed. However, removing and transporting contaminated materi- als from one place to another within the INEL (from SL-1 or BORAX-I to the Radioactive Waste Management Complex) simply transfers the risk from one place to another.

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treat- ment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

Treatment to reduce the toxicity of radionuclides is presently not feasible; therefore non of the remedial alternatives developed for the burial grounds involve the use of treat- ment to reduce the toxicity, mobility, or volume of contaminated materials.

8.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement remediation methods to reduce any adverse impacts on human health and the environment that may be posed during the con- struction and implementation period until cleanup goals are achieved.

The short-term effectiveness for any remedial action taken at the burial grounds would be enhanced to the maximum extent practicable through adherence to strict health and safety protocols for worker protection and use of engineering controls to prevent potential contaminant migration. However, the alternative that requires the least amount of disturbance of contaminant material ranks the highest in terms of short-term effectiveness. As such, Alternative 1 (no action) provide the highest degree of short- term effectiveness because no additional on-site activities are required. Implementation of Alternative 2 (containment) would require disturbance to the surface of the burial grounds, however, no contact with buried waste would be involved. Alternative 2 does require contaminated surface soil at BORAX-I to be consolidated near the location of the reactor foundation. Assuming no protective measures were in place, workers installing the Alternative 2 cap would receive external exposure to penetrating radiation until sufficient construction material (such as soil, sand, and gravel) was placed over the burial ground to provide adequate shielding. Based on modeling and field measurements, approximately 3 inches (0.1m) of additional soil placed over the SL-1 burial ground and 9 inches (0.2 m) of additional soil placed over the BORAX-I burial ground would reduce external exposures to background radiation levels. Consequently, the soil required to form the foundation for a protective cover is likely to reduce external exposures to background levels. Alternative 3 (conventional excavation) offers the least short-term effec- tiveness due to direct contact with contaminated materials during excavation of the burial grounds and transport to the Radioactive Waste Management Complex. Short-term effectiveness for Alternatives 2 and 3 would be equally diminished if surface-soil consolidation is required at BORAX-I.

8.2.4 Implementability

The implementability criterion has the following three factors requiring evaluation: (a) technical feasibility, (b) administrative feasibility, and (c) the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring con- siderations. The ability to coordinate actions with other agencies is one factor for evaluating adminis-

trative feasibility, and the agencies have demonstrated this ability throughout the project to date. Other administrative activities that would be readily

implementable include planning, use of administrative controls, and personnel training. In terms of services and materials, an evaluation of the following availability factors is required: necessary equipment and personnel, prospective technologies, and cover materials.

Alternative 1 (no action) is the simplest remedial action to implement from a technical perspective because environment monitoring is all that is required. Monitoring would be required until future reviews of the remedial action indicate such activities are no longer necessary. Environmental monitor- ing services and equipment are readily available. However, Alternative 1 is administratively unaccept- able due to the potential risks to human health and the environment posed by SL-1 and BORAX-I.

The containment option of Alternative 2 is technically implementable. Consolidation of contami- nated surface soils at BORAX-I would involve standard earth moving equipment to perform excavation activties and water spray vehicles for dust suppression. Construction capabilities for engineered barri- ers are commercially available, and such barriers have been used at many similar sites in both provate industry and at government facilities. Specialized construction equipment and materials would not be required. The engineering required to design and construct a cap meeting the requirements necessary to ensure protection of human health and the environment at SL-1 and BORAX-I would be specified during the remedial design phase. The general performance requirements of the cap are established in this Record of Decision.

Alternative 3 (excavation and removal) would be the most difficult remedial option to implement because of the complexity of the remediation process. Containment of contamination during excava- tion and handling contaminated materials removed from the burial grounds would be required. Conventional excavation techniques to perform removal operations are commercially available and commonly used for earth moving applications. Administratively this alternative would require signifi- cant time and resources to perform environmental assessments, safety analyses, designs, and demon- strations prior to initiating any removal activity.

8.2.5 Cost

In evaluating project costs, and estimation of the direct and indirect costs in present-worth dollars is required. Direct costs include the estimated dollars for equipment, construction, and operation activi- ties to conduct a remedial action. Indirect costs include the estimated dollars for activities that support the remedial action (such as construction management, project management, and management reserve). In accordance with remedial investigation/feasibility study guidance, the costs presented are estimates (-30% to +50%). Actual costs will vary based on the final design and detailed cost itemization.

Table 9 for SL-1 and Table 10 for BORAX-I summarize the estimated costs for each remedial action alternative. The costs presented are based on a specific set of assumptions and as those assump-

tions change so will the cost estimates. For example, CERCLA guidance specifies monitoring and maintenance costs to be estimated for 30 years. However, these activities may be required beyond 30 years and as a result may cost significantly more than estimated.

The cost estimates presented for Alternative 3 (excavation and removal) are based on the proposed plan and the remedial investigation/feasibility study prepared for SL-1 and BORAX-I. As indicated in Section 7.2.1, the estimated cost for no action (Alternative 1) differs form the proposed plan because monitoring requirements for the sites have been refined.

The cost estimates presented for Alternative 2 (containment) have been revised since the proposed plan. As part of the CERCLA process, estimated costs for the selected remedy have been refined based on further developments in the level of design detail for Alternative 2. Estimated costs for Alternative 2 have been revised based on a cap design specific to the conditions at the INEL and identification of specific environmental monitoring requirements at both sites. The cap design is based on research per- formed at the INEL by the Environmental Science and Research Foundation. Environmental monitor- ing has been specified by the agencies to consist of radiological surveys. Groundwater monitoring costs have not been included because groundwater monitoring needs will be determined by the WAG 5 Comprehensive RI/FS for WAG 5 as a whole and the WAG 10 Comprehensive RI/FS for WAG 6. Responsibility for radiological surveys at SL-1 will be assumed by the WAG 5 Comprehensive RI/FS once the comprehensive program is in place. Similarly, responsibility for radiological surveys at BORAX-I will be assumed by the WAG 10-06 Comprehensive RI/FS once the comprehensive program is in place. The cost estimates included 30 years of radiological surveys at both sites. (Air monitoring at both sites will be conducted as part of the INEL-wide air monitoring program. Therefore air moni- toring costs are not included in the estimates.) The estimated costs presented for Alternative 2 reflect these refinements.

Table 9. SL-1 alternative cost estimates.a

Cost Elements	Alternative 1 No Action	Alternative 2 Containment	Alternative 3 Removal
Construction and construction operationsb	NA	$1,368,000	$58,724,000
Post-closure maintenancec	NA	115,000	NA
Post-closure monitoringd	150,000	150,000	NA
Contingency	38,000	337,000	10,149,000
Totale	$188,000	$1,970,000	$68,870,000

a. Costs are for 1995 for Alternatives 1 and 2 and 1994 for Alternative 3. b. Includes operating costs (net present value) during remedial action. c. Net present value assuming 5% interest (net of inflation) for 30 years. d. Changed from proposed plan to include soil monitoring only. See Section 11. e. Rounded

to ten thousands. NA = Not applicable (item is not included in the scope for the alternative).

Table 10. BORAX-I alternative cost estimates.a

Cost Elements	Alternative 1 Containment	Alternative 2 Removal	Alternative 3	No Action
Construction and construction operationsb	$1,058,000	$17,518,000		NA
Post-closure maintenancec	NA	27,000	NA	
Post-closure monitoringd	144,000	144,000	NA	
Contingency	36,000	225,000	3,020,000	
Totale	$1,450,000	$20,540,000	$180,000	

a. Costs are for 1995 for Alternatives 1 and 2 and 1994 for Alternative 3. b. Includes operating costs (net present value) during remedial action. c. Net present value assuming 5% interest (net of inflation) for 30 years. d. Changed from proposed plan to include soil monitoring only. See Section 11. e. Rounded to ten thousands. NA = Not applicable (item is not included in the scope for the alternative).

8.3 Modifying Criteria

Two modifying criteria are used in the final evaluation of remedial alternatives: state acceptance and community acceptance. For both of these criteria, the factors that are considered include the ele- ments of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

8.3.1 State Acceptance

The IDHW concurs with the selected remedial alternative, containment with an engineered cover comprised primarily of native materials. The IDHW has been involved in the development and review of the remedial investigation/feasibility study, the proposed plan, and this Record of Decision. Comments received from IDHW were incorporated into these documents, which have been issued with IDHW concurrence.

8.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the proposed plan. Specific comments are addressed in the Responsiveness Summary portion of Appendix A in this document.

Nine individuals provided comments on the proposed plan the public comment period. One additional comment was received after the comment period. A total

of nineteen comments were received. Public opinion on the preferred alternative, in no particular order, included, but was not lim- ited to (a) Alternative 3, Removal, should have been selected; (b) Alternative 2, Containment, was the best choice; (c) models for groundwater fate and transport should be benchmarked and validated before proceeding; (d) maximum doses should be compared to maximum dose limits; (e) how were the laws addressing disposal of spent fuel, transuranic wastes, greater-than-Class-C wastes, and low-level wastes accounted for; (f) trials regarding partial cleanup, including ground scraping and removal, should be conducted and considered; (g) future land uses should be considered; (h) results of other capping stud- ies should be used in this evaluation; (i) no further out-of-state shipments of radioactive wastes should be allowed to be deposited there; and (j) publications and the expenditures directed toward low-risk projects are a total waste of taxpayers' dollars.

In summary, three commentors favored the preferred alternative, two preferred Alternative 3, and the others either requested additional or clarifying information or provided comments not specifically associated with the two sites in question. The additional information requested appears in the Responsiveness Summary in Appendix A.

9. Selected Remedy

Based upon consideration of the requirements of CERCLA, on detailed analysis, and on public com- ments, the DOE-ID, the EPA, and the IDHW have selected Alternative 2, Containment, as the most appropriate remedy for both the SL-1 and BORAX-I burial grounds. The agencies believe that this alter- native represents the best balance of trade-offs with respect to the evaluation criteria. Alternative 2 pro- vides overall protection of human health and the environment, complies with ARARs, provides long- and short-term effectiveness, is readily implementable, and is cost-effective. An engineered barrier can effec- tively isolate contaminated materials from the accessible environment. Isolation both inhibits migration of contaminants from the burial grounds and allows time for radioactive decay of the primary contributor, cesium-137 and progeny, to the overall risk. Engineered barriers can also inhibit biotic and inadvertent human intrusion into the burial grounds. The agencies believe that an engineered cover system can main- tain isolation of contaminated materials while the overall risks decrease. Engineered barriers have been used extensively for remedial actions involving radionuclide-contaminated wastes.

Results of the baseline risk assessment indicate that the direct exposure pathway dominates the overall risk for both burial grounds. The primary contributor to this risk at both sites is cesium-137 and its progeny. Based on the time required for radionuclide decay to reduce the direct exposure risk to 1 in 10,000 at SL-1 and 2 in 10,000 at BORAX-I, a protective cover must be effective for approximately 400 years at SL-1 and for approximately 320 years at BORAX-I.

9.1 Description of Selected Remedy

The selected remedial action for both burial grounds is Alternative 2, containment by capping with an engineering long-term barrier comprised primarily of natural materials. The cover will be designed to maintain effective long-term isolation of contaminants. The number and thicknesses of layers designed in the cover depend on local climatic and geographic conditions, including precipitation rate, freeze depth, indegenous plant and animal species, and local topography. A 25-foot (7.5-meter) buffer zone will be established around the perimeter of the containment structures at each site. Additional design considerations will include the engineered lifetime of each cap, a minimum of 400 years at SL-1 and a minimum of 320 years at BORAX-I, to allow decay of cesium-137 and to reduce exposure risks. Surface-water diversion measures, including contouring and grading, will be used as necessary to direct runoff away from the burial grounds and into nearby, naturally occurring drainage formations. The specific cover design for each burial ground will be defined during final remedial design.

The cover system design will provide:

Shielding from penetrating radiation

A barrier to inhibit biotic and inadvertent human intrusion

Longevity through the predominant use of naturally occurring materials

Resistance to erosion that could expose buried waste and contribute to contaminant migration

Containment of contaminated surface soils which pose an excess risk greater than 1 in 10,000 at BORAX-I

Low maintenance requirements.

The capping system will be combined with institutional controls consisting of access and land use restrictions to discourage intrusion into the SL-1 and BORAX-I burial grounds. The DOE would be responsible for establishing and maintaining land use and access restrictions for at least 100 years. Access restrictions in the form of fences, warning signs, and permanent markers would be used to deter unauthorized entry into the burial grounds. Institutional controls would include placing written notifi- cation of the remedial action in the facility land use master plan; the nofication will be given to the Bureau of Land Management, together with request that a similar notification be placed in the Bureau of Land Management property management records. The DOE will provide EPA and IDHW with writ- ten verification that notification, including Bureau of Land Management notification, have been fully implemented.

Cap integrity monitoring and radiological survey programs will be established to ensure the func- tionality of the containment systems and provide

early detection of potential contaminant migration. These programs will be implemented annually for the first five years following completion of the caps. The necessity for continued monitoring will then be reevaluated and defined as determined appropriate by the agencies during subsequent five-year reviews. Groundwater monitoring needs at WAG 5 will be determined by the WAG 5 Comprehensive RI/FS. Radiological surveys at SL-1 will be conducted as part of this Record of Decision until such time the surveys can be included as part of environmental monitoring program established for the WAG5 Comprehensive RI/FS. Similarly, groundwater moni- toring needs at WAG 6 will be determined during the WAG 10 Comprehensive RI/FS. Radiological surveys at BORAX-I will be conducted as part of this Record of Decision until such time the surveys can be included as part of the environmental monitoring program established for the WAG 10 Comprehensive RI/FS. Air monitoring will be conducted as part of the INEL-wide air monitoring pro- gram. Cap integrity monitoring for cracks, erosion, and any observable degradation will be conducted to identify maintenance requirements. Institutional controls and monitoring requirements will be the responsibility of the DOE and will be evaluated for adequacy, effectiveness, and necessity during each five-year review of the remedial actions.

During implementation dust suppression measures such as water sprays will be used to minimize dust generation and thereby ensure compliance with ARARs (IDAPA 16.01.01.650 and .651). Health and safety plans will be established to identify training requirements, specify personal protection equip- ment requirements, and define general safe work practices. The remedial design will include measures to ensure mitigation of potential contaminant migration during implementation.

Implementation of the selected remedy at BORAX-I includes consolidation of contaminated surface soils which pose and excess risk greater than 1 in 10,000 to a location near the reactor foundation. Any surface soils consolidated will then be isolated beneath the engineered barrier. Action levels for the radionuclides of concern in BORAX-I surface soils are identified as 16.7 pCi/g for cesium-137, 10.8 pCi/g for strontium-90, and 13.2 pCi/g for uranium-235.

Because this remedy will result in wastes remaining on site, five-year reviews of this Record of Decision and reviews of monitoring data will be conducted. Evaluation will be performed within five years of the Record of Decision signature and will be conducted at least every five years thereafter until such evaluations are determined by the agencies to be no longer necessary. The purpose of these reviews is to ensure that the remedy achieves the remedial action objectives set forth in this Record of Decision and continues to provide adequate protection of human health and the environment.

9.2 Remediation Goals

The purpose of this response action is to inhibit potential exposure for human and environmental receptors and to minimize the spread of contamination. This will be accomplished be constructing long-term covers (caps) and restricting access to the sites.

Performance standards will be implemented to ensure that the cover system provides protection against direct exposure to the wastes at the two sites. The

performance standards identified for the con- tainment alternative include:

Installation of caps that are designed to remain in existence for at least 400 years at SL-1 and 320 years at BORAX-I to discourage any individual from inadvertently intruding into the buried waste or form contacting the waste at any time after active institutional controls over the dispos- al sites are removed up to the design life of the cap.

Application of maintenance and surface monitoring programs for the containment systems capa- ble of providing early warning of releases if radionuclides from the disposal site before they leave the site boundary.

Institution of restrictions limiting land use to industrial applications for at least 100 years.

Implementation of surface water controls to direct surface water away from the disposed wastes.

Elimination, to the extent practicable, of the need for ongoing active maintenance of the dispos- al sites following closure so that only surveillance, monitoring, or minor custodial care are required.

Placement of adequate cover to inhibit erosion by natural processes for the specified design lives of the caps.

Incorporation of features to inhibit biotic intrusion into the waste disposal pits and trench at the SL-1 burial ground.

The inspection and maintenance of the cover system will be conducted concurrent with the radiolog- ical survey program. Implementation of the maintenance and survey programs will ensure protection of human health and the environment from any unacceptable risks. These programs will be implemented annually for the first five years following completion of the caps. The necessity for continued monitor- ing will then be reevaluated and defined as determined appropriate by the agencies during subsequent five-years reviews.

9.3 Estimated Cost Details for the Selected Remedy

A summary of the costs for each of the remedial action alternatives evaluated was presented in Tables 9 and 10. As noted in Section 8.2.5, additional design details for the engineered barrier and environmental monitoring requirements have enable subsequent refinements in the original cost esti- mates for Alternative 2 (containment). Tables 11 and 12 provide detailed breakdowns of the estimated costs for the selected remedy, based on refinements in the costs presented previously in the proposed plan. Post-closure costs for maintenance and monitoring of the sites are net present value dollars for 1994. These costs are calculated based on a 5 percent interest rate (net of inflation).

Table 11. SL-1 selected remedy detailed cost estimate.a

Cost Elements	Estimated Cost
Construction Mobilize/demobilize cap subcontractor	$ 95,000
Construction of cap	543,000
Subsidence prevention	22,000
Surface water control	51,000
Air monitoring 50,000	
Miscellaneous	141,000
Construction management	234,000
Engineering design and inspection	111,000
Contractor overhead and profit	121,000
Contingency 271,000	
Construction subtotalb $1,639,000	
Post-closure costs Cap monitoring and maintenance	$ 108,000
Fence maintenance	7,000
Environmental monitoring	150,000
Post-closure contingency	66,000
Post-closure subtotalc $331,000	
Totald	$1,970,000

a. Costs are for 1995.

b. Includes net present value operating costs during remedial action.

c. Net present value assuming 5% interest (net of inflation) over 30 years.

d. Rounded to ten thousands.

Table 12. BORAX-I selected remedy detailed cost estimate.a

Cost Elements	Estimated Cost
Construction Mobilize/demobilize cap subcontractor	$ 95,000
Construction of cap	274,000
Surface soil consolidationb	-
Subsidence prevention	5,000
Surface water control	20,000
Air monitoring 50,000	
Miscellaneous	162,000
Construction management	233,000
Engineering design and inspection	79,000
Contractor overhead and profit	140,000
Contingency 182,000	
Construction subtotalc $1,240,000	
Post-closure costs Cap monitoring and maintenance	$ 24,000
Fence maintenance	3,000
Environmental monitoring	144,000
Post-closure	

contingency	43,000 Post-closure cost
subtotald	$214,000
$214,000	
Totale	$1,450,000

a. Cost are for 1995.

b. Cost for soil consolidation are covered by the other cost elements.

c. Includes net present value operating costs during remedial action.

d. Net present value assuming 5% interest (net of inflation) over 30 years.

e. Rounded to ten thousands.

10. Statutory Determinations

Remedy selection is based on CERCLA and the regulations contained in the national Oil and Hazardous Substances Pollution Contingency Plan. All remedies must meet the two threshold criteria (see Section 8.1) established in the National Oil and Hazardous Substances Pollution Contingency Plan: protection of human health and the environment, and compliance with ARARs. In addition, CERCLA requires that the remedy uses permanent solutions and alternative treatment technologies to to maximum extent practicable, and that the implemented action is cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy addresses these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 9, the selected remedy for both SL-1 and BORAX-I satisfies the criterion of overall protection of human health and the environment by isolating contaminated materials from the accessible environment. The remedy will maintain isolation for a sufficient period of time to allow short-lived radionuclides to decay, thereby decreasing direct exposure risks. Decay of short-lived radionuclides (primarily cesium-137 and its progeny) will reduce direct exposure risks to 1 in 10,000 at SL-1 after approximately 400 years and to 2 in 10,000 at BORAX-I after approximately 320 years. The risk level at SL-1 will continue to decrease to a lower limit of 3 in 1,000,000 after approximately 650 years, where it will remain due to the presence of long-lived uranium-235. The risk level at BORAX-I will decrease to 2 in 10,000 in about 320 years and will stabilize due to long-lived uranium-235.

Although the National Oil and Hazardous Substances Pollution Contingency Plan established the acceptability of risk to be within a range of 1 in 10,000 to 1 in 1,000,000, the estimated long-term risk levels cited above for SL-1 and BORAX-I are considered acceptable for several reasons. First, the Office of Solid Waste and Emergency Response Directive 9255.0-30, dated April of 1991,

states that the upper boundary of this risk range is not a discrete line at 1 in 10,000 and that a specific risk esti- mate around 1 in 10,000 may be considered acceptable if justified based on site-specific conditions. On this basis, risk levels around 1 in 10,000 have been determined to be acceptable for remedial actions implemented at other INEL operable units. Second, there are no practical, safe, and cost-effec- tive methods of removing the uranium-235 and its progenies from the contaminated materials associat- ed with the burial grounds. Any uranium-235 and its progenies removed would still require long-term isolation because there are no technologies for accelerating radionuclide decay. Finally, the methodolo- gy used in the baseline risk assessment to determine potential risks at SL-1 and BORAX-I resulted in upper bound estimates; uncertainty analysis indicates that risk is likely over-estimated, not under-esti- mated. Therefore it is probable that the long-term risks at BORAX-I, estimated at 2 in 10,000 may actually be within the 1 in 10,000 to 1 in 1,000,000 range.

Several assumptions, as discussed in Section 6.1.4, were incorporated into the methodology of the baseline risk assessment to ensure an upper-bound estimate would be computed. The assessment of residential scenarios was based on the assumption that direct contact with buried waste would be main- tained for 24 hours a day, 350 days per year, for 30 years. Similarly, occupational scenarios included the assumption that direct contact with buried waste would be maintained for 8 hours a day, 250 days per year, for 25 years. For surface exposures, the assessments also included an assumption of homoge- neous contamination with soils, based on the highest radionuclide concentrations detected during sampling activities. The result of these assumptions is most likely an over-estimation of the potential risks associated with the SL-1 and BORAX-I burial grounds.

The remedy selected for both SL-1 and BORAX-I is containment by capping, with engineered bar- riers comprised primarily of natural materials. The selected remedy will include consolidation of cont- aminated surface soils at BORAX-I for isolation beneath the engineered barrier. The engineered barri- ers will shield against penetrating radiation, discourage human and boitic intrusion, resist erosion, require low maintenance, and provide long-term performance and durability. Until determined by the agencies to be no longer necessary, radiological surveys will be preformed to ensure effective isolation of contamination at both sites. Monitoring of the engineered barriers will be performed until deter- mined by the agencies to be no longer necessary to ensure the integrity of the caps is not compromised by erosion or other deteriorating mechanisms. Additionally, institutional controls consisting of access restrictions (e.g., fencing, warning signs, and permanent markers) and runoff controls (e.g., contouring and grading as determined necessary)will be implemented to enhance isolation of the burial grounds. Land use will be restricted to industrial applications for the duration of DOE operations at the INEL. The DOE will request that the U.S. Department of Interior, Bureau of Land Management imposes simi- lar restrictions.

Because this remedy will result in waste remaining on site at both SL-1 and BORAX-I, reviews of this Record of Decision and monitoring data will be conducted. The initial review will be performed within five years of this

Record of Decision signature with subsequent reviews conducted at least every five years thereafter until determined by the agencies to be no longer necessary. The purpose of these five-year reviews is to ensure the remedy provides adequate protection of human health and the envi- ronment.

10.2 Compliance with ARARs

The engineered caps for SL-1 and BORAX-I will be designed to meet all state and federal ARARs. The ARARs that will be satisfied by the selected remedy are explained below.

10.2.1 ARARs

No chemical-or location-specific ARARs were identified for the remedial action at either SL-1 or BORAX-I. A single action-specific ARAR was identified for the selected remedy at both SL-1 and BORAX-I (see Section 7.1.2, Table 8). The requirements of the rules for Control of Fugitive Dust

(IDAPA 16.01.01.650 and .651) will be satisfied at both SL-1 and BORAX-I by application of appro- priate engineering controls to minimize generation of airborne contamination and dust during installa- tion of the engineered barriers and consolidation of surface soil at BORAX-I.

10.2.2 To-Be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to consider a number of procedures and guidance documents that are not legally binding. The following list of DOE orders are to be con- sidered as guidance documents:

DOE 5400.5, "Radiation Protection of the Public and Environment"

DOE 5820.2A, "Radiation Waste Management."

These DOE orders provide guidance to ensure radiation protection for the environment and the public. DOE Order 5400.5 provides radiation prodtection standards to protect the general public from activities conducted at DOE sites. DOE Order 5820.2A addresses future control of sites; the DOE intends to maintain active institutional control of low-level radioactive waste disposal sites for 100 years following closure.

10.3 Cost Effectiveness

The selected remedy is cost-effective based on the overall protection to human health and the envi- ronment relative to the costs incurred. Due to the persistent toxicity associated with radionuclides, removing waste from SL-1 and BORAX-I simply results in the transfer of risk from one location to another with a significant increase in cost and short-term risk. Therefore, compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in pro- tecting human health and the environment.

10.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable for the SL-1 and BORAX-I burial grounds. The National Oil and Hazardous Substances Pollution Contingency Plan prefers a permanent solution whenever possible. However, guidance established in the National Oil and Hazardous Substances Pollution Contingency Plan to assist in the selection and implementation of appropriate remedial actions states that EPA encourages the use of containment for waste that poses a relatively low long-term threat or where treatment is impracticable. Therefore, the selected remedy focuses on long-term containment, radiological monitoring, and institutional control of the burial grounds, due to the persistent radiotoxicity associated with radionuclides. The selected remedy pro- vides protection by isolating contaminated materials from the accessible environment for a sufficient period of time to reduce potential exposure risks to acceptable levels. Based on analysis of the CERCLA remedial alternative evaluation criteria and in particular the five balancing (see Section 8.2), containment provides the best remedy for both the SL-1 and BORAX-I burial grounds in

terms of long- and short-term effectiveness, cost, implementability, and reduction of toxicity, mobility, and volume. The following discussion highlights the trade-offs among the alternatives considered for SL-1 and BORAX-I relative to the five balancing criteria.

Long-term effectiveness is equally achieved by either containment or removal and disposal, because both remedial actions involve isolation from the accessible environment to ensure long-term protection of human health and the environment. However, removal actions would involve significantly increased worker exposure during the short-term period of implementation. No action would not be effective in the short- or long-term.

The toxicity of radionuclides associated with the burial grounds can only be reduced by natural decay; there are currently no technologies available to accelerate the decay process. Therefore, evalua- tion of the remedial actions considered with respect to reduction in toxicity is not applicable. In addition, the alternatives evaluated do not affect the volume of contaminated material existing at the burial grounds. However, both the selected remedy and the removal and disposal alternative would result in significantly reduced mobility based on long-term isolation from the accessible environment. No action would not have an impact on toxicity, volume, or mobility of contaminants at SL-1 or BORAX-I.

Implementability and cost are directly related to the complexity of the remedial actions considered. Removal and disposal is the most complex alternative due to health and safety concerns associated with handling the contaminated materials buried at SL-1 and BORAX-I. As a result, removal and disposal is the mist difficult to implement and the most expensive alternative. Although no action would be unacceptable to the agencies, this alternative is

technically easy to implement and the least expensive. The selected remedy is not complex and therefore is not difficult to implement and is much less expensive than removal and disposal.

Relative to the five balancing criteria, short-term effectiveness, implementability, and cost were the decisive factors in selecting the containment alternative. The containment alternative does not require intrusion into the burial grounds and therefore does not require worker exposure to the contaminated waste burial at SL-1 and BORAX-I. Furthermore, the containment alternative is not difficult to imple- ment and does not involve significant cost when compared to the removal and disposal alternative. No action was not considered a viable option.

State and community acceptance were also included in the decision-making process for remedy selection. The IDHW participated in the development and review of all required CERCLA documenta- tion, including the remedial investigation/feasibility study, the proposed plan, and this Record of Decision, and supports the selected alternative. The Environmental Management Site Specific Advisory Board for the INEL concurred with the selection of the containment alternative at both burial grounds and recommended that construction and monitoring costs be reduced to the extent possible to reflect the costs for similar actions performed within the private sector. In addition, public meetings

were held at various locations throughout the state, and publications were made available to inform, educate, and encourage participation of the community regarding remedial activities associated with the SL-1 and BORAX-I burial grounds.

10.5 Preference for Treatment as a Principal Element

Treatment was not considered in the formulation of potential alternatives for SL-1 and BORAX-I based on review of remedial actions previously selected for similar CERCLA sites. In addition, the nonhomogeneous characteristics associated with the wastes buried at SL-1 and BORAX-I rendered standard treatment techniques inappropriate. Contaminated materials buried at these site include con- struction debris, with physical properties ranging in size, shape, and material. Furthermore, based on the inability of treatment to reduce the toxicity of radionuclides, the remedy selected did not consider treatment as a principal element.

11. Documentation of Significant Change

Several refinements have been identified for the selected remedial action at the SL-1 and BORAX-I burial grounds. These refinements are related to surface soil consolidation, monitoring, and refine- ments, the boundaries of Operable Unit 5-05, and other changes to the proposed plan and are described in the following subsections.

11.1 Surface Soil Consolidation

The information in the proposed plan indicated that the surface soils around the burial grounds could require consolidation due to the presence of wind-dispersed contamination. Costs in the pro- posed plan were developed as ranges to accommodate the potential for consolidation of surface soils and the types of caps under consideration. Refined cost estimates were prepared for this Record of Decision based on no surface soil consolidation at SL-1, and consolidation of the entire 84,000-square foot (7,800-square meter) area at BORAX-I.

Subsequent to finalization of the proposed plan an evaluation of new data in conjunction with his- torical sampling and survey data determined that surface soils surrounding the SL-1 burial ground do not pose an unacceptable risk to human health or the environment. Soil ingestion, dust inhalation, groundwater ingestion, and external exposure were evaluated for current occupational and 30-year future residential scenarios. Surface soil concentrations of identified contaminants of concern outside of the exclusion fence are at or below background values within Operable Unit 5-05. Dose equivalent rate measurements of the Operable Unit 5-05 surface soils indicate radiological field levels at or below the average INEL level of 20 ærem/hr. The agencies have reviewed this infromation and concur that no further action is appropriate for the surface soils outside of the exclusion fence within Operable Unit 5-05. Documentation in support of the decision can be found in the Administrative Record for Operable Units 5-05 and 6-01 specifically in an engineering design file titled "ARA Windblown Area

Risk Evaluation" and an associated letter report titled "Assessment of Surface Soils Surrounding the SL-1 Burial Ground".

It is expected that surface soil consolidation will be necessary at BORAX-I to appropriately man- age soil contamination and minimize the potential for human or environmental exposure to unaccept- able risks. Therefore the refined cost estimate for capping the BORAX-I site incorporates the consoli- dation of surface soil option discussed in the proposed plan.

11.2 Monitoring

Long-term monitoring to confirm isolation of the buried contaminants for to accessible environ- ment and groundwater was described in the proposed plan. Environmental monitoring of air, soil, and groundwater, and cap integrity monitoring to assess erosion, cracking, or other observable deterioration were included. In the effort to refine costs the monitoring component was critically examined. It was determined that large components of the environmental monitoring could be incorporated into larger programs on the INEL at significant cost savings. Monitoring costs for the no action alternative were revised to be consistent with monitoring estimated for the selected Alternative 2. Therefore the no action alternative includes only soil monitoring. Alternative 3 did not include monitoring, and esti- mates have not changed.

11.2.1 Groundwater Monitoring

The results of the baseline risk assessment indicate risks via ingestion of groundwater of 1E-06 at the SL-1 burial ground and 3E-06 for the BORAX-I burial ground. These estimates, very low in the acceptable risk range, are upper bounds on risk because parameters for the groundwater modeling were selected to maximize the potential risk estimates also represent the summation of risks due to all contaminants, regardless of modeled peak concentration time in the aquifer.

Uncertainty analyses support the conclusion that there is no risk to groundwater form either burial ground; therefore, costs for groundwater monitoring have been eliminated. Installation of groundwater monitoring wells specific to these sites, at an approximate cost of $200,000 per well, is not necessary. Therefore, groundwater monitoring needs will be determined under the Waste Area Group 5 Comprehensive Remedial Investigation/feasibility Study for WAG 5 and the Waste Area Group 10 Comprehensive Remedial Investigation/feasibility Study for WAG 6. This approach will be more cost efficient because groundwater monitoring plans can be designed to cover much larger areas. Five-year studies. In the unlikely event that either burial ground is suspected of contribution to groundwater con- tamination, additional site-specific monitoring wells or other means of contaminants migration detection can be installed in the future.

11.2.2 Air Monitoring

Costs for long-term monitoring of air have been eliminated for both burial grounds for Alternatives 1 and 2. An INEL-wide program is in place that would make additional monitoring specific to either site redundant. In compliance with the identified ARARs, site-specific air monitoring will be per-

formed during the construction of the caps; after the remedial action is complete, responsibility for air monitoring at each site will be assumed by the site-wide program.

11.2.3 Soil Monitoring

Under Alternative 2, surface soils will be monitored by radiological surveys. For SL-1 cost esti- mates include radiological monitoring until the Waste Area Group 5 Comprehensive Remedial Investigation/Feasibility Study monitoring program is in place. At that time, long-term responsibility for these surveys will be placed under the Waste Area Group 5 program. Monitoring results and the need for continued monitoring will be evaluated during subsequent five-year reviews by the agencies.

Because there will be no long term monitoring plan for Waste Area Group 6, estimates in this Record of Decision include costs for radiological monitoring of the BORAX-I site. The need for con- tinued monitoring will be assessed periodically in the five-year reviews conducted by the agencies.

Estimates for monitoring under the No Action Alternative 1 were revised to be consistent with the approach formulated for Alternative 2.

11.3 Cost Refinements

The estimated costs for the selected remedy were present in the proposed plan as ranges; $3,684,000 to $8,775,000 for SL-1, and $2,340,000 to $4,690,000 for BORAX-I. The refined cost esti- mates presented in this Record of Decision are $1,970,000 for SL-1 and $1,450,000 for BORAX-I. The cost refinements result from the soil consolidation issues discussed in Section 11.1, monitoring discussed in Section 11.2, and refinements in general design parameters applied to the extent possible without specific engineering designs. Further refinements of costs will be achieved when the remedial design is finalized and well-defined.

Removing costs for groundwater and air monitoring (see Section 11.2) results in estimates for the No Action Alternative 1 of $188,000 for SL-1 and $180,000 for BORAX-I.

11.4 Operable Unit 5-05 Boundary

In the proposed plan the boundary of OU 5-05 was defined as the 1,200- by 1,500-foot (366- by 477-m) area around the SL-1 burial ground. The investigation of the surface soils and external exposure pathway discussed above in Section 11.1 was not limited to this region, but encompassed the entire area defined by the isopleth illustrated in Figures 2 and 4. Rather than assess a region in the middle of none end of this isopleth, the agencies have agreed to expand the boundary of Operable Unit 5-05 to include the northeast portion, about 40% of the entire area defined by the aerial isopleth. This approach avoids the necessity for future reassessment and expenditure of additional funds for the administration of the additional evaluation. Based on recently acquired dose equivalent rates, there are no unacceptable external exposure risks due to surface soil outside the exclusion fence but inside the revised Operable Unit 5-05 boundary. There are no other pathways of concern for the surface soils in the defined area. Therefore not remedial actions will be necessary. Expanding Operable Unit 5-05 to include the surrounding surface soils efficiently addresses the region and saves significant time and funds. The remaining 60% of the area defined by the aerial isopleth will be addressed in the WAG 5 comprehensive RI/FS as site ARA-23.

11.5 Other Changes to the Proposed Plan

Several other minor changes have been made due to refinement of elements presented in the pro- posed plan.

Institutional control: Institutional control will be maintained by DOE for at least 100 years to limit land use to industrial applications. Institutional controls will include placing written noti- fication of the remedial action in the facility land use master plan; the notification will prohibit any activities that would interfere with the remedial

activity. A copy of the notification will be given to the Bureau of Land Management, together with a request that a similar notification be placed in the Bureau of Land Management property management records. The DOE will pro- vide EPA and IDHW with written verification that notification, including Bureau of Land Management notification, have been fully implemented.

Remedial action objectives: The word "prevent" has been replaced with the word "inhibit" to more realistically describe each of the remedial action objectives.

Biotic intrusion at BORAX-I: In the development of preliminary cap design, the agencies have reviewed the available data and concluded that a biotic barrier is not necessary for protection of human health and the environmental at BORAX-I.

Biotic intrusion at SL-1: In the development of preliminary cap design, the agencies have reviewed the available data and concluded that a biotic barrier is not necessary over the entire SL-1 burial ground. Layers to inhibit biotic intrusion will be placed only directly over the dis- posal pits and trench.

12. Decision Summary for No Action Sites

This Record of Decision includes determinations for 10 Track 1 sites. The agencies have evaluated each site and support decisions for no further action. Much of the information discussed in previous sections, particularly Sections 1 through 5, also applies to these 10 sites. Additional information specif- ic to these sites is discussed in the remainder of this section, with individual descriptions of the 10 sites in Section 12.6. Further details can be found in the Administrative Record for Waste Area Group 5.

12.1 Site Name, Location, and Decription

Waste Area Group 5 contains two groups of facilities: the Auxiliary Reactor Area and the Power Burst Facility (see Figure 9). The Auxiliary Reactor Area is comprised of four inactive facilities located along Fillmore Boulevard north of Highway 20. The Power Burst Facility is just north of the Auxiliary Reactor Area and consists of a total of five facilities spread radially around the Power Burst Facility Control Area at the end of Jefferson Boulevard. Section 1 describes the topography, meteorology, sur- face-water hydrology, geology, ecology, demography, and land use for both areas. The general descrip- tion of groundwater hydrology is also the same, with site-specific depths to groundwater of approximate- ly 667 feet (203 m) at the Auxiliary Reactor Area and 483 feet (147 m) at the Power Burst Facility.

12.2 Site History and Enforcement Activities

The Auxiliary Reactor Area was originally constructed in 1957 for U.S. Army research and devel- opment of a compact power reactor. The area consisted of four facilities called Auxiliary Reactor Areas I through IV. In 1965 the Army program was discontinued. Technical support services, not including reactor operations, were continued until 1985, when the facilities were shut down. Three Track 1 sites, two at Auxiliary Reactor Area I and one at Auxiliary Reactor Area III, are included in this Record of Decision.

The Power Burst Facility was originally called the Special Power Excursion Reactor Test area. Built in the late 1950s for reactor behavior and safety experiments, the facility consisted of five areas, the Control Area and Special Power Excursion Reactor Test Area I through IV. After this series of experiments terminated, all of the reactors were removed, and the individual facilities within the area were converted to other uses. With the construction of a new reactor in 1970, the area was renamed the Power Burst Facility. The Special Power Excursion Reactor Test Control Area became, respectively, Facility Control Area; Special Power Excursion Reactor Test Areas I through IV became, respectively, the Power Burst Facility Reactor Area, the Waste Engineering Development Facility, the Waste Experimental Reduction Facility, and the Radioactive Mixed Waste Storage Facility. Seven Track 1 sites located at the Power Burst Facility are included in this Record of Decision.

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12.3 Highlights of Community Participation

All 10 Track 1 sites were included in the proposed plan for the SL-1 and BORAX-I burial grounds. Public comments were solicited at the same meetings and in the same comment periods discussed pre- viously. No comments were received.

12.4 Scope and Role of Operable Unit or Response Action

Ten sites in Waste Area Group 5 are presented in this Record of Decision with no further action determinations. As illustrated in Figure 9, three are located in the Auxiliary Reactor Area, and seven are within the Power Burst Facility. Of the twelve operable units in Waste Area Group 5, four have one or more individual Track 1 sites presented here for no further action.

All 10 sites were identified in the Federal Facility Agreement and Consent Order and evaluated according to INEL-specific guidance for Track 1 sites. Qualitative Track 1 risk assessments evaluate all available existing information and data, including site operating, waste, and disposal histories, engi- neering drawings, and anecdotal evidence. These assessments examine only potential hazards to human health, utilizing the assumption that actions taken to protect human health will also be protec- tive of the environment. The information was evaluated by representatives of the DOE, the IDHW, and the EPA, who agreed that the sites did not warrant remediation or further study.

As previously described, cumulative risks from each operable unit will be

further evaluated in the comprehensive remedial investigation/feasibility study for Waste Area Group 5. Final evaluation of site-wide impacts will be performed in the Waste Area Group 10 assessment.

12.4.1 Auxiliary Reactor Area Sites

Operable Unit 5-01, located at the Auxiliary Reactor Area I, contains six sites; two of the six, ARA-05 and ARA-17, are included in this Record of Decision. Also addressed is site ARA-13, the only site in Operable unit 5-11. This Operable Unit is located at the ARA-III.

12.4.2 Power Burst Facility Sites

All of the five sites in Operable Unit 5-03 (PBF-06, PBF-07, PBF-13, PBF-24) and PBF-28, are included in this Record of Decision. Of these five sites, four are located at the Power Burst Facility Reactor Area and the fifth, PBF-24, is at the Radioactive Mixed Waste Storage Facility. The other two Power Burst Facility sites are two of the three sites in Operable Unit 5-04, site codes PBF-14 and PBF-19. PBF-14 is located at the Waste Engineering Development Facility. PBF-19 is adjacent to the Waste Experimental Reduction Facility.

12.5 Site Characteristics

The complete Track 1 Decision Documentation Packages and other information supporting the evaluations for these sites can be found in the Administrative Record. Standard exposure pathways and scenarios were evaluated according to the INEL-specific guidance for assessing Track 1 sites. Potential exposure routes considered were external exposure to ionizing radiation, soil ingestion, inhalation of dust, inhalation of volatiles, and groundwater ingestion. Both current occupational and future residen- tial scenarios were qualitatively evaluated. The following section summarizes the contaminants consid- ered for each site and the results of the qualitative risk assessments.

12.6 Summary of Site Risks

The 10 sites were categorized for discussion and summary into three different types: wastewater disposal sites, soil contamination sites, and underground storage tanks.

12.6.1 Wastewater Disposal Sites

The six sites discussed in the following subsections were associated with liquid waste discharges. During the initial site identifications, several of these sites were only suspected of receiving hazardous of radioactive wastes. Subsequent evaluation determined that not disposal activities had occurred. Other sites were identified as recipients of contaminated wastes, but evaluation determined that dis- charges were neutralized, biodegraded, or in quantities too small to pose an unacceptable risk.

12.6.1.1 ARA-05. ARA-05 in Operable Unit 5-01 was originally described in the initial site iden- tification as an evaporation pond northeast of ARA-I.

The area is a shallow natural depression in the ground that may have received some runoff from an adjacent small parking lot. There are no records of waste generation or disposal processes associated with this site, nor are there any records indicating that the site was ever the intended destination of any waste stream. Historical monitoring surveys detected the presence of random radioactive particles in both the pond area and the general vicinity around ARAs I and II. These hot particles were probably a result of the SL-1 accident and cleanup efforts. This site was prepared in 1993 for removal of radioactive particles, but the survey indicated that the area was free of radioactivity above the ambient background.

12.6.1.2 ARA-17. ARA-17 in Operable Unit 5-01 is a nearly flat drainage area south of ARA-I that received drainage from two sources: the boiler room blow-down from the Hot Cells building and the raw-water storage tank and pump house at the southwestern corner of the facility. Surface dimen- sions are approximately 150 by 150 feet (46 by 46 m). These are no known concentrations of radiolog- ical contamination above background levels at this site, as confirmed by radiological surveys, and no evidence of noradiological constituents. Historical documents and process information pertinent to ARA-I do not indicate that this site was the intended destination of any waste stream except uncontam- inated water.

12.6.1.3 PBF-28. PBF-28 in Operable Unit 5-03 consists of an overspray area of surface soils north of the drainage ditch that is south and west of the Power Burst Facility Reactor Area cooling tower. The reactor cooling tower began service in 1076 and received reactor secondary cooling water until 1985. The drainage ditch was constructed in the early 1970s and is approximately 600 feet (183 m) in length. This drainage ditch was used for surface runoff drainage from the reactor area. It also received water from the bioler blow-down tank and discharge for overflow of secondary cooling water from the cooling towers. Soil samples were collected along the entire length of the drainage ditch and the cooling tower area and analyzed for chromium, the primary contaminant of concern. Results indi- cated a 100- by 100-foot (30- by 30-m) area was contaminated by aerosol overspray from the cooling tower. However, the concentrations of chromium found at this site are substantially below risk-based contaminant levels and surveys indicate no radiological activity above background levels for the cool- ing tower area or the drainage ditch.

12.6.1.4 PBF-06. PBF-06 in Operable Unit 5-03 is a ditch located west of the Power Burst Facility reactor building. A pipe running from the oil-fired boiler has emptied approximately 30 gal- lons (114-liters) per day of blow-down water into the pit since 1970. Although the reactor was placed in a standby status in 1985, the boiler is still being used to support ongoing activities at the facility, which require continued release of the boiler blow-down water. The blow-down water contains some chemicals that are used to inhibit corrosion in the boiler. However, the corrosion inhibitors used con- tain no hazardous chemicals, are nontoxic, and are used in very small quantities. A radiological survey conducted in 1991 found no radiological contamination above background levels at this site.

12.6.1.5 PBF-24. PBF-24 in Operable Unit 5-03 is a boiler blow-down pit that was used for drainage of the reactor building boiler waters from 1960 to 1971. The 2- by 2- by 6-foot (0.6- by 0.6- by 1.8-m) pit, located 30 feet (9 m) north of the reactor building, is a subsurface reinforce concrete struc- ture and has an open gravel base for drainage. A pipe running from the oil-fired boiler emptied approxi- mately 30 gallons (114 liters) per day of blow-down water into the pit. The blow-down water contained some chemicals that were used to inhibit corrosion in the boiler. However, the corrosion inhibitors used contained no hazardous chemicals were relatively nontoxic, and were used in very small quantities. Radiological surveys show no radiological contamination above background levels at this site.

12.6.1.6 ARA-13. ARA-13 in Operable Unit 5-11 consists of a septic tank, a distribution box, and a drain field at Auxiliary Reactor Area III. Sanitary wastes were disposed into the system from 1969 to 1980. Between 1980 and 1983, in addition to sanitary wastes, small quantities of hazardous laboratory wastes were diverted to this system. Sampling and analysis yield low-level concentrations of arsenic, barium, beryllium, mercury, nickel, selenium, and thallium in four samples taken from the leach field. The metals were detected at depths from 1 to 6 feet (0.3 to 1.8 m). However, concentrations were lower than background metalconcentrations found in soils at other operable units at the INEL. The contents of the system were sampled and analysis showed concentrations were below levels that would present an unacceptable risk.

12.6.2. Soil-Contamination Sites

The following two Track 1 sites were classified as potential soil-contaimination sites. One site was suspected of having received hazardous waste and possible oil spillage, but subsequent site evaluation determined that no such disposal activities had occurred. The other site was a dump for a variety of materials, including piping with asbestos insulation and some heavy metals. The asbestos has been removed, and subsequent evaluation of the site indicated that remaining contaminant concentrations do not pose an unacceptable risk to human health or the environment.

12.6.2.1 PBF-07. PBF-07 in Operable Unit 5-03 is the location of an oil drum storage area at the Power Burst Facility Reactor Area. The site consists of a wholly enclosed 4- by 8-foot (1.2- by 2.4-m) concrete pad, which is used to temporarily store two or three 55- gallon (208-liter) drums of used oil and lubricant until pick up for recycling. The site initially only had a steel roof covering the oil drums, but in 1990, the pad was enclosed with metal corrugated siding, and a drip pan was installed. There have been no recorded oil spills and the site shows no physical evidence of spillage. No hazardous substances have been sorted on the site, and a radiological survey conducted in 1991 detected no radio- logical activity above background.

12.6.2.2 PBF-13. PBF-13 in Operable Unit 5-03 is a rubble pit located north of the Power Burst Facility Reactor Area cooling tower. The rubble pit was first used to dispose of soil and basalt pieces excavated during facility construction in the late 1960s and was later used as a dump for a variety of construction materials until approximately the mid-1970s. Fence posts marks the

location of the 75- by 45-by 10-foot (23- by 14- by 3-m) dumping area. The dump received lumber, rusting empty barrels and cans, cable, concrete, and piping with asbestos insulation. All visible materials containing asbestos were removed from the pit in 1993. Any small quantity that remains was covered when the pit was backfilled with 3 to 12 feet (0.9 to 3.7 m) of clean soil and basalt rubble. Soil samples indicated the presence of cadmium, chromium, lead, nickel, and zinc in small amounts consistent with background levels. Volatile organic compounds detect at very low concentrations were acetone and toluene.

12.6.3 Underground Storage Tanks

The following two Track 1 sites were associated with underground storage tanks. One of the tanks, its contents, associated piping, and contaminated soil have been removed. This site is now paved and used for storage. The other tank was filled with sand, disconnected from the associated piping, and abandoned in place. Risk evaluations determined that possible residual soil contamination would not pose an unacceptable risk.

12.6.3.1 PBF-14 in Operable Unit 5-04 is the site of a a buried 500-gallon (1,893-liter) gasoline tank once used top power an emergency generator. The tank was in service from 1960 to 1964, when the Special Power Excursion Reactor Test II reactor was functional. The tank was filled with sand and abandoned in place with the fuel line discounted. Two posts prevent parking on the tank site. The top of the tank is about 2 feet (0.6 m) below the surface. During the Track 1 investigation,

soils were excavated down to the top of the tank to a depth of 2 to 2.5 feet (0.6 to 0.8 m). No stained soils were visible, volatile organic compounds were not detected and there were no holes observed in either the tank or associated piping.

12.6.3.2 PBF-19. PBF-19 in Operable Unit 5-04 was a 3,000-gallon (11,355-liter) underground fuel oil storage tank associated with the furnace in the reactor building at the Special Power Excursion Test Reactor III. Documentation from 1986 indicates that the tank and any contaminated soil associat- ed with the tank were scheduled for removal, but post-removal records were not found. Although evi- dence that the tank was removed versus abandoned in place is not confirmed, it is likely that the tank and any associated contaminated soil were removed in 1986. The area has since been paved and is now used for outside storage.

12.7 Description of the No Action Alternative

Based on the information summarized above from the supporting documents placed in the Administrative Record, the 10 Track 1 sites described do not pose an unacceptable risk to either human health or the environment. No further action is warranted. Although no additional efforts will be expended to remediate or assess these sites individually, each will be considered again for cumulative effects in the comprehensive remedial investigation/feasibility study

for Waste Area Group 5 and the site-wide assessment for Waste Area Group 10.

Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

A. 1 Overview

Operable Unit 5-05 is within Waste Area Group 5 of the Power Burst Facility/Auxiliary Reactor Area at the INEL. The unit comprises the SL-1 burial ground and surrounding area. Operable Unit 6-01 is within Waste Area Group 6 of the Experimental Breeder Reactor-I/Boiling Water Reactor Experiment at the INEL and comprises the BORAX-I burial ground and surrounding area. Both of these operable units are described in the Record of Decision to which this Responsiveness Summary is attached. Due to the similarities of the two operable units, they were investigated together. A proposed plan was released April 28, 1995, with a public comment period from May 3 to June 3, 1995. The pre- ferred alternative recommended in the proposed plan is containment by capping with an engineered long-term barrier comprised primarily of natural materials. This Responsiveness Summary recaps and responds to the comments received during the comment period. Generally, the comments reflect a broad range of views, from strong support for the selected alternative to opposition and support for Alternative 3, Removal and Disposal.

A. 2 Background on Community Involvement

In accordance wit CERCLA 113 (k)(2)(B)(i-v) and 117, a serious of opportunities for public infor- mation and participation in the remedial investigation and decision process for the SL-1 and BORAX-I burial grounds were provided to the public from September 1994 through May 1995. For the public, the activities included receiving fact sheets that briefly discussed the investigation to date, INEL Reporter articles and updates, a proposed plan, an

availability session and public meetings. A few members of the public received telephone briefings

In September 1994, a kickoff fact sheet concerning the SL-1 and BORAX-I remedial investigation/feasibility study was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list. The fact sheet contained a postage-paid comment form to solicit early public input on the investigations.

The investigations were discussed at informal semiannual briefings in Twin Falls (October 11, 1994), Pocatello (October 13, 1994), Moscow, (October 18, 1994), Boise (October 19, 1994), and Idaho Falls (October 20, 1994). During these briefings, representatives from the DOE and INEL discussed the projects with members of the community, answered questions, and listened to public comments.

Regular reports concerning the status of the project were included in the INEL Reporter and mailed to those who were on the mailing list. Reports also appeared in two Citizens' Guides.

In April 1995, a fact sheet concerning the project was sent to about 6,700 individuals of the general public and 650 INEL employees on the INEL Community Relations Plan mailing list. On April 11, 1995, the DOE issued a news release to more than 100 news medial contacts concerning the beginning of a 30-day public comment period, which began May 3, 1995 and ended June 3, 1995, pertaining to the proposed plan for SL-1 and BORAX-I. Many of the news releases resulted in a short note in com- munity calendar sections of newspapers and as public service announcements on radio stations. Both the fact sheet and news release gave notice to the public that documents for SL-1 and BORAX-I would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, the INEL Boise Office, as well as in public libraries in Idaho Falls, Fort Hall, Pocatello, Twin Falls, Boise, and the University of Idaho Library in Moscow. Also, table top displays were set up at the Grand Teton Mall in Idaho Falls (May 15-20), Burley Public Library (April 24- May 5), Twin Falls Public Library (May 5-26), Boise Towne Square Mall (April 29), and the Pocatello City Building (April 24-May 15).

Opportunities for public involvement in the decision process for SL- 1 and BORAX-I were provided beginning in May 1995. For the public, the activities ranged from receiving the proposed plan, con- ducting one teleconference call, and attending open houses and public meetings to informally dis- cussing the issues and offering verbal and written comments to the agencies during the 30-day public comment period.

Copies of the proposed plan for the burial grounds were mailed to about 6,700 members of the pub- lic and 650 INEL employees on the INEL Community Relations Plan mailing list on April 28, 1995, urging citizens to comment on the proposed plan and to attend public meetings. Display advertise- ments announcing the same information and the location of public meetings on May 16,

17, and 18, 1995, in Idaho Falls, Boise, and Moscow, respectively, appeared in seven major Idaho newspapers. All of the public meetings were held on the scheduled days. Large advertisements appeared in the follow- ing Idaho newspapers on April 26: Post Register (Idaho Falls); Idaho State Journal (Pocatello); South Idaho Press (Burley); Times News (Twin Falls); Idaho Statesman (Boise); Lewiston Morning Tribune (Lewiston); and The Daily News (Moscow).

Personal calls were made to stakeholders in Idaho Falls, Pocatello, Twin Falls, Boise and Moscow the week of May 8 and 15 to remind individuals about the meetings. A post card was mailed on May 10, 1995, to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list to encourage them to attend the public meetings and provide verbal or writ- ten comments. Both media, the news release and newspaper advertisements, gave public notice of pub- lic involvement activities and offerings for briefings, and the beginning of a 30-day public comment period that was to begin May 3 and run through June 3, 1995.

Written comment forms, including a postage-paid business-reply form, were made available to those attending the public meetings. The forms were used to turn in written comments at the meeting, and by some, to mail in comments later. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to record transcripts of discussions and public comments. Transcripts from the three public meetings were planned in the Administrative Record section for the SL-1 and BORAX-I burial grounds, Operable Units 5-05 and 6-01, in five INEL Information Repositories. A total of about 10 people attended the public meetings. Overall, eight provided formal comment; of these eight people , three provided oral comments and five provided written comments. For those who did not attend the public meetings but wanted to make formal written comments, a postage-paid comment form was attached to the proposed plan. All comments received on the proposed plan were considered during the development of this Record of Decision.

This Responsiveness Summary has been prepared as part of the Record of Decision. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment. The Record of Decision presents the preferred alternative for the project, selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. The decision for this operable unit is based on information contained in the Administrative Record.

A.3 Summary of Comments with Responses

Comments and questions raised during the public comment period on the SL-1 and BORAX-I bur- ial grounds proposed plan are summarized below. The public

meetings were divided into an informal question-and-answer session and a formal public comment session. The meeting format was described in published announcements and meeting attendees were reminded of the format at the beginning of each meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal question- and-answer period during the public meetings on the proposed plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during that part of the public meeting. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meeting were addressed by the agen- cies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message by calling the INEL's toll-free number. Seven written comments were received and 12 verbal comments were offered during the public meet- ings. This Responsiveness Summary responds to those comments.

1. Comment: One commenter asked what the maximum doses are regardless of time, at least to 10,000 years, and how these compare to the maximum dose limits of Nuclear Regulatory Commission and the DOE for an unrecognized abandoned radiation waste disposal facility.

   Response: The annual dose was estimated for the SL-1 and BORAX-I burial grounds based on the residential intrusion scenario beginning 30 years in the future. This scenario was selected because it represents the "maximum dose" at the time of earliest possible public access to either site. Selection of this exposure scenario from the 10 scenarios modeled in the baseline risk assessment represents the highest risk to the public and is also consistent with the proposed plan.

   Risk spreadsheets generated for the baseline risk assessment provided the starting point for the esti- mation of dose. Radionuclides posing a risk less than 1 in 10,000,000 for a given pathway were screened from this evaluation as insignificant contributors to the total dose. The methodologhy, including formulae, source terms, and dose conversion factors used to estimate annual dose rates, is presented in the technical memorandum titled Dose Conversions for the SL-1 and BORAX-I Burial Grounds, and can be found in the Administrative Record for Operable Units 5 and 6.

   Results of the calculations for the 30-year residential intrusion scenarios are summarized below. A limit of 25 mrem/yr for members of the public has been established by the Nuclear Regulatory Commission and by the DOE.

Table A-1. Estimates of dose for the 30-year residential intrusion scenario.

Estimated Annual Dose Rate (mrem/yr)	Site	Pathway
SL-1	External exposure	34,000
	Soil ingestion	

69 Dust inhalation 0.31 Groundwater ingestion
0.043 Total (2 significant digits) 34,000

BORAX-I External exposure 1,800 Soil ingestion
7.0 Dust inhalation 0.14 Groundwater
ingestion 0.64 Total (2 significant digits)
1,800

2. Comment: Two commentors feel the models used for groundwater fate and transport must be benchmarked and validated before we can proceed with action or no action.

Response: GWSCREEN was the groundwater modeling code used to estimate groundwater concen- trations and potential risks due to groundwater ingestion. This code was designed to EPA and IDHW specifications to address conditions and uncertainties pertinent to the INEL. Worst case upper bounds

of concentrations and risks were generated by using EPA and IDHW approved default input parame- ters defined for evaluating Track 2 sites (sites about which little is known, and low risk is expected). The code has been validated by benchmarking against the PORFLOW and GRDFLX codes, both of which are well known and accepted codes in groundwater modeling. GWSCREEN results were within 5% of both PORFLOW and GRDFLX results. Further information regarding the develop- ment, validation, and benchmarking of GWSCREEN can be found in the following documents which are available in the Administrative Record for Operable Units 5-05 and 6-01.

Rood, A. S. and R.C. Arnett, J.T. Barraclough. Contaminant Transport in the Snake River Plain Aquifer: Phase I, Part 1: Simple Analytical Model of Individual Plumes" EGG-ER-8623, May 1989.

Matthews, S.D., "Software Configuration Management Plan for Controlled Code Support System", EGG-GEO-10798, April 1992.

Rood, A.S., "Software Verification and Validation Plan for the GWSCREEN Code", EGG-GEO-10798, May 1993.

Smith, C.S., and C.A. Whitaker, "Independent Verification and Limited Benchmark Testing the GWSCREEN Computer Code, Version 2.0", GEE-GEO-10799, June 1993.

Rood, A.S., "GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination Theory and User's Manual Version 2.0", EGG-GEO-10797, June 1994, Revision 2.

Rood, A.S., "GWSCREEN: A Simi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination: Theory and User's Manual", EGG-GEO-10158, March 1992.

DOE, Track 2 Site: Guidance for Assessing Low Probability Hazard Sites at

the INEL, DOE/ID- 10389, January 1994, Revision 6.

3. Comment: One commenter requested information regarding the water transport time the sur face to the aquifer, any flow rate in the quifer used in the groundwater modeling. The commenter also inquired about the extremes examined in the uncertainly analysis, what kind of uncertainty analyses were done, and the resultant extremes of dosage imposed by the more significant radionu- clides in the aquifer plumes from SL-1 and BORAX-I.

   Response: Vadose zone water travel times used in the evaluation were 18 years for SL-1 66.3 years for BORAX-I. The GWSCREEN model (see comment #2) uses water travel times esti- mated using only sediment thicknesses in the vadose zone. Water travel time through the basalts was neglected because describing water movement through the basalts in the vadose zone is not scientif- cally well-defined. Neglecting the travel time through basalt results in conservative estimates. The average linear water velocity in the quifer was specified as 570 m/yr for both facilities.

A parametric sensitivity/uncertainly analysis was performed for both SL-1 and BORAX-I for those parameters that were though to most significantly affect the results. Sensitivity calculations were done only for the radionuclides with the highest estimated groundwater risk at each facility bound- ary using based case parameters. The radionuclides were technetium-99 for SL-1 and U-234 for BORAX-I. Parameters varied in the analysis were: infiltration rate, vadose zone sediment thick- ness, sediment moisture content, distribution coefficient, aquifer porosity, aquifer dispersivity, and well-screen thickness. Each parameter was varied over a range and only one parameter was varied at a time, except infiltration rate and moisture content which were related through the moisture characteristic curve for the sediment.

Vadose zone water travel times for base case calculations as well as minimum and maximum values investigated as part of the sensitivity/uncertainty analysis are shown in Table A-2. The minimum and maximum vadose zone water travel times were a result of varying the vadose zone thickness or infiltration rate.

Table A-2. Minimum and maximum vadose zone water travel times (years) considered in the sensitiv- ity/uncertainty analysis.

Facility/Location	Base Case Value	Minimum Value	Maximum Value
SL-1	18	10.2a	54.4b
BORAX-I	66.3	42.5a	156c

a. Using minimum value of vadose zone sediment thickness and base case infiltration.

b. Using maximum value of vadose zone sediment thickness and base case infiltration.

c. Using minimum value of infiltration rate and base case vadose zone sediment thickness.

The average linear groundwater velocity was not varied as part of the sensitivity/uncertainty analy- sis because the burial ground boundary receptor is so close to the source that the concentration and corresponding risk values are relatively insensitive to changes in this parameter. The term average linear groundwater velocity is the average speed traveled by water in the aquifer, and is often referred to as aquifer pore velocity.

The results of the sensitivity/uncertainty analysis were presented as a percent change form the base case peak groundwater concentration. This comparison can be extended to risk because the rela- tionship between concentration and risk is linear. For SL-1, the changes in concentration ranged from a minimum of 19% (of base case concentration) using the maximum well screen thickness (vertical mixing zone) to a maximum of 301% (of base case concentration) using the minimum aquifer dispersiveness. For BORAX-I, the changes ranged from a minimum of 8% to a maximum of 970%. Both of these are the result of using the minimum and maximum distribution coefficients. A more complete discussion of the sensitivity/uncertainty analysis as well as a discussion of the effect of each parameter and assumption can be found in Appendix C, Section C-5, of the remedial investigation/feasibility study report.

Because annual dose due groundwater ingestion is insignificant (see Comment #1), sensitivity analyses to generate the extremes of dose by radionuclide, as requested by this commenter, were not generated.

4. Comment: One commenter requested more infromation regarding potential contaminant plumes and stated that cumulative impacts from various facilities must be considered to at least 10,00 years in the future, not contributions from individual sites for only 100 or 1,000 years. Specific questions included "Will the SL-1 contaminant plume in the aquifer overlap the plume from BORAX-I?", and "Will these plumes overlap the plume from the previously evaluated RWMC Pad A?"

Response: It is unlikely that potential groundwater plumes from SL-1 and BORAX-I will overlap and cause significant concentrations. Figure 1 in the Record of Decision shows the locations of the INEL site boundary receptors for SL-1 and BORAX-I. These locations were determined based on the regional groundwater flow direction which is to the southwest. Radionuclide concentrations from both SL-1 and BORAX-I were predicted to decrease several orders of magnitude by the time they reach the INEL site boundary receptors. It is doubtful that the plumes would overlap on the INEL unless there were an uncharacteristically large degree of spreading. Any plume overlap would likely occur off the INEL site. At that point, the additive concentrations of any plume over- lap would be much less than those predicted at the burial

ground boundary, facility boundary, and probably the INEL site boundary. Nevertheless, overlap of plumes will be considered in the sitewide groundwater assessment in conjunction with the Waste Area Group 10 remedial investiga- tion/feasibility study.

The possibility of potential groundwater plumes from other facilities was not evaluated. It is likely however, that a plume from BORAX-I would overlap a plume from Pad A given the relatively close proximity of the two sites. Any impact of overlaps will be evaluated in Waste Area Group 10.

The peak radionuclide groundwater concentrations were calculated irrespective of any time frame. Several radionuclides were predicted to take more than 10,000 years to reach the aquifer. For con- servatism, the peak groundwater concentrations of each radionuclide were assumed to occur at the same time for each receptor.

5. Comment: One commenter wanted to know how the requirements of 40 CFR 193, particularly 10,000 year disposal requirements, and the Low-Level Waste Policy Act of 1985 are being met for these two sites, described by the commenter as "inactive disposal sites for spent fuel, transuranic waste, greater than Class C waste, and low-level waste."

   Response: The proposal draft of 40 CFR 193 states explicitly that "The management and stor- age standards are not intended to apply to remedial actions at LLW facilities which were closed prior to the effective date of 40 CFR 193...". The draft acknowledges that it may be years before 40 CFR 193 is finalized. 40 CFR 193 does not qualify as an ARAR until it became law.

Capping of the two burial grounds does, however, satisfy the intent of the preproposal draft. The draft states that "The only practical method of reducing the radiation hazard from LLW is to isolate it from people and the environment until the radioactivity has decayed," and the proposed standards should consider "...the protection provided by the engineered and natural barriers of a disposal sys- tem." The caps will be designed to prevent human or environmental exposure to the waste for 400 years at SL-1 (when the external exposure risk will reach 1E-04) and 320 years at BORAX-I (when the long-lived uranium-235 becomes the primary risk contributor at 2E-04).

In terms of possible intrusion into the waste, the draft states that "the standards have not been devised to protect individuals who purposefully or inadvertently farm on the superjacent land or penetrate into the waste. They do apply outside the area delineated by permanent markers and in records of government ownership." It is anticipated that these restrictions will be specified in the remedial design phase which follows the signing of this Record of Decision.

The EPA proposes a standard of 15 mrem committed effective dose per year (equivalent to a fatal cancer risk of 5E-04) to the public, outside of the area delineated by permanent markers and recorded government ownership.

Shielding provided by the caps will be adequate to keep expo- sures below 15 mrem/yr above background.

The commenter referred to disposal requirements for spent fuel, transuranic waste, and greater- than-Class C waste. The wastes buried at both SL-1 and BORAX-I do not meet the definition of these waste types. All wastes associated with the SL-1 and BORAX-I burial grounds are consid- ered low-level waste. The following paragraphs clarify this point.

Spent nuclear fuel is defined in DOE Order 5820.2A (Radioactive Waste Management), Attachment 2, as "Fuel that has been withdrawn from a nuclear reactor following irradiation, but that has not been reprocessed to remove its constituent elements." Neither the SL-1 or BORAX-I reactor oper- ated for long enough to achieve burn-up to the design core lifetime prior to destruction of the facili- ties. Thus, the fuel never became "spent".

Transuranic waste is defined in DOE Order 5820.2A, Attachment 2, as "Without regard to source or form, waste that is contaminated with alpha emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay." The concen- trations of transuranium radionuclides at SL-1 are estimated to be in the nCi/g range and no transuranium radionuclides were identified as contaminants of concern at BORAX-I. Thus, no transuranic wastes exist at either burial ground.

A comparison of the radionuclide concentrations associated with the SL-1 and BORAX-I burial grounds with Class C waste determination criteria revealed that no waste concentrations in excess of Class C level exists at either site. This determination is based on the assumption of uniform distribution of contaminants throughout the estimated volume. Therefore, it is possible that localized areas of higher concentrations could exceed Class C criteria. However, based on the comparison performed, contaminant concentrations are below the lower end of the Class B criteria range.

All the waste associated with both burial grounds does meet the definition of low-level waste, as defined in DOE Order 5820.2A, Attachment 2:

> "Waste that contains radioactivity and is not classified as high-level waste, transuranic waste or spent nuclear fuel or 11(e) byproduct material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production ot power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less that 100 nCi/g."

Therefore, only low-level radioactive waste management and disposal requirements are considered relevant to the SL-1 and BORAX-I burial grounds.

The commenter also referenced disposal requirements specified in the Low-Level Waste Policy of 1985. The act specifically excludes low-level waste owned or generated by the DOE. DOE Order 5820.2A specifies

requirements for managing and disposing DOE owned and generated low- level waste. This DOE Order specifies that inactive sites such as SL-1 and BORAX-I be managed in conformance with CERCLA, which is the process currently being undertaken. The Order does no specify retrofitting such inactive sites to meet the requirements that would apply for new or operating disposal facilities.

6. Comment: One commenter calls the reports "excellent and interesting" but thinks cost estimates are too high, especially for construction management and contractor overhead and profit. The com- menter states that competitive bedding on a fixed price design that is simple and clear should reduce estimated costs by 25 to 50%.

Response: Cost estimates for the alternatives analyzed were developed for comparison purposes only, and will not likely reflect the actual cost of implementing the selected alternative. The cost estimates were developed on the basis of a preliminary conceptual design, and therefore have omit- ted many specific details of the alternatives that were not well defined. These specific details are accounted for within a contingency cost element included in each estimate. However, the com- menter judged the estimates as being excessive by 25 to 50 percent. This evaluation by the com- menter is consistent with CERCLA guidance for preparing such cost estimates, which calls for accuracy within the range of -30 to +50 percent.

The commenter specifically identified Construction Management and Contractor Overhead & Profit costs as being "very high". These cost elements are computed on a percentage basis. The percent- age rate used was developed from INEL -specific construction cost history.

Costs were refined in preparation for public meetings with the EM Site-Specific Advisory Board-INEL. These refined estimates include additional specific items, such as foundation prepara- tion and acquisition and transportation of materials, thus reducing the contingency factor percentage. These refinements results in estimates of $1.95 million for SL-1 and $1.45 million for BORAX-I. Although these estimates are better than those that appeared in the proposed plan, they are still fairly rough. Anticipated actual costs can not be presented until remedial design is complete.

7. Comment: Three commentors expressed opinions that Alternative 2 is the best choice.

Response: The agencies agree that Alternative 2, containment by capping with an engineered bar- rier comprised primarily of natural materials, is the preferred alternative based on effectiveness, cost, and the other evaluation criteria discussed in the proposed plan and Record of Decision. Consequently, this alternative appears in the Record of Decision as the selected remedial action for both the SL-1 and the BORAX-I burial grounds.

8. Comment: Two commentors favor Alternative 3. One commenter felt that Alternative 2 would leave us vulnerable to natural disasters, vandalism, or

cutbacks in monitoring. The other com- menter was worried that the INEL, being situated above the Snake River Plain Aquifer and in an earthquake sensitive area, is "a disaster awaiting its own fulfillment."

Response: The excavation and removal discussed in Alternative 3 does return the sites to natural conditions; however, this remedy essentially moves the problem from one location to another with- in the INEL with significant risks to workers and the public and at very high cost. This action would only forestall a timely decision regarding the final disposition of the wastes and would not alleviate the commenters' concerns. The prediction regarding "a disaster awaiting its own fulfill- ment", refers to events such as earthquakes and other natural disasters. A very small probability exits that such events could occur; therefore design features such as slope minimization will be evaluated and incorporated into the engineered covers as determined appropriate during the Remedial Design phase.

9. Comment: One commenter stated that the Special Power Excursion Reactor Test I reactor pro- gram was also concluded with a destructive test similar to the BORAX-I experiment. The com- menter concludes that this experiment must also have resulted in contaminated debris and soil, and wanted to know why it is not included in any proposed clean-up plan.

   Response: The Special Power Excursion Reactor Test I facility was decommissioned in 1964. The reactor pit was demolished in 1985 and the site returned to its original state. No known contami- nated debris remains at the site. The Power Burst Facility reactor was built just north of the Special Power Excursion Reactor Test I location, and the facility is now known as the Power Burst Facility Reactor Area. The only two remediation sites identified within this facility are a seepage pit (site code PBF-11) and a leach pond (site code PBF-12). Both have received no further action recom- mendations.

10. Comment: One commenter expressed the opinion that taxpayers money is being wasted by pro- ducing publications and expending funds on "low risk projects."

    Response: The SL-1 and BORAX-I burial grounds can not be considered low risk projects in view of the risks estimated in the baseline risk assessment and summarized in he proposed plan. In response to Superfund guidance and the INEL Community Relations Plan, the agencies have direct- ed that program funds be used to communicate information concerning the investigations to the public. The preparation of the INEL Reporter, fact sheets, and proposed plans are traditional meth- ods of updating citizens on project specifics. The object of these publications is to describe how the agencies are approaching the work outlined in the Federal Facility Agreement and what new information is learned about the sites. The invitation for citizens to interact with the agencies con concerning this process is an important part of finding out what citizens think of the agencies' recom- mendations. The result of interaction between the public and the agencies is the formulation of a decision that considers the issues raised by citizens through a fair and reasonable process.

11. Comment: One commenter stated that trials should be conducted to determine if scraping surface soils and extracting the uranium-235 results in recovery of significant amounts of uranium. If suc- cessful, the method should be applied more extensively at the sites because recovery of the uranium would return it to secure storage and reduce the long-term impacts from these sites.

Response: The commenter referred to the use of technologies which could be used to extract ura- nium-235 from surface soils if soils were scraped from the areas surrounding the burial grounds. The technology being referred to is called "soil wasing". The technology has been demonstrated for the removal of uranium from soil, but was not considered for application at either SL-1 or BORAX-I. As described in Section 11, the surface soil associated with the SL-1 burial ground will not require remedial action. In addition, uranium was not identified as a contaminant of concern in SL-1 surface soils. This technique for BORAX-I is described below.

The effectiveness of soil washing is dependent on site-specific soil characteristics and the chemical behavior of contaminants in the environment. Soil washing studies performed at the Hanford site indicated that uranium would typically be concentrated in the smaller soil size fractions (silts and clays). Therefore, removal of uranium from BORAX-I soils would initially require separation into specific soil size fractions such as gravel, sand, silt, and clay. The larger soil size fractions, gravel and sand, would then be analyzed and either return to the site or trated, depending on the results of the analysis. If necessary, mechanical agitation or scrubbing would be used to physically remove uranium from the surfaces of the larger size soil fractions. The smaller soil size fractions, most likely to contain the majority of uranium, would then be leached by a chemical extractant such as sulfuric acid. Studies have shown such leaching processes can reduce uranium concentrations in the smaller soil size fractions to levels between approximately 20 and 70 parts per million. The chemical extractant and wash water would require additional treatment to remove uranium extract- ed from the soils.

Separating uranium from the soil surrounding BORAX-I is not considered feasible based on the extremely low concentrations anticipated in the surface soils, and the smallmass of uranium actually contained in the soil. Scraping contaminated surface soils would result in considerable mixing of the exiting gravel cover and the clean soil immediately beneath the contaminated soil. Assuming the entire mass of unrecovered uranium at BORAX-1, about eight pounds (3.7 kilograms), is uniformly distributed throughout the 84,000 square feet of potentially contaminated soil area, removal of the top foot of soil and gravel from this area would result in a maximum uranium concentration of one part per million. For the sake of argument, assuming the smaller soil size fraction represented 20 percent of this volume and was effectively separated by the initial soil washing stage, then a maximum of only five parts per million could be obtained. Assuming the entire eight pounds (3.7 kilograms) were distributed in a much smaller area, perhaps one-sixth the entire 84,000 square feet, the uranium con- centration would be approximately parts per million. If the smaller soil size fraction represented 20 percent of this volume and were effectively

separated by the initial soil washing, then a maximum of 30 parts per million could be obtained. Such low concentrations would not be amenable to effec- tive leaching in the final stage of the soil washing process.

Soil washing could be effective for removing larger particles if the majority of uranium were not in the form of uniformly distributed fine particles. However, historical documentation indicates the fuel frag- ments (larger particles) were collected from the surface soils and the majority of the remaining contamina- tion interred in he reactor foundation. Therefore the actual mass of uranium in the BORAX-I surface soils is probably significantly less than the unrecovered eight pounds (3.7 kilograms).

The focused remedial investigation/feasibility study performed for SL-1 and BORAX-I was based on remedial actions identified in previous CERCLA Records of Decision, and although soil wash- ing technology exists and is currently in use under the EPA Superfund Innovative Technology Evaluation Program, the technology has not been specified for use in previous CERCLA Records of Decision involving radionuclide contaminated soils.

12. Comment: One commenter suggested that selection of an alternative should be deferred until the methods and costs associated with the Pit 9 action are available. The commenter felt the cost esti- mates for SL-1 and BORAX-I and the decision for these two sites could change if some of the waste could be processed through the Pit 9 treatment facilities.

    Response: The situation at Pit 9 is sufficiently different from that at the SL-1 and BORAX-I burial grounds to eliminate the possibility of similar treatment. The limited production tests at Pit 9 are directed at transuranic wastes in concentrations greater than 10 nanocuries per gram; wastes at the SL-1 and BORAX-I burial grounds are described in terms of picocuries, three orders of magnitude smaller. In addition, Pit 9 wastes include hazardous substances and some mixed waste, unlike the SL-1 and BORAX-I burial grounds where radionuclides are the only contaminants of concern. Preliminary information regarding cost and effectiveness of the limited production tests being per- formed for the Pit 9 treatments will not be available before January, 1997. The agencies do not

anticipate that delaying this remedial action until the Pit 9 cost and effectiveness data are available will alter their preference for capping the sites as described in Alternative 2 of the proposed plan.

13. Comment: One commenter stated that partial cleanup including ground scraping and removal of cont- amination in excess of 10 CFR 61 Class A limits should be considered as an additional alternative.

    Response: Removal of contaminated surface soil is a potential aspect of the final remedial design phase. Three potential options for is position of contaminated surface soils surrounding the burial grounds were identified in the remedial investigation/feasibility study. These options include:

    No action or restricted access

Removal followed by disposal at Radioactive Waste Management Complex

Consolidation near the location of buried waste for inclusion beneath the protective cover.

10 CFR 61 defines the criteria under which the Nuclear Regulatory Commission issues licenses for land disposal of radioactive waste. The disposal at the SL-1 and BORAX-I burial grounds took place prior to the effective date of 10 CFR 61, so the licensing requirements do not apply.

14. Comment: Two commenters indicated that future land use scenarios should be established before decisions are made so that exposure scenarios could be determined on the basis of realistic project- ed land use.

Response: The INEL is in the process of establishing land use scenarios for areas surrounding Site facilities. Certain areas may be designated for future industrial land use; these scenarios will be used to form the basis of risk calculations in the future. In the meantime, the agencies have decided to take the cautious approach to protect workers, the public, and the environment by applying the most protective land use scenarios incurrnt risk assessments.

15. Comment: One commenter expressed the opinion that results of capping studies from the old dairy farm and other studies should be used in this evaluation.

Response: INEL- specific research involving capping design has been included in the preliminary conceptual designs of the caps evaluated for SL-1 and BORAX-I. The Environmental Science and Research Foundation is currently conducting cap design experiments at the INEL. These experi- ments, called the Protective Cap/Biobarrier Experiments, focus on low-cost, natural systems to effectively isolate municipal, industrial, and low-level radioactive wastes and contaminated soil sur- faces from the environment, for centuries." The results obtained thus far in the experiments were incorporated in the Uranium Mill Tailings Remedial Action type ap design presented in the reme- dial investigation/feasibility study report. This included a 5-foot (1.6-m) soil layer for water bal- ance, a 1.5-foot (45-cm) rock/cobble layer in combination with a 1-foot (30-cm) gravel later for

biotic control. During the remedial design phase such INEL-specific information will be included in the final cap design.

16. Comment: One commenter demands that Alternative 3 be selected for SL-1 and BORAX-I and that no further out-of-state shipments of radioactive waste be "allowed to be deposited there".

Response: Alternative 3 is the removal of wastes from the burial ground with disposal at the INEL's Radioactive Waste Management Complex. Removal and disposal only relocates the contamination within the INEL at a high cost and potentially high risk to workers and the public; it does not eliminate the problem. Alternative 2, covering and controlling the contamination through time while radioactive decay decreases the risk, is a safer and more

cost-effective approach. The SL-1 and BORAX-I sites have never received waste shipped into the state from other sources. To receive information or ask questions concerning possible transportation of waste to the INEL from out-of-state, citizens can call the INEL's toll-free number, 1-800-708-2680, to request additional details and assistance.

17. Comment: One commenter suggested that "debris treatment" should be utilized to reduce volumes of mixed waste.

    Response: Mixed wastes have not been identified at either burial ground. Also see responses 11, 12, and 13.

18. Comment: One commenter asked what considerations to reduce volumes of contaminated soils were being exercised.

    Response: Under the preferred alternative, capping with an engineered barrier, contaminated sur- faces soils will be consolidated at BORAX-I based on field screening and sample data acquired dur- ing the remedial design phase of the remedial action. No other applicable minimization efforts have been identified.

A.4 Comment and Response Index

Because comments are summarized in the Responsiveness Summary for response, and index is included to assist in identifying responses to specific comments. All oral comments, as received at the public meetings, and all written comments are included verbatim. Each comment is coded with a W, meaning a written comment, or a T for an oral comment transcribed during the public meetings. Seven people submitted written comments and three rendered oral comments during the meeting. A total of 19 comments were received.

<IMG SRC 1096132L>

<IMG SRC 1096132M>

Appendix

Administrative Record File Index

Idaho National Engineering Laboratory Administrative Record File Index for the Track 2 Scoping of the ARA-II SL-1 Burial Ground OU 5-05 and 6-01 6/26/95

File Number

AR1.1 Background

Document# EGG-GEO-10068 Title: A Modeling Study of Water Flo in the Vadose Zone beneath the RWMC Author: Baca, R.G. Recipient: N/A Date: 01/01/92

*Note: This Document is filed in the Pad A Administrative Record Binder Operable Unit 7-12 Volume I

Document # EGG-BG-9175 Title: Independent Verification an Benchmark Testing of the Porflo-3 Computer Code, Version 1.0

Author: Baca, R.G. Recipient: N/A Date: 08/01/90

Document #: KJH-09-94 Title: Interviews with Darrell Hann Regarding the SL-Burial Ground Author: Holdren, K.J. Recipient: Halford, V.E. Date: 07/06/94

Document #: 10022 Title: Record of Meeting with Roger G Jensen, U.S.G.S., Regarding Depth to Aquifer near BORAX-I/SL-1 Author: VanDerpoel, G. Recipient: N/A Date: 02/17/94

Document#: 10023 Title: Record of Meeting with Dick Meservey EG&G Idaho Regarding BORAX-I Author: Tucker, J. Recipient: N/A Date: 02/17/94

File Number

AR1.1 Background (Continued)

Document# 10024 Title: Record of Meeting with Roge Wilhelmson, EG&G Idaho, Regarding Pipes in Author: Baca, R.G. SL-1 Burial Ground Author: Meadows, G. Recipient: N/A Date: 04/15/94

Document # 10025 Title: Record of Meeting with Eddy Chew DOE-Idaho Regarding SL- Burial Ground Pipes Author: Meadows, D. Recipient: N/A Date: 04/14/94

Document #: 10026 Title: Record of Meeting with Glenn Briscoe Regarding SL-1 Burial Ground Author: Meadows, D. Recipient: N/A Date: 01/25/94

Document #: 10027 Title: Record of Meeting with Craig Kwamm LITCO, Regarding Basis for RWMC Disposal Costs Author: Vetter, D. Recipient: N/A Date: 12/02/94

Document#: 10028 Title: Memo of Conversation with Richar Green, Regarding Pipes in the SL-1 Burial Ground Author: Holdren, K.J. Recipient: N/A Date: 04/14/94

Document #: 10133 Title: Support Documentation: Estimation o Uranium-235 Surface Soil Concentrations Based on Mass Unrecovered at the BORAX-I Burial Ground Author: R. Filemyr Recipient: J.Holdren Date: 08/30/95

Document #: 10134 Title: Errata for the Remedia Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX-I Burial Grounds) Author: R. Filemyr Recipient: N/A Date: 08/30/95

Document #: 10135 Title: Support Documentation: Annual Dos Calculation for Selected Scenarios at the SL-1 and BORAX-I Burial Grounds Author: R. Filemyr Recipient: J. Holdren Date: 08/30/95

Document #: 10136 Title: SL-1/BORAX-I Class C Waste Equivalenc Determination Author: R. Filemyr Recipient: J. Holdren Date: 08/30/95

ARA-II SL-1 Burial Ground OU5-05 and 6-01 6/26/95

File Number AR1.7 Initial Assessments

Document #: 2984 Title: ARA-06, ARA II SL-1 Burial Ground Author N/A Recipient: N/A Date: 09/15/86

Document #: 2629 Title: BORAX-02, BORAX-I Burial Site Author N/A Recipient: N/A Date: N/A

AR3.8 Risk Assessment

Document #: MISC-94001 Title: Preliminary Baseline Ris assessment for the OU-5-05 and 6-01, SL-1 and BORAX-I Burial Grounds RI/FS Author: N/A Recipient: N/A Date: 10/01/93

Document #: 5662 Title: Overview of Exposure Scenarios for th Baseline Risk Assessment for the OU 5-05 and 6-01, SL-1 and BORAX-I Burial Grounds RI Author: N/A Recipient: N/A Date: 10/01/93

Document #: INEL-95/103 Rev 2 Title: ARA Windblown Area Ris Evaluation Author: D. Jorgensen Recipient: N/A Date: 09/07/95

Document #: 10137 Title: Assessment of Surface Soils Surroundin the SL-1 Burial Grounds Author: K.J. Holdren Recipient: N/A Date: October, 1995

ARA II SL-1 Burial Ground OU 5-05 and 6-01 6/26/95

File Number

AR3.10 Scope of Work

Document #: EGG-ER-10998 Title: Scope of Work for Operable Unit 5-05 and 6-01 (SL-1 and BORAX-I Burial Grounds) Remedial Investigation Feasibility Study (RI/FS) Author: Halford, V.E. Recipient: N/A Date: 03/01/94

AR3. 12 Remedial Investigation/Feasibility Study

Document #: OPE-ER-157-94 Title: Transmittal of the Draf Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 BORAX-I Burial Grounds RI/FS); Volume 1 of 2 Author: Lyle, J.L. Recipient: Piere, W.; Nygard, D. Date: 06/15/94

Document #: INEL-95/0027 Title: Remedia Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX Burial Grounds) Author: Holdren, K.J.; Filemyr, R.G.; Vetter D.W. Recipient: N/A Date: 03/1/95

AR4.3 Proposed Plan

Document #: 10011 Title: Proposed plan for Operable Unit 5-05 and 6-01 Stationary Low-Power Reactor-1 and the Boiling Water Experiment-I Burial Grounds Author: DOE,EPA, IDHW Recipient: N/A Date: 05/01/95

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/01/1995
Operable Unit: 24
ROD ID: EPA/ROD/R10-96/147

Media: soil

Contaminant: radionuclides, cesium-137, barium-137

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the Department of Energy (DOE). The INEL occupies 880 square miles of the northeastern portion of the Eastern Snake River Plain. The stationary low-power reactor-1 (SL-1) and Boiling Water Reactor Experiment-1 (BORAX-1) burial grounds are approximately 38 and 52 miles west of Idaho Falls, Idaho.The SL-1 site is located about 1,600 feet northeast of the Auxiliary Reactor Area II and includes the surface soil area surrounding a 600- by 300-foot fenced burial ground. Approximately 99,000 cubic feet of radionuclide contaminated debris, soil, and gravel are disposed of in the burial ground. An estimated 2 feet of soil with a thick grass cover lies over the waste.The BORAX-1 burial ground is located about 2,730 feet northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-1 site includes a 200- by 420- foot surface soil contamination area surrounding the 100- by 100-foot fenced burial ground. The volume of buried radionuclide contaminated soil and debris is approximately 6,336 cubic feet. The area was covered with 6 inches of gravel in 1954, but grass,

sagebrush, and other plants have reseeded the area since then.The INEL was originally established as the National Reactor Testing Station by the U.S. Atomic Energy Commission in 1949. The National Reactor Testing Station's mission was to build, test, and operate nuclear reactors, fuel processing plants, and support facilities. The INEL's current mission, as directed by the DOE, is the integration of engineering, applied science, and operations in an environmentally conscious, safe, and cost-effective manner.The SL-1 and BORAX-1 burial grounds are historical disposal areas and do not host any current programs. Current activities are limited to periodic observations for maintenance of the fences and grounds and monitoring for radioactivity.There are no residential communities within the INEL boundaries, and none of the 11,700 people employed at the INEL work full time at either burial ground. The nearest residential community is Atomic City, approximately 1 mile south of the INEL boundary.Most of the surrounding area is unimproved rangeland or farmland, and approximately 330,000 acres of the INEL are open to grazing by permit. However, grazing is prohibited within 2 miles of any nuclear facility, and no dairy cows are allowed. Approximately 95% of the INEL site has been withdrawn from the public domain by land transfer from the U.S. Bureau of Land Management to DOE.The SL-1 and BORAX-1 burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-1 burial ground was established in 1954 and the SL-1 burial ground was established in 1961. In January 1961, the SL-1 reactor was destroyed by an accidental nuclear excursion that resulted in a steam explosion. Very little contamination was released to the environment at the time of the accident due to the containment provided by the reactor building. Demolition and cleanup activities resulted in the spread of contamination over surface soils from Auxiliary Reactor Area II to the SL-1 burial ground. In 1954, the design mission of the BORAX-1 reactor was completed and the decision was made to conduct one final experiment that would result in the destruction of the reactor. The excursion contaminated approximately 84,000 square feet of ground. Following cleanup, the area was covered with soil.

Remedy: The major components of the selected remedy include: containment by capping with an engineered barrier constructed primarily of native materials; for BORAX-1 implementation will include consolidation of surrounding contaminated surface soils for containment under the engineered cover; contouring and grading of surrounding terrain to direct surface water runoff away from the caps; periodic above ground radiological surveys following completion of the caps to assess the effectiveness of the remedial action; periodic inspection and maintenance following completion of the caps to ensure cap integrity and surface drainage away from the barriers; access restrictions consisting of fences, posted signs, and permanent markers; restrictions limiting land use to industrial applications for at least 100 years following completion of the caps; and review of the remedy no less often than every five years until determined by the regulatory agencies to be unnecessary.The selected remedy addresses the principal threats posed by the burial grounds by providing shielding from ionizing radiation, a barrier to inhibit ecological and human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

Text: Full-text ROD document follows on next page.

<IMG SRC 10961470>

<IMG SRC 1096147A>

Declaration of the Record of Decision

Site Name and Location

Stationary Low-Power Reactor-1 Burial Ground,
Boiling Water Reactor Experiment-I Burial Ground, and
10 No Action Sites Within the
Auxiliary Reactor Area and the Power Burst Facility

Idaho National Engineering Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

This document presents the selected remedial action for the Stationary Low-Power Reactor-1 (SL-1) burial ground, the Boiling Water Reactor Experiment-I (BORAX-I) burial ground, and 10 no action sites in Waste Area Group 5. The remedial actions were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA)(hereafter referred to collectively as "CERCLA"), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan. Information supporting the selection of the remedies for the burial grounds is contained in the Administrative Record for the SL-1 and BORAX-I burial grounds (Operable Units 5-05 and 6-01). The Administrative Record for Track 1 sites in Waste Area Group 5 contains information regarding the 10 no action sites (Operable Unites 5-01, 5-03, 5-04, and 5-11).

The U.S. Department of Energy (DOE) is the lead agency for this decision. The U.S. Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare (IDHW) have participated in the evaluation of the final action alternatives. The EPA and IDHW both concur with the selection of the preferred remedy for the SL-1 and BORAX-I burial grounds and with the no

action determinations for the 10 Track 1 sites.

Assessment of the Sites

Actual or threatened releases of hazardous substances from the SL-1 and BORAX-I burial grounds, if not addressed by implementing the response action selected in this Record of Decision, may present a current or potential threat to public health, welfare, or the environment.

The 10 no action sites do not present a threat to human health or the environment.

Description of the Selected Remedy

The Idaho National Engineering Laboratory (INEL) has been subdivided into 10 waste area groups for investigation pursuant to the Federal Facility Agreement and Consent Order between the DOE, EPA, and IDHW. The SL-1 burial ground is designated Operable Unit 5-05, one of 13 operable units in Waste Area Group 5; the BORAX-I burial ground is Operable Unit 6-01, one of five operable units in Waste Area Group 6. The major components of the selected remedy for both sites are:

- Containment by capping with an engineered barrier constructed primarily of native materials
- For BORAX-I implementation will included consolidation of surrounding contaminated surface soils for contaminant under the engineered cover
- Contouring and grading of surrounding terrain to direct surface water runoff away from the caps
- Periodic above-ground radiological surveys following completion of the caps to assess the effectiveness of the remedial action
- Periodic inspection and maintenance following completion of the caps to ensure cap integrity and surface drainage away from the barriers
- Access restrictions consisting of fences, posted signs, and permanent markers
- Restrictions limiting land use to industrial applications for at least 100 years following comple-tion of the caps
- Review of the remedy no less often than every five years until determined by the regulatory agencies to be unnecessary.

The selected remedy addresses the principal threats posed by the burial grounds by

providing
shielding from ionizing radiation, a barrier to inhibit ecological and human intrusion, and a long-lasting
cover to diminish the effects of wind and water erosion.

Statutory Determination

The selected remedies are protective of human health and environment, comply with federal and state requirements that are legally applicable or relevant and appropriate requirements (ARARs) to
the remedial actions, and are cost effective. These remedies utilize permanent solutions and alternative
treatment technologies to the maximum extent practicable. However, because treatment of the princi-
pal threats of the two burial grounds was not found to be practicable, this remedy does not satisfy the
statutory preference for treatment as a principal element of the remedy. The EPA's preference for sites
that pose relatively low long-term threats or where treatment is impracticable is engineering controls,
such as containment. The radioactivity at each burial ground precludes a remedy in which contami-
nants could be readily excavated and treated without unacceptable exposures to workers. The primary
contributor to risk is a short half-lived radionuclide more effectively managed by providing engineered
containment while allowing the radionuclide to decay naturally.

Because these remedies will result in radionuclide-contaminated substances remaining on site at the
burial grounds in excess of health-based levels, reviews will be conducted within five years after com-
mencement of the remedial actions. Subsequent reviews will be conducted no less often than every five
years thereafter to ensure that the remedies continue to provide adequate protection of human health and
the environment. The periodic reviews will be discontinued when the regulatory agencies determine the
sites no longer pose an unacceptable risk to human health or the environment.

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment-I Burial Ground, and 10 no further action sites in Waste Area Group 5 at the
Idaho Naiontal Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environemtnal Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096147B>

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment I Burial Ground, and 10 no further action sites in Waste Area Group 5 at the
Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096147C>

Signature sheet for the foregoing Stationary Low-Power Reactor-1 Burial Ground, the Boiling Water Reactor Experiment I Burial Ground, and 10 no further action sites in Waste Area Group 5 at the
Idaho National Engineering Laboratory Record of Decision between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 1096147D>

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Acronyms and Abbreviations

ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirements
BORAX-I	Boiling Water Reactor Experiment-I
°C	degree(s) Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act

CFR	Code of Federal Regulations
cm	centimeter(s)
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
g	gram(s)
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
km	kilometer(s)
m	meter(s)
m^2	square meter(s)
mg	milligram(s)
mR	milliroentgen
µrem/hr	microroentgen equivilant man per hour
nCi	nanocurie(s)
PBF	Power Burst Facility
pCi	picocurie(s)
RI/FS	Remedial Investigation/Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
sec	second
SL-1	Stationary Low-Power Reactor-1
TBC	To-BE-Considered
WAG	Waste Area Group
yr	year

Decision of Summary

1. Site Name, Location, and Description

The Idaho National Engineering Laboratory (INEL) is a government facility managed by the U.S. Department of Energy (DOE). The main security gate in the southern portion of the site is located 44 miles (71 km) west of Idaho Falls, Idaho. The INEL occupies 890 square miles (2,305 km²) of the northeastern portion of the Eastern Snake River Plain. The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approxiamately 38 and 52 miles (61 and 84 km) west of Idaho Falls (Figure 1).

The SL-1 site is located about 1,600 feet (488 m) northeast of the Auxiliary Reactor Area II and includes the surface-soil area surrounding a 600- by 300-foot (182.9- by 91.4-m) fenced burial ground (Figure 2). Approxiamately 99,000 cubic feet (2,800 m 3) of radionuclide-contaminated debris, soil, and gravel are disposed of in the burial ground. An estimated 2 feet (0.6 m) of soil with a thick grass cover lies over the waste.

The BORAX-I burial ground is located about 2,730 feet (832 m) northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a 200- by 420-foot (61 by 128-m) surface-soil contamination area surrounding the 100- by 100-foot (30- by 30-m) fenced burial ground (Figure 3). The volume of buried radionuclide-contaminated soil and debris is approximately 6,336 cubic feet (180 m 3). The 84,000-square foot (7,800-m²) area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then.

The INEL was originally established as the National Reactor Testing Station by the U.S. Atomic Energy Commission in 1949. The National Reactor Testing Station's mission was to build, test, and operate nuclear reactors, fuel processing plants, and support facilities. The INEL's current mission, as directed by the DOE, is the integrated of engineering, applied science, and operations in an environ-mentally concious, safe, and cost-effective manner.

The SL-1 and BORAX-I burial grounds are historical dispoal areas and do not host any current programs. Current activities are limited to periodic observation for maintenance of the fences and grounds and monitoring for radioactivity.

Of the approximately 11,700 people employed at the INEL, none work full time at either burial ground. There are no residential communities within the INEL boundaries. The nearest residential community is Atomic City, located approxiamtely 1 mile (1.6 km) south of the INEL boundary, with a population of 25. Larger communities near the INEL include Idaho Falls, located approximately 44 miles (71 km) to the east of the main gate, with a population of 43,973; Blackfoot, located approximately 37 miles (60 km) to the southeast, with a population of 9,646; and Arco, located approximately 19 miles (31 km) to the west, with a population of 1,016.

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Most of the area surrounding the INEL is either unimproved rangeland or farmland, and approximately 330,000 acres (1,300 km²) of the INEL are open to grazing by permit. However, grazing is prohibited within 2 miles (3 km) of any nuclear facility, and no dairy cows are allowed. Approximately 95% of the INEL site has been withdrawn from the public domain by land transfer from the U.S. Bureau of Land Management to the DOE.

The climate of the region is arid to semiarid. Average annual precipitation is 8.71 inches (22 cm), wind is generally fr5om the southwest with average speeds of 5 to 9 miles per hour (8 to 15 km/hour), and average air temperatures are 64.6°F (18.1°C) in the summer and 18.8°F (-7.3°C) in the winter.

The INEL lies in the Pioneer Basin, a closed topographic depression locate on the Eastern Snake River Plain. Elevations range from approximately 4,800 to 5,400 feet (1,463 to 1,646 m) with a total relief of about 600 feet (183 m). The area receives surface water from rainfall, snowmelt, and streamflow. The streamflow sources are the Big Lost River, the Little Lost River, and Birch Creek. Streamflow that reaches the INEL goes to the Big Lost River playa or the Birch Creek playa and is lost to evaporation and infiltration. Consequently, there is little available surface water within the INEL site boundaries and none available at the SL-1 and BORAX-I sites.

The Eastern Snake River Plain is a broad, flat plain composed of thick basaltic flows

covering rhyolitic calderas. The flows occur as layers of lava, ranging from a few inches to a few feet thick, interspersed with cinders, breccia, and unconsolidated sediments. Much of the INEL's land surface consists of basalt flows. The western and central portions of the INEL lie within the floodplain of the Big Lost River, which extends across the site from ther southwest to the northeast. Alluvial depostis from the Big Lost River grad into lacustrine (lake) deposits in the northern portion of the INEL where the Big Lost River enters a series of playa lakes. Less depostis (wind-deposited silts) can be found covering the basalt bedrock over much of the rest of the INEL to thicknesses up to 20 feet (6 m). The loess deposits are the source of the soil typically found in the southern portion of the INEL. This soil is generally shallow, poorly developed, and has a sandy-loam or loamy texture.

The Snake River Plain Aquifer, the largest potable water aquifer in Idaho, underlies the Eastern Snake River Plain and the INEL. The aquifer is approximately 200 miles (322 km) long, 20 to 60 miles (32.2 to 96.5 km) wide, and covers an area approximately 9,600 square miles (24,853 km²). The depth to the Snake River Plain Aquifer varies from approximately 200 feet (61 m) in the notheastern corner of the INEL to approximately 900 feet (274 m) in the southeastern corner, a distance of 42 miles (67.6 km). Depth to groundwater is approximately 667 feet (203 m) in the vicinity of the SL-1 burial ground and approximately 596 feet (181 m) near BORAX-I.

The INEL is a flat, semiarid sagebrush desert with plants typical of such ecologies. Important shrubs include big sagebrush, rabbitbrush, winterfat, shadscale saltbush, nuttall saltbush, and gray horsebrush. The most abundant vegetation types are big sagebrush, green rabbitbrush, bluebunch wheatgrass, thickspike wheatgrass, horsebrush, dwarf sagebrush, saltbush, and crested wheatgrass.

The variety of habitats on the INEL support numerous species of reptiles, birds, and mammals. Ten reptiles, including the short-horned lizard, the gopher snake, the sagebrush lizard, and the western rattlesnake, and one amphibian species, the Great Basin spadefoot toad, have been observed on the site. A total of 164 species of birds inhabit the INEL, including sparrow, raptors, waterfowl, swallows, American kestrels, killdeers, American robins, sage thrashers, sage sparrows, western meadowlarks, house sparrows, and mallards during the breeding season and sage grouse, rock doves, horned larks, and black-billed magpies year-round. The 37 species of mammals found on the site include 18

species of rodents, four species of leporids, and six species of carnivores. The most common rodents are the Townsend's ground squirrel, the least chipmunk, the Great Basin pocket mouse, and Ord's kangaroo rat; the dominant leporid is the rabbit; common carnivores are the coyote and the long-tailed weasel. Pronghorn antelope and mule deer are frequently observed.

Only two species have been identified at the INEL that are classified as endangered or threatened: the bald eagle and the American peregrine falcon. The bald eagle has been seen in the winter months at or around the INEL, and the peregrine falcon has been observed in the northern portion of the INEL on rare occasions.

2. Site History and Enforcement Activities

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-I burial ground was established in 1954; the SL-1 burial ground was established in 1961. Both sites were identified in the Consent Order and Compliance Agreement which was signed by the EPA and the DOE and promulgated in 1987 pursuant to the Resource Conservation and Recovery Act Section 3008(h). Under this agreement, the DOE initially assessed and screened the identified sites and established a procedure for conducting corrective actions. Both burial grounds were identified as solid waste management units. The INEL was proposed for listing on the National Priorities List in July 1989. The listing was proposed by the EPA under authorities granted by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. This act is also referenced by the acronym "CERCLA" or as the "Superfund." The act was amended by the Superfund Amendments and Reauthorization Act of 1986. References to CERCLA include the amendments of 1986. The National Priorities List identifies the highest risk sites, as determined by a screening and ranking process, which are to be remediated via the CERCLA process. The INEL was officially placed on the National Priorities List in November 1989.

Subsequent to the CERCLA listing, the DOE, the EPA, and the IDHW (collectively referred to as the agencies) negotiated a Federal Facility Agreement and Consent Order and an Action Plan for remediation of the INEL. The documents were signed in December 1991. Both burial grounds were classified as Track 2 operable units, described in the Action Plan as operable units that may require field data collection before a remedial decision could be reached. A Track 2 investigation would determine if no further action, an interim action, or a remedial investigation/feasibility study was warranted.

Results of the 1993 Track 2 preliminary scoping for the SL-1 burial ground led the agencies to conclude that the evaluation of the site should be elevated to a remedial investigation/feasibility study. The scope of the investigation was limited to existing data, considered sufficient by the agencies to determine a remedial action for the site, and a feasibility study focused on examining remedial alternatives selected in other Records of Decision for similiar sites. In addition, because of the similarities of the BORAX-I burial ground to the SL-1 burial ground, the agencies determined that both sites would be assessed in the same remedial investigation/feasibility study.

This Record of Decision documents the remedy selected based on the results of the remedial investigation/feasibillity study and additional information contained in the Administrative Record for Operable Units 5-05 and 6-01. Aditional details concerning the history of each of the two burial grounds follow in the next two subsections.

2.1 SL-1

The SL-1 was a small nuclear power plant designed for the military to generate electric power and heat for remote arctic installations. The reactor was operated from August 1958 until January 3, 1961, as a test, demonstration, and training facility. On the evening of January 3, 1961, the SL-1 reactor accidentally achieved a prompt critical nuclear reaction, which caused a steam explosion that destroyed the reactor and resulted in the deaths of the three operators on duty. The reactor vessel and building were severely damaged and highly contaminated, and a massive cleanup operation ensued to dismantle and dispose of the reactor and building.

A burial ground was constructed approximately 1,600 feet (488 m) northeast of the original site of the reactor. This was done to minimize radiation exposure to the public and site workers that would have resulted from transport of contaminated debris from SL-1 to the Radioactive-Waste Management Complex over 16 miles (26 km) of public highway. Original cleanup of the site took about 18 months. The entire reactor building, contaminated materials from nearby buildings, and soil and gravel contaminated during cleanup operations were disposed of in the burial ground. The majority of buried materials consiste of soils and gravel.

Recovered portions of the reactor core, including the fuel and all other parts of the reactor that were important to the accident investigation, were taken to the INEL's Test Area North for study. After the accident investigation was complete, the reactor fuel was sent to the Idaho Chemical Processing Plant for reprocessing. The reactor core minus the fuel, along with the other components sent to Test Area North for study, was eventually dispose of at the Radioactive Waste Management Complex.

The SL-1 burial ground of three excavations, in which a total volume of 99,000 cubic feet (2,800m 3) of contaminated material was deposited. The excavations were dug as close to basalt as the equipment used would allow and ranges from 8 to 14 feet (2.4 to 4.3 m) in depth. At least 2 feet (0.6 m) of clean backfill was placed over each excavation. Shallow mounds of soil over the excavations were added at the completion of cleanup activities in September 1962. Operable Unit 5-05 is defined as the surface and subsurface soils and debris within the 600- by 300-foot (183- by 91-m) SL-1 burial ground exclusion fence and the surface area surrounding the burial ground (see Figure 2). Other residual surface contamination from the SL-1 accident is being investigated in Waste Area Group 5 under Operable Unit 5-12, site code Auxiliary Reactor (ARA)-23, which is southwest of and adjacent to Operable Unit 5-05 (see Figure 2). ARA-23 includes the original location of the SL-1 reactor.

Numerous radiation surveys and cleanup of the surface of the burial ground and surrounding area have been performed in the years since the SL-1 accident. Aerial surveys were performed by EG&G Las Vegas in 1974, 1982, 1990, and 1993. The Radiological and Environmental Sciences Laboratory conducted gamma radiation surveys every 3 to 4 years between 1973 and 1987 and every year between 1987 and 1994. Particle-picking at the site was performed in 1985 and 1993. Results from the surveys indicated that cesium-137 and it progeny (decay product) are the primary surface-soil contaminants. During a survey of surface soil in June 1994, "hot spots," areas of higher radioactivity, were found within the burial ground with activities ranging from 0.1 to 50 milliroentgen (mR)/hour. On November 17, 1994, the highest radiation reading measured at 2.5 feet (0.75 m) above the surface at the SL-1 burial ground was 0.5 mR/hour; local background radiation was 0.2 mR/hour. A dose equivalent rate survey was conducted in 1995; all locations surveyed within Operable Unit 5-05 yielded readings at or below the background value of 20 µrem/hr.

Today the SL-1 burial ground is defined by a three-strand, barbed-wire exclusion fence posted with radiological controls signs. Inside the burial ground the ends of the excavations are identified by concrete markers. The surface of the burial ground is covered with various grass species. The two mounds and several minor depression due to subsidence are visible within the fenced area. A second radiological-control fence encompasses the burial ground, a larger contaminated surface soil area, and the Auxiliary Reactor Area I and II facilities. The fences, posted with radiological-control signs, and restricted access protect INEL workers and the public from exposure.

2.2 BORAX-I

The BORAX-I reactor was a small experimental reactor used in the summer months of 1953 and 1954 for testing boiling-water reactor tecnology. In 1954, the design mission of BORAX-I was completed, and the decision was made to make one final test, which resulted in the intentional destruction of the reactor. The destruction of the reactor contaminated approximately 84,000 square feet of the surrounding terrain. Immediately following the final test of the BORAX-I reactor, much of the radioactive debris, including some fuel residue, was collected and buried on site in the reactor shield tank. Recovered fuel fragments and fuel residue were sent to the Idaho Chemical Processing Plant and Oak Ridge National Laboratory in Tennessee. Reusable equipment associated with the reactor was successfully decontaminated and used in the construction of BORAX-II. However, the cleanup did not sufficiently reduce the radioactivity at the site; therefore, the 84,000-square foot (7,800-m²) contaminated area was covered with approximately 6 inches (15 cm) of gravel to reduce radiation levels at the ground surface.

Buried materials at the site consist of unrecovered uranium fuel residue, irradiated metal scrap, and contaminated soil and debris. Part of the waste was buried in the bottom half of the shield tank; the top half of the tank was collapsed into the bottom and the void space was filled with debris. The burial ground is contained within the foundation of the BORAX-I installation, the dimensions of which are 18 by 32 by 11 feet (5.5 by 9.8 by 3.4 m). A mounded gravel and dirt cover approximately 5 feet (1.5 m) high and 30 feet (9 m) in diameter is centered over the buried shield tank. Operable Unit 6-01 includes the buried debris, as well as the 84,000-square feet (7,800-m²) of contaminated surface soil.

Field radiation surveys conducted in 1978 and 1980 detected radiation at about three times the

background levels in the central portion of the gravel-covered 84,000-square foot (7,800-m²) area south-southeast of the buried reactor. Radiation in adjacent areas was at background levels. Surface and subsurface soil sampling of the 84,000-square foot (7,800-m²) gravel-covered area in 1978 and 1980 indicated that radioactive contamination exists and is highest at a depth of approximately 6 inches (15 cm) at the interface of the gravel cover and the original ground surface. Ongoing monitoring of the site through the use of radiation dosimeters shows that radiation levels are slightly above background levels. On November 18, 1994, the radiological field measured at 2.5 feet (0.75 m) above the surface of the BORAX-I burial ground was 0.1 mR/hour; local background radiation was also 0.1 mR/hour.

Today, the ground surface at the site looks very much like the surrounding terrain. Abundant native vegetation has grown over the mound and surrounding area. A large stake about 5 feet (1.5 m) tall marks the reactor location. A 6-foot (1.8-m)-high chain-link fence surrounds the burial ground, forming an enclosed area approximately 100 feet (30 m) on each side. The contaminated surface soil area outside of the chain-link fence is bounded by a two-wire exclusion fence. The fences, posted with radiological-control signs, and restricted access protect INEL workers and the public from acceptable exposures.

3. Highlights of Community Participation

In accordance with CERCLA §113(k)(2)(B)(i-v) and §117, a series of opportunities for public information and participation in the remedial investigation and decision process for the SL-1 and BORAX-I burial grounds was provided to the public from September 1994 through May 1995. For the public, notifications included fact sheets that briefly discussed the investigation to date, INEL Reporter articles and updates, a proposed plan, telephone briefings, and public meetings. The INEL Reporter is a periodic, public information publication of the INEL's Environmental Restoration Program.

In September 1994, a fact sheet concerning the SL-1 and BORAX-I remedial investigation/feasibil-ity study was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list.

The project was discussed at informal semiannual briefings in Twin Falls (October 11, 1994), Pocatello (October 13, 1994), Moscow (October 18, 1994), Boise (October 19, 1994), and Idaho Falls (October 20, 1994). During these briefings, representatives from the DOE and the INEL discussed the project, answered questions, and listened to public comments.

Regular reports concerning the status of the project were included in the INEL Reporter and were mailed to those who were on the mailing list. Reports also appeared in two issues of Citizens' Guide (a supplement to the INEL Reporter).

In April 1995, another fact sheet concerning the project was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list. On April 11, 1995, the DOE issued a news release to more than 100 contacts concerning the beginning of a 30-day public comment period, which began May 3, 1995, and ended June 3, 1995, pertaining to the SL-1 and BORAX-I proposed plan. Many of the news releases resulted in a short note in community calendar sections of newspapers and in public service announcements on radio stations. Both the fact sheet and news release gave notice to the public that SL-1 and BORAX-I documents would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, in the INEL Boised Office, and in public libraries in Idaho Falls, Fort Hall, Pocatello, Twin Falls, Boise, and Moscow. Also, table top displays were set up at the Grand Teton Mall in Idaho Falls (May 15-20), Burley Public Library (April 24-May 5), Twin Falls Public Library (May 5-26), Boise Towne Square Mall (April 29), and the Pocatello City Building (April 24-May 15).

Opportunities for public involvement in the decision process for the SL-1 and BORAX-I project began in May 1995. For the public, the activities included receiving the proposed plan, receiving telephone calls, attending the availability sessions at public meetings to informally discuss the issues, and submitting verbal and written comments to the agencies during the 30-day public comment period.

Copies of the proposed plan for SL-1 and BORAX-I were mailed to about 6,700 memebers of the public and to 650 INEL employees on the INEL Community Relations Plan mailing list on April 28, 1995, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the same information and the locations of public meetings on May 16, 17, and 18, 1995, in Idaho Falls, Boise, and Moscow, respectively, appeared in seven major Idaho newspaper. Large advertisements appeared in the following newpapers on April 26: the Post Register (Idaho Falls); the Idaho State Journal (Pocatello); the South Idaho Press (Burley); the Times News (Twin Falls); the Idaho

Statesman (Boise); the Lewistown Morning Tribune (Lewistown); and the Daily News (Moscow).

Post cards were mailed on May 10, 1995, to about 6,700 members of the public and to 650 INEL employees on the INEL Community Relations Plan mailing list to encourage them to attend the public meetings and to provide verbal or written comments. News releases and newspaper advertisements gave public notice of public involvement activities. Offerings for briefings and the 30-day public comment period that was to begin May 3 and run through June 3, 1995 were also announced. Personal calls were made to stakeholders in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow the weeks of May 8 and 15 to remind individuals about the meetings.

Written comment forms, including a postage-paid business-reply form, were made available to those attending the public meetings. The forms were used to submit written comments either at a meeting or by mail. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to keep transcripts of discussions and public comments. The meeting trasncripts were placed in the Administrative Record sections for SL-1 and BORAX-I, Operable Units 5-05 and 6-01, in five INEL Information Repositories. For those who could not attend the public meetings but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

A Responsiveness Summary has been prepared as part of the Record of Decision. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in Appendix A and in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

A total of about 10 people not associated with the project attended the SL-1/BORAX-I public meetings. Overall, 10 provided formal comment; of these 10 people, three provided oral comments, and seven provided written comments. All comments received on the proposed plan were considered during the development of this Record of Decision. The decision for this action is based on the information in the Administrative Record for these operable units.

On August 2, 1995, the project manager from the Idaho Department of Health and Welfare Division of Environmental Quality gave a brief presentation on the projects to the Environmental Management Site Specific Advisory Board-Idaho National Engineering Laboratory. The advisory board is a group of individuals representing the citizens of Idaho, making recommendations to DOE, EPA, and the state of Idaho regarding environmental restoration activities at the INEL.

4. Scopes and Roles of Operable Units and Response Actions

Under the Federal Facility Agreement and Consent Order, the INEL is divided into ten waste area groups. Each waste area group is further subdivided into operable units, each of which may contain one or more sites. The first nine waste area groups correspond to particular operating facilities on the INEL; the tenth waste area group represents the entire INEL and the Snake River Plain Aquifer. The SL-1 site is part of Waste Area Group 5, which contains 13 operable units and is the only site in Operable Unit 5-05. The BORAX-I site is in Waste Area Group 6 and is the only site in Operable Unit 6-01. A complete evaluation of all cumulative risks associated with CERCLA action in Waste Area Groups 5 and 6 will be addressed in the respective comprehensive remedial investigation/feasibility study for each waste area group. Cumulative risks for the entire INEL will be addressed in the Waste Area Group 10 risk assessment.

Existing data from past operating and disposal activities were available to expedite the evaluation of these sites. Therfore, the scope of the remedial investigation for the SL-1 and BORAX-I burial grounds did not include any sampling or acquisition of new data, and a Work Plan was not produced. A focused feasibility study, one that examined only those alternatives that had been previously selected in Records of Decision for similar sites, was performed.

The SL-1 site is defined as the buried waste in the SL-1 burial ground plus the surface soils in the surrounding area shown in Figure 2. The BORAX-I site is defined as the buried waste in the BORAX-I burial ground plus the surface soil in the surrounding 84,000-square foot (7,800-m^2) area illustrated in Figure 3. This Record of Decision addresses the contaminated surface soils and buried wastes at both burial grounds. Both of these sites pose unacceptable risk to human health and the environment, primarily because of the risks from direct exposure to ionizing radiation from the buried wastes. There is also a lesser but still unacceptable risk due to soil ingestion. The purpose of this response is to inhibit current or future exposure to the buried waste and to reduce risks from soil ingestion.

5. Site Characteristics

This section summarizes the historical data used to evaluate at the SL-1 and BORAX-I burial grounds. The agencies determined that sufficient data exist to recommend a remedial action for

each site, therefore, no sampling was conducted for the remedial investigation. A complete discussion of the site characteristics for the SL-1 and BORAX-I burial grounds can be found in the remedial investigation/feasibility study and the Administrative Record for Operable Units 5-05 and 6-01.

5.1 SL-1

On January 3, 1961, the SL-1 reactor was destroyed by an accidental nuclear excursion that resulted in a steam explosion. Very little contamination was released to the environment at the time of the accident due to the containment provided by the reactor building; however, demolition and cleanup activities resulted in the spread of contamination over surface soils from Auxiliary Reactor Area II to the SL-1 burial ground. Numerous radiological surveys, surficial soil sampling, and particle-picking activities have been conducted in the years since the accident. The following section summarizes the results of these activities.

5.1.1 Previous Investigations

The DOE's Radiological and Environmental Sciences Laboratory conducted gamma radiation surveys in the vicinity of Auxiliary Reactor Areas I and II and the SL-1 burial ground every 3 to 4 years between 1973 and 1991. The areas north of Auxiliary Reactor Areas I and II and northeast of the SL-1 burial ground had the highest gamma radiation intensities. Soil sampling in 1977 found that cesium-137 was the primary contaminant.

The INEL's Waste Management Group surveyed areas in the vicinity of Auxiliary Reactor Area II and outside of the SL-1 burial fence in 1985. The survey identified and mapped 236 radioactive particles, of which 219 had maximum surface readings of 20 mR/hour or greater. Of these, 16 had readings greater than 200 mR/hour (the maximum reading possible for the instruments used in the survey). A total of 44 of the particles were removed. Particles with readings greater than 200 mR/hour that were located on the road between Auxiliary Reactor Area II and the burial ground or were located in the disturbed area across Fillmore Boulevard from Auxiliary Reactor Area II were removed.

The INEL's Environmental Monitoring Unit conducted annual radiological surveys of surface soils within the SL-1 burial ground fence from 1987 through 1992. One-third of the area was surveyed each year; at the end of each three-year period, the entire area had been surveyed. From 1987 to 1989, readings ranged from 0.05 to 11.0 mR/hour measured at contact. From 1990 to 1992, readings ranged

from
0.04 to 4.42 mR/hour measured at contact.

In 1993, the Environmental Monitoring Unit performed a surface-soil radiological survey and parti-
cle-picking at the SL-1 burial ground. There were 874 particles identified with readings from 0.01 to
200 mR/hour at contact. Particles reading greater than 0.15 mR/hour were removed if they were locat-
ed in the top 3 inches (7.6 cm) of soil. Of the 874 particles, 709 were removed for disposal at the
Radioactive Waste Management Complex. Activity levels of the particles deeper than 3 inches
(7.6 cm) and left in place ranged from 0.01 to 50 mR/hour.

As part of the 1993 effort, an area immediately adjacent and northeast of the burial ground was
investigated. Of the 163 particles identified, 66 were removed. The remaining particles were located
at a depth of greater than 3 inches (7.6 cm) and had activities ranging from 0.1 to 250 mR/hour. Three
soil samples were collected from a depth of 0 to 1 foot (0 to 0.3).

Four soil samples were collected from the vicinity of the SL-1 burial ground in a separate, unrelat-
ed sampling effort conducted in 1993 as part of the Waste Area Group 3 and Waste Area Group 10 soils
treatability study. The soil samples were analyzed for gross alpha, gross beta, and cesium-137.

A surface-soil survey in June 1994 found 217 particles within the burial-ground fence, with activi-
ties ranging from 0.1 to 50 mR/hour. There were 51 particles identified in the area just northeast of the
burial ground, with activities ranging from 0.2 to 250 mR/hour. In November 1994, a survey was con-
ducted to determine radiation levels within the burial ground at a height of 2.5 feet (0.8 m). A maxi-
mum of 0.5 mR/hour was detected at two locations; the remainder of the area was at the local back-
ground of 0.2 mR/hour.

Aerial surveys of the SL-1 burial ground were conducted in 1974, 1982, 1990, and 1993. The sur-
veys detected gamma radiation from man-made sources in the area, with cesium-137 the primary con-
tributor. The 1990 survey, which was used to define the site boundary, is illustrated in Figure 4. A risk
assessment was completed in August 1995 on the basis of soil samples and dose equivalent rate mea-
surements within the isopleth defined by the 1990 aerial survey (see Section 11.1).

5.1.2 Nature and Extent

5.1.2.1 Surface Contamination. Operable Unit 5-05 comprises the area illustrated in Figure 2.

Based on the original source of surface contamination (aerial distribution of contaminants during demolition and cleanup of the SL-1 reactor) and the limited mobility of radionuclides in the soil at the INEL, it is believed that contamination is restricted to the upper 0.5 foot (0.15 m) of soil. For the remedial investigation, identification of the contaminants of concern associated with surface soils at SL-1 was based on comparison of analytical data with background concentrations. Concentrations of

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the contaminants of concern for surface soils were based on the 95% upper confidence limit of the analytical data, and the assumption was made that each contaminant is uniformly distributed across the site. Table 1 presents the contaminants of concern for surface soils.

An assessment of the surface soils surrounding the SL-1 burial ground was concluded in August 1995 subsequent to the remedial investigation and proposed plan. Based on the results of this assessment, all dose equivalent rates within the Operable Unit are at or below the background value or 20 µrem/hr.

Table 1. Contaminants of concern and surface soil concentrations at SL-1.

Radionuclide	Concentration (pCi/g) 95% upper confidence limit	INEL Background a
Cobalt-60	0.36	No data available
Cesium-137	904	1.28
Europium-154	2.68	No data available
Strontium-90	1,370	0.76
Thorium-228	1.6	2.1 b
Thorium-230 and/or uranium-234	2.7	1.88, 1.95
Thorium-232	1.4	2.1 b

a. 95%/95% upper tolerance limit, grab sample background concentrations from Background Dose Equivalent Rates and

Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory, INEL-94/0250,
S.M. Rood, G.A. Harris, G.J. White, February 1995.

b. Thorium-228 and -232 were retained for evaluation based on background data that were available when the remedial investiga-
tion was prepared; the above-referenced background document was released after the remedial investigation was finalized.

5.1.2.2 Subsurface Contamination. Subsurface contamination at the SL-1 burial ground is restricted to the excavations that received contaminated building debris, equipment, and gravel and soil from demolition and cleanup following the SL-1 reactor accident. The estimated volume of buried contaminated material is 99,000 cubic feet (2,800 m 3).

The inventory and activities of radionuclides in the subsurface of the SL-1 burial ground were estimated using the computer model ORIGEN2. Because 93% of the uranium-235 fuel was recovered during the acci-dent investigation and cleanup, it was assumed that only 7% of the original quantity of fuel was disposed of in the SL-1 burial ground. Inventories of radionuclide activities were generated for 1961, 1994, 2024, and 2094 and were utilized in the baseline risk assessment to calculate risks for current, 30-year future, and 100-year future scenarios. Inventories were calculated for specific times to account for the decay (decrease through time) of parent radionuclides and the ingrowth (an increase through time) of radioactive progenies. The con-centration of each contaminent of concern for each time evaluated was estimated using the assupmtion that 7% of the model-generated activity for each contaminant of concern was uniformly distributed throughout the source volume. Table 2 presents contaminants of concern for the subsurface and estimated concentrations.

Table 2. Potential contaminants of concern and estimtated subsurface concentrations at SL-1 for non-groundwater pathways.

	Concentration (pCi/g)		
Radionuclide	July 1994	July 2024	July 2094
Cesium-137	2.29E+04	1.14E+04	2.27E+03
Strontium-90	2.15E+04	1.05E+04	1.99E+03
Krypton-85	6.91E+02	9.94E+01	1.08E+00
Samarium-151	5.20E+02	4.13E+02	2.41E+02
Promethium-147	2.62E+01	9.46E-03	8.78E-11
Plutonium-241	1.96E+01	4.62E+00	1.59E-01
Europium-154	1.84E+01	1.64E+00	5.80E-03
Europium-155	1.24E+01	1.87E-01	1.05E-05
Plutonium-239	1.04E+01	1.04E+01	1.04E+01

Technetium-99	6.85E+00	6.85E+00	6.85E+00
Plutonium-238	6.72E+00	5.30E+00	3.05E+00
Americium-241	2.57E+00	2.93E+00	2.76E+00
Plutonium-240	1.56E+00	1.56E+00	1.55E+00
Zirconium-93	1.04E+00	1.04E+00	1.04E+00
Niobium-93m	8.09E-01	9.46E-01	9.83E-01
Antimony-125	7.30E-01	4.01E-04	9.89E-12
Europium-152	7.11E-01	1.54E-01	4.35E-03
Uranium-235	4.60E-01	4.60E-01	4.60E-01
Cesium-135	4.34E-01	4.34E-01	4.34E-01
Uranium-236	2.32E-01	2.32E-01	2.32E-01
Tellurium-125m	1.78E-01	9.78E-05	2.41E-12
Antimony-126m	1.78E-01	1.78E-01	1.78E-01
Tin-126	1.78E-01	1.78E-01	1.78E-01
Cesium-134	9.12E-02	3.81E-06	2.30E-16
Tin-121m	2.70E-02	1.78E-02	6.76E-03
Antimony-126	2.49E-02	2.49E-02	2.49E-02
Neptunium-237	2.14E-02	2.14E-02	2.15E-02
Iodine-129	1.12E-02	1.12E-02	1.12E-02
Palladium-107	7.38E-03	7.38E-03	7.38E-03
Uranium-234	6.28E-03	6.79E-03	7.60E-03
Uranium-238	5.64E-03	5.64E-03	5.64E-03
Protactinium-231	3.34E-04	6.26E-04	1.31E-03
Americium-242m	2.40E-04	2.09E-04	1.52E-04
Actinium-227	1.31E-04	3.60E-04	1.00E-03
Americium-243	3.55E-05	3.54E-05	3.52E-05
Protactinium-234	7.33E-06	7.33E-06	7.33E-06
Curium-243	6.83E-06	3.29E-06	6.00E-07
Francium-223	1.81E-06	4.96E-06	1.39E-05

5.1.3 Fate and Transport

Potential pathways for contaminant migration at the SL-1 burial ground are limited by site condi-
tions. The SL-1 site is fairly isolated, is gently sloped, is in a desert climated, and has a great depth to
groundwater [approximately 667 feet (203 m)]. Although there is surface contamination at the site, the
majority of contamination is subsurface. In general, the potential pathways for contaminant migration
include atmospheric transport and transport via surface water and groundwater.

There is a potential for windblown migration of radionuclides present in the surface soil at the SL-1
burial ground, although the presence of a thick grass cover minimizes mobilization of dust and its dis-
persion by wind.

No suface-water migration pathway exists at the site, and there are no surface-water features. The
SL-1 burial ground is in a topographic low, minimizing the chance for significant erosion due to sur-

face water but increasing infiltration from precipitation. Flooding of the Big Lost River is no a concern at SL-1 because of topography, distance from the river, and the INEL's flood diversion system.

No groundwater sampling data are available for the SL-1 burial ground, therefore the groundwater pathway was evaluated using the GWSCREEN (version 2.02) computer model. Concentrations in the groundwater were modeled for three hypothetical locations: the edge of the burial grounds, the downgradient boundary of the waste area group (Figure 2), and the nearest downgradient INEL site-boundary (Figure 1). Groundwater flow is generally from northeast to southwest. The groundwater modeling performed in support of the remedial investigation indicates that vertical migration of contaminants from the SL-1 burial ground is limited. The tendency of the contaminants to chemically react with naturally occurring minerals in the soil and low annual precipitation result in long transit times within the vadose zone (typically hundreds of years or more). It is assumed that no lateral migration of contaminants has occurred within the subsurface because there is no mechanism or driving force to move contaminants horizontally. Infiltration of precipitation is primarily vertical within the vadose zone and therefore would not contribute significantly to the horizontal migration of radionuclides.

5.2 BORAX-I

In 1954, the design mission of the BORAX-I reactor was completed and the decision was made to conduct on final experiment that would result in the destruction of the reactor. The excursion contaminated approximately 84,000 square feet (7,800-m²) of ground, in a strip approximately 200 feet (61 m) wide and 420 feet (128 m) long, extending south-southeast from the reactor. Folowing cleanup, the contaminated area of approximately 84,000 square feet (7,800-m²) was covered with gravel to a depth of 6 inches (15 cm). Soil sampling of the 84,000 square foot (7,800-m²) area of surface contamination was conducted in 1978 and 1980. Results of these activities are summarized in the following section.

5.2.1 Previous Investigations

In 1978, the Radiological and Environmental Sciences Laboratory performed a multiphase study to assess the distribution of radioactivity at the BORAX-I reactor burial ground. Exposure rates at 3 feet (1 m) above the ground were determined.

A portable gamma-ray spectroscopy system was used to identify gamma-emitting radionuclides. In situ gamma-ray spectrums were obtained from nine locations. Surface-soil samples were also collected at nine locations outside of the graveled area in order to assess the extent of contamination. The collection locations were chosen to include samples down range of the major debris and surface deposition zones. Soil samples were collected from five locations within the gravel-covered area and were analyzed by gamma ray spectroscopy in order to assess the deposition and migration activity. Analyses of the soil samples showed that cesium-137 and uranium-235 were only detectable gamma-emitting radionuclides present. Samples collected from the gravel covering showed that 98% of the radioactive contamination was located within 2 inches (5 cm) of the gravel/soil interface.

An investigation of the BORAX-I reactor was conducted in June and November 1980. The investigation consisted of a gridded radiation survey of the BORAX-I site, including high-resolution gamma spectrometer measurements of the surface soil, soil samples from trenches, and sodium-iodide gamma spectrometer profiles of selected boreholes. The purpose of the radiological characterization was to identify the radionuclides present within the area and to specify their concentrations and distributions. Cesium-137 was the only man-made gamma emitter detected during the radiologicial surveys. Soil-sample analyses detected cesium-137, strontium-90, uranium-235, and plutonium-239. Results indicated that surface contamination was limited to relatively small areas, mainly along a south-southeast line from the reactor location.

Aerial surveys of the BORAX-I burial ground were conducted in 1974, 1982, 1990, and 1993. The surveys detected gamma radiation from man-made sources in the area, with cesium-137 being primary contributor. Figure 5 illustrates the results of the 1990 survey.

5.2.2 Nature and Extent

5.2.2.1 Surface Contamination. Operable Unit 6-01 comprises an area approximately 200 by 420 feet (61 by 128 m). Based on the original source of surface contamination (aerial distribution of contaminants resulting from the final experiment of the BORAX-I reactor) and the limited mobility of radionuclides in the soil at the INEL, it is believed that contamination is restricted to the upper 1 foot (0.3 m) including 0.5 foot (0.15 m) of contaminated soil and 0.5 foot (0.15 m) of gravel cover.

Identification of the contaminants of concern associated with surface soils at BORAX-I was based on comparison of analytical data with background concentrations. Concentrations of the contaminants

of concern for surface soils were based on the 95% upper confidence limit of the analytical data, and the assumption was made that each contaminant in uniformly distributed throughout the 200- by 420-foot (61- by 128-m) area. Table 3 presents the contaminants of concern for surface soils.

Table 3. Contaminants of concern and surface soil concentrations at BORAX-I.

Radionuclide	Concentration (pCi/g) 95% upper confidence limit	INEL Background a
Cesium-137	1,817	1.28
Strontium-90	2.0	0.76
Uranium-235	68.6	0.055 - 0.059 b

a. 95%/95% upper tolerance limit, grab sample background concentrations for cesium-137 and strontium-90 from Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory, INEL-94/0250, S.M. Rood, G.A. Harris, G.J. White, February 1995.

b. Range of background for uranium-235 from the remedial investigation/feasibility study, Attachment 1 of Appendix B.

5.2.2.2 Subsurface Contamination. Subsurface contamination at the BORAX-I burial ground is restricted to the contaminated soil and materials deposited in the concrete foundation of the reactor structure. The estimated volume of contaminated material in the subsurface is 6,336 cubic feet (180 m 3).

The BORAX-I inventory and acitivities of buried radionuclide were estimated using the computer model RSAC-5. Decontamination documents prepared after the cleanup of the BORAX-I facility in 1954 reported that 12% of the uranium-235 fuel had been recovered. Based on this figure, it was assumed that 88% of each of the associated radionuclides remained unrecovered and was disposed of in the burial ground. Inventories of radionuclides were generated for 1954, 1994, 2024, and 2094 and were used in the baseline risk assessment to calculate risks for current, 30-year future, and 100-year future scenarios. Inventories were calculated for specific times to account for the decay (a decrease through time) of parent radionuclides and for ingrowth (an increase through time) of radioactive progenies. The concentration of each contaminant of concern for each evaluated was estimated using the assumption that 88% of the model-generated activity for each contaminant of concern was uniformly distributed throughout the source volume. Table 4 presents the contaminants of concern for the subsurface.

Table 4. Potential contaminants of concern and estimated subsurface concentrations at BORAX-I for non-groundwater pathways.

Radionuclide	Concentration (pCi/g) July 1994	July 2024	July 2094
Cesium-137	1.20E+03	6.02E+02	1.19E+02
Strontium-90	1.10E+03	5.39E+02	1.01E+02
Uranium-234	9.29E+02	9.29E+02	9.29E+02
Samarium-151	5.05E+01	4.01E+01	2.34E+01
Uranium-235	2.94E+01	2.94E+01	2.94E+01
Krypton-85	1.90E+01	2.73E+00	2.95E-02
Technetium-99	4.27E-01	4.27E-01	4.27E-01
Thorium-230	3.34E-01	5.38E-01	1.17E+00
Promethium-147	2.77E-01	1.00E-04	9.25E-13
Uranium-238	1.91E-01	1.91E-01	1.91E-01
Zirconium-93	6.35E-02	6.35E-02	6.35E-02
Niobium-93m	5.57E-02	6.21E-02	6.35E-02
Protactinium-231	2.18E-02	3.83E-02	7.65E-02
Tin-126	1.10E-02	1.10E-02	1.10E-02
Actinium-227	9.51E-03	2.29E-02	5.95E-02
Cesium-135	8.29E-03	8.29E-03	8.29E-03
Anitmony-125	8.14E-03	4.46E-06	1.10E-13
Radium-226	2.88E-03	8.77E-03	3.48E-02
Lead-210	8.99E-04	4.01E-03	2.25E-02
Iodine-129	6.02E-04	6.02E-04	6.02E-04
Protactinium-234	2.48E-04	2.48E-04	2.48E-04
Europium-154	1.12E-04	9.96E-06	3.53E-08
Niobium-94	6.35E-07	6.32E-07	6.32E-07

5.2.3 Fate and Transport

Potential pathways for containment migration at the BORAX-I burial ground are limited by conditions at the site. The site is fairly isolated, is gently sloped, is in a desert climate, and has a great depth to groundwater [approximately 596 feet (181 m)]. Although there is surface contamination at the site, the majority of contamination is in the subsurface. In general, the potential pathways for contaminant migration include atmospheric transport and transpot by surface water and groundwater.

There is a potential for windblown migration of radionuclides present in the surface soil at the BORAX-I burial ground, although the existing vegetive cover minimizes the mobilization of dust and its dispersion by wind.

No surface-water migration pathway exists at the site and there are no surface-water features. Although the BORAX-I burial ground is located on a slight rise, the slope of the ground immediately adjacent to the site is fairly gentle, minimizing the likelihood of erosion. Flooding of the Big Lost River is not a concern at BORAX-I because of topography, distance from the river, and the INEL's flood diversion system.

No groundwater sampling data are available for the BORAX-I burial ground, therefore the ground-water pathway was evaluated using the GWSCREEN (version 2.02) computer model. Concentrations in the groundwater were modeled for three hypothetical locations: the edge of the burial grounds, the downgradient boundary of the waste area group (Figure 3), and the nearest downgradient INEL site-boundary (Figure 1). Regional groundwater flow is generally from northeast to southwest. Results of the modeling indicated that vertical migration of contaminants from the BORAX-I burial ground is lim-ited. The tendency of the contaminants to chemically react with naturally occurring minerals in the soil and low annual precipitation result in long transit times within the vadose zone (typically hundreds of years or more). It is assumed that no lateral migration of contaminants has occurred within the subsur-face becuase there is no mechanism or driving force to move contaminants horizontally. Infiltration of precipitation is primarily vertical within the vadose zone and therefore would not contribute significant-ly to the horizontal migration of radionuclides.

6. Summary of Site Risks

A baseline risk assessment was conducted to evaluate current and future potential risks to human health. The risk assessments were conducted in accordance with the EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual and other EPA guidance. Risk scenarios and default parameters used in the risk assessment were selected with concurrence of the agencies.

Radionuclides are the only contaminants of concern at the SL-1 and BORAX-I burial grounds. Although nonradioactive contaminants may be present at either site, it was determined that, if present, they probably represent an insignificant contribution to the total risk. Radionuclides present in surface soils at BORAX-I and subsurface soils at both sites pose potential carcinogenic (cancer causing) risks to occupa-tional workers and future residents. Carcinogenic risks are generally a much greater concern than noncar-cinogenic risks from radionuclides. Therefore, the baseline risk assessment focused on a quantitive assessment of carcinogenic risks. Noncarcinogenic risks were subjected to a qualitive evaluation and were

eliminated from further assessment. The assessment considered the carcinogenic health effects that could result from exposure to the contaminants under current occupational and future occupational and residential land use scenarios. The health effects differ depending on whether the sites are used for light industry or residential development. Effects could result from direct exposure to radiation, from inhaltion of contaminated dust, or from ingestion of contaminated soil or groundwater. Section 6.1 summarizes the results of the baseline risk assessment.

The baseline risk assessment for Operable Unit 5-05 evaluated potentially contaminated surface soils in an area 1,200 by 1,500 feet (366 by 457 m). Subsequent to finalization of the remedial investigation/feasibility study report and the proposed plan, an evaluation of new data in conjunction with historical sampling and survey data determined that surface soils within Operable Unit 5-05 do not pose an unacceptable risk to human health or the environment (see Section 11.1). Support documentation for this determination can be found in the Administrative Record for Operable units 5-05 and 6-01.

A qualitative ecoligical risk assessment was performed to evaluate potential risks to the environment due to contamination at the SL-1 and BORAX-I burial grounds. Section 6.2 summarizes results of the ecological risk assessment.

6.1 Human Health Risks

A baseline risk assessment was performed to evaluate the risks associated with taking no further action at a site. Thus, it was assumed in the assessment, as instructed in EPA guidance, that no remediation will take place. Potential risks for specified land use scenarios were assessed.

The risk assessment consisted of contaminant identification, exposure assessment, toxicity assessment, and human health risk characterization. The contaminants identified at the SL-1 and BORAX-I burial grounds were based on historical soil-sampling data and radionuclide inventories calculated using computer models. The exposure assessment identified the potential exposure pathways for current worker and for future workers and residents. The toxicity assessment evaluated the potential health effects to an individual as a result of exposure to contaminants. Exposure scenarios were chosen

to reflect a range of potential future land uses. Industrial land use is assured for the next 100 years, after which residential use is considered possible. Specifically, scenarios included the current use of the SL-1 and BORAX-I burial grounds (current occupational land use) and potential future land use scenarios (occupational and residential land use) in which the onset of exposure are delayed for 30 and 100 years.

The baseline risk assessment was presented in two parts: (1) an evaluation of deterministic risk based on standard EPA methology and (2) an evaluation of the uncertainty associated with the mean risk using probabilistic risk assessment. The fist quantity (deterministic risk) is a point estimate that represents a quantified upper bound of risk. Deterministic risks are used by decisionmakers to define the estimate excess risk that must addressed in remedial decisions. Probabilistic methods are used in the second evaluation to quantify the uncertainty associated witht the deterministic risk. These methods provide a more complete understanding of the excess risk potential at a site by examining the likelihood of over- or under-estimation risk.

6.1.1 Contaminant Identification

Historical soil sampling analytical data were used to identify radionuclides present in surface soils at both sites. The lists of radionuclides were screened based on comparison with background concentrations determined for the INEL. The range of sample concentrations was compared to the range of background concentrations. If the maximum sample concentration exceeded the maximum background concentration, the radionuclide was retained and assessed in the risk assessment (Tables 1 and 3).

Computer models were used to generate lists of radionuclides with estimated activities for the subsurface at each site. The radionuclides were screened based on availability of toxicological data and potential for posing a significant risk. Radionuclides evaluated in the risk assessment for the subsurface are presented in Tables 2 and 4.

6.1.2 Exposure Assessment

The objective of the exposure assessment was to estimate the magnitude of exposure to contaminants of concern at SL-1 and BORAX-I. The magnitude of exposure was determined by measuring or estimating the quantities of the contaminants available for contact at an exposure point during

a speci-
fied time period. The results of the exposure assessment were then combined with contaminant-specif-
ic toxicity information to characterize potential risks.

6.1.2.1 Exposure Scenarios. Only those exposure pathways where a plausible route of exposure
can be demonstrated from the site to an indvidual were quantitatively evaluated in the risk assessment.
The populations at risk due to exposure from wastes at the SL-1 and BORAX-I burial grounds were
identified by considering both current and future land use scenarios. For each of the two sites, 10
potential exposure scenarios (five residential scenarios and five occupational scenarios) were examined
in the baseline risk assessment.

The residential scenarios model a person living on the site 350 days a year for 30 years, beginning
in 2024 and 2094 (30 and 100 years for 1994). The intrusive scenarios reflect conditions if the
buried waste is exposed. The nointrusive scenarios model the risk to an individual who lives on the
surface above the wastes in 2024 and 2094 and to subsistence farmer on the site beginning in 2094.

The five occupational scenarios model nonintrusive daily industrial use without restrictions in 1994,
two 1994 site-specific evaluations reflecting occupational activities ove the last few years, and daily
industrial use 30 and 100 years in the future in the years 2024 and 2094. Section 6.1.2.3 lists exposure
parameters for each scenario.

6.1.2.2 Media Concentrations. Limited sampling and analytical data were available regarding
contaminants present in the surface and subsurface soil at the SL-1 and BORAX-I sites. Surface-soil
samples from burial grounds and adjacent areas were used to evaluate the risk for soil ingestion,
inhalation of dust, and ingestion of crops, meat, and milk for nonintrusion scenarios. Surface-sam-
ple data were also used to evaluate the external exposure pathway for the subsistence farmer scenarios.
Subsurface contamination was evaluated based on radionuclide inventories and activities estimated
using computer models. All pathways for the intrusion scenarios and the groundwater and external
exposure pathways for the nonintrusion scenarios were evaluated using the computer-generated
radionuclide inventories and activities. The radionuclides and concentrations evaluated in the baseline
risk assessment are listed in Tables 1 through 4.

To provide an understanding of the external exposure risk presnet at the surface at the two

sites,
risk attributable to the radiological field measurements taken within the fence at each burial grounds
was also evaluated. A radioligical field survey conducted in November 1994 found levels of 0.5 mR/hour at the SL-1 burial ground and 0.1 mR/hour at the BORAX-I burial ground. Measurements were taken at 2.5 feet (0.8 m) above the ground surface. Local backgrounds were 0.2 mR/hour for SL-1 and 0.1 mR/hour at BORAX-I. However, dose equivalent rates measurements taken in 1995 in the area around SL-1 yielded readings at or below the background value of 20 µrem/hr.

6.1.2.3 Quantification of Exposure. The following exposure pathways were considered applica-
ble to the evaluation of human exposure to contaminants at the sites: ingestion of soil; inhalation of
fugitive dust; ingestion of groundwater (residential scenarios only); ingestion of crops, meat, and milk
(subsistence farmer scenario only); and external exposure from radionuclides. The future residential
setting included a hypothetical well, which could provide contaminated groundwater for use as drink-
ing water. For the subsistence farmer scenario, the resident was also assumed to consume homegrown
produce, meat, and milk produced on site.

Adult exposure were evaluated for all scenarios and pathways (external exposure; inhalation of
dust; and ingestion of soil, groundwater, and foods); child exposures (0 to 6 years old) were considered
separately only for the soil ingestion pathway in the residential scenarios. Children were included
because children ingest more soils than adults, significantly increasing their exposure rate.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance.
The exposure parameter default values in the risk assessment are designed to estimate the reason-
able maximum exposure at a site. The EPA defines reasonable maximum exposure as the highest
exposure at a site. Use of this approach makes under-estimation of the actual cancer risk highly unlike-
ly. Concentrations of the radionuclides evaluated in the baseline assessment are listed in Tables 1
through 4. The exposure parameters used in the risk assessment were:

- All pathways

  -Exposure frequency, residential: 350 days/year

  -Exposure frequency, occupational, current: 230 days/year

  -Exposure frequency, occupational, site-specific #1: 30 days/year

  -Exposure frequency, occupational, site-specific #2: 5 days/year

  -Exposure frequency, occuptaional, current: 25 years

-Exposure duration, occupational, site-specific #1 and #2: 3 years

- External exposure pathway

  -Exposure time, residential: 24 hour/day

  -Exposure time, occupational: 8 hour/day

  -Exposure duration, residential: 30 years

- Soil ingestion pathway

  -Soil ingestion rate, residential, adult: 100 mg/day

  -Soil ingestion rate, residential, child: 200 mg/day

  -Soil ingestion rate, occupational: 50 mg/day

  -Exposure duration, residential, adult: 24 years

  -Exposure duration residential, child: 6 years

- Dust inhalation pathway

  -Inhalation rate: 20 m 3 of air/day

  -Exposure duration, residential: 30 years

- Groundwater ingestion pathway

  -Groundwater ingestion rate, residential: 2 liters/day

  -Exposure duration, residential: 30 years.

The parameters and distributions used in the probabilistic risk assessment are presented in Tables 6-9 through 6-11 of the Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX-I Burial Grounds), INEL-95/0027 (K. J. Holdren, R. G. Filemyr, D. W. Vetter, Idaho National Engineering Laboratory, March 1995), which is included in the Administrative Record for Operable Units 5-05 and 6-01.

6.1.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at SL-1 and BORAX-I. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Carcinogenic values (slop factors) for the sites were obtained from EPA's Health Effects Assessment Summary Tables: Annual FY-93, ECAO-CIN-909, 1993. The slope factors selected for the soil ingestion, inhalation of dust, and external exposure pathways include progenies when available. Slope factors used to evaluate the

groundwater pathway do not always include daughters because the groundwater model GWSCREEN specifically accounts for up to five daughters.

Slope factors have been developed by the EPA for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Slope factors for radionuclides are expressed in units of risk/pCi for ingestion and inhalation and risk/year per pCi/gram for external exposure. Slope factors are multiplied by the estimated intake of a potential carcinogen, in pCi (pCi-year/gram for external exposure), to provide an upper-bound estimate of the excess lifetime cancer risk associated with the exposure at that intake level. Slope factors are derived from the results of human epidemio-logical studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

6.1.4 Human Health Risk Characterization

Excess lifetime cancer risks are estimated by multiplying the intake level, developed using the exposure assumptions, by the slope factor (see Section 6.1.3). These risks are probabilities that are generally expressed in either scientific notation (1X10 -6) or exponential notation (1E-06). An excess lifetime cancer risk of 1E-06 indicated that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. Excess cancer risks estimated below 1E-06 typically indicate that no further action is appropriate. Risks estimated in the range of 1E-04 to 1E-06 (1 in 10,000 to 1 in 1,000,000) indicate that further investigation or remediation may be needed, and risks estimated above 1E-04 typically indicate that further action is appropriate. However, the upper boundary of the risk range is not a discrete line at 1E-04, although EPA generally uses 1E-04 in mak-ing risk management decisions. A specific risk estimate around 1E-04 may be considered acceptable if justified based on site-specific conditions.

6.1.4.1 Deterministic and Probabilistic Risk Summary. The results of the deterministic and probabilistic risk calculations are summarized in Table 5 for SL-1 and in Table 6 for BORAX-I and presented graphically in Figures 6 and 7. For the probabilistic simulations, the risk summary tables and figures present the 50th percentile, representing the average individual risk, and the 95th

percentile,
representing the reasonable maximum exposure individual risk.

The probablistic risk assessment showed that the greatest contributors to uncertainty in the overall
risk for the site (that is, the risk to external exposure) are associated with the exposure duration,
concentration of cesium-137, and the external exposure slope factor for cesium-137. A number of sce-
narios and pathways utilized source terms estimated from computer models. Because of the lack of a
sample population from which to estimate statistical parameters for use in the probablistic simulations,
it was necessary to assume specific values for the parameters. Increases in the amount of actual data
used for input into the probablistic assessment would result in increased value and usefulness of the
results.

At both sites, the primary contributor to risk is cesium-137 (plus progeny) in the external exposure
pathway. Cesium-137 has a half-life of about 30 years. The decreasing concentration through time
results in decreased risk through time. External exposure risk will remain above 1E-04 for approxi-
mately the next 400 years at the SL-1 burial ground and will decrease to 2E-04 after approximately 320
years at the BORAX-I burial ground. Due to the long half-life of uranium-235 (7E+08 years), the
external exposure risk at BORAX-I will essentially never decrease below 2E-04.

For SL-1, the only radionuclides predicted to reach the aquifer in concentrations of potential con-
cern were tritium and technetium-99, with associated risks of 2E-07 and 6E-07, respectively. Summed
with the risk from the remaining radionuclides, the total risk due to groundwater ingestion associated
with the SL-1 bural ground is 1E-06. For BORAX-I, uranium-234 and its progenies were the only
radionuclides predicted to reach the aquifer in concentrations of potential concern, with a risk sum of

2E-06. Summed with the risks from the remaining radionuclides, the total risk due to groundwater
ingestion associated with BORAX-I is 3E-06.

For SL-1, an evaluation of risks due to surface soils defined by the 1990 aerial survey isopleth was
performed. It was determined that there are no unacceptable risks via the soil ingestion, inhalation of
dust, groundwater ingestion, or external exposure pathways within Operable Unit 5-05. Section 11.1
contains specific references contained in the Administrative Record in support of this assessment.

6.1.4.2 Radiological Field Risk. Surface radiological field measurements taken within the fences at the burial grounds provide exposure levels that account for shielding of radiation provided by the soil cover. Based on the reported maximum, single point radiological field measurements of 0.5 mR/hour at SL-1 and 0.1 mR/hour for BORAX-I, the 30-year residential risk at the surface was estimated at 9E-02 for SL-1 and 2E-02 for BORAX-I. The risk associated with local background is 3E-02 at SL-1 and 2E-02 and BORAX-I. The risk associated with the average background radiological field at the INEL is 3E-03 (0.02 mR/hour). The 30-year residential risk from national average natural background radiation ranges from 2E-03 (0.011 mR/hour) to 6E-03 (0.034 mR/hour). Risks based on radiological field measurements taken within the fences are shown graphically in Figure 8.

A more comprehensive data set for SL-1 was acquired in 1995 and an assessment of the surface soils within Operable Unit 5-05 was completed in August 1995. Dose equivalent rate measurements, all below the background value of 20 µrem/hr, indicate no unacceptable external exposure risks due to surface soils within Operable Unit 5-05.

Table 5. Summary of risks for the potential exposure scenarios and pathways at SL-1.

Scenario Pathway	Deterministic risk	Probabilistic 50th percentile risk	Probabilistic 95th percentile risk
Residential (30-year, intrusive)			
External exposure	5E-01	1E-01	6E-01
Ingestion of soil	9E-04	4E-05	1E-04
Inhalation of dust	8E-07	2E-07	9E-07
Ingestion of groundwater	1E-06	NC b	NC b
Total scenario risk	5E-01 a	1E-01	6E-01
Residential (30-year, nonintrusive)			
External exposure	5E-01	1E-01	6E-01
Ingestion of soil	5E-05	3E-07	8E-07
Inhalation of dust	4E-07	7E-08	2E-07
Ingestion of groundwater	1E-06	NC b	NC b
Total scenario risk	5E-01 a	1E-01	6E-01
Residential (100-year, nonintrusive)			
External exposure	1E-01	3E-02	2E-01
Ingestion of soil	2E-04	8E-06	2E-05
Inhalation of dust	4E-07	1E-07	5E-07
Ingestion of groundwater	1E-06	NC b	NC b
Total scenario risk	1E-01 a	3E-02	2E-01
Subsistence farmer (100-year)			

(water independent pathways)			
External exposure	1E-03	NC c	NC c
Ingestion of soil	4E-07	NC c	NC c
Inhalation of dust	2E-06	NC c	NC c
Ingestion of plants	1E-05	NC c	NC c
Ingestion of meat	4E-05	NC c	NC c
Ingestion of milk	1E-05	NC c	NC c
Total scenario risk	1E-03 a	NC c	NC c
Occupational (current)			
External exposure	2E-01	8E-02	4E-01
Ingestion of soil	2E-05	8E-08	4E-07
Inhalation of dust	4E-07	9E-08	3E-07
Total scenario risk	2E-01 a	6E-02	3E-01

Refer to footnotes at end of table.

Table 5. (continued)

Scenario Pathway	Deterministic risk	Probabilistic 50th percentile risk	Probabilistic 95th percentile risk
Occupational (site-specific #1)			
External exposure	4E-03	2E-03	1E-02
Ingestion of soil	3E-07	2E-09	5E-09
Inhalation of dust	6E-09	NC d	NC d
Total scenario risk	4E-03 a	2E-03	1E-02
Occupational (site-specific #2)			
External exposure	6E-04	3E-04	2E-03
Ingestion of soil	6E-08	3E-10	9E-10
Inhalation of dust	9E-10	NC d	NC d
Total scenario risk	6E-04 a	3E-04	2E-03
Occupational (future - 30 years)			
External exposure	1E-01	4E-02	3E-01
Ingestion of soil	1E-05	4E-08	2E-07
Inhalation of dust	2E-07	5E-08	2E-07
Total scenario risk	1E-01 a	4E-02	3E-01
Occupational (future - 100 years)			
External exposure	3E-02	9E-03	6E-02
Ingestion of soil	2E-06	8E-09	3E-08
Inhalation of dust	2E-07	5E-08	2E-07
Total scenario risk	3E-02 a	9E-03	6E-02

a. Cesium-137 (plus barium-137m) is the primary contributing radionuclide.

b. A probabilistic risk assessment was not performed for the groundwater pathway due to its small contribution to total risk
and to the absence of published probability distribution functions for input parameters.

c. A probabilistic risk assessment was not performed for the subsistence farmer scenario due to

the absence of published
probability distribution functions for input parameters.

d. A probabilistic risk assessment was not performed due to its small contribution to total risk.

NC = Not calculated

Table 6. Summary of risks for the potential exposure scenarios and pathways at BORAX-I.

Scenario Pathway	Deterministic risk	Probabilistic 50th percentile risk	Probabilistic 95th percentile risk
Residential (30-year, intrusive)			
External exposure	3E-02	7E-03	5E-02
Ingestion of soil	7E-05	3E-06	8E-06
Inhalattion of dust	9E-07	2E-07	1E-06
Ingestion of groundwater	3E-06	NC b	NC b
Total scenario risk	3E-02 a	7E-03	5E-02
Residential (30-year, nonintrusive)			
External exposure	3E-02	7E-03	5E-02
Ingestion of soil	3E-05	4E-09	1E-08
Inhalation of dust	8E-07	5E-09	5E-08
Ingestion of groundwater	3E-06	NC b	NC b
Total scenario risk	3E-02 a	7E-03	5E-02
Residential (100-year, intrusive)			
External exposure	7E-03	1E-03	1E-02
Ingestion of soil	3E-05	1E-06	4E-06
Inhalation of dust	9E-07	2E-07	1E-06
Ingestion of groundwater	3E-06	NC b	NC b
Total scenario risk	7E-03 a	1E-03	1E-02
Residential (100-year, intrusive)			
External exposure	7E-03	1E-03	1E-02
Ingestion of soil	8E-06	2E-09	1E-08
Inhalation of dust	8E-07	5E-09	5E-08
Ingestion of groundwater	3E-06	NC b	NC b
Total scenario risk	7E-03 a	1E-03	1E-02
Subsistence farmer (100-years) (water independent pathways)			
External exposure	5E-03	NC c	NC c
Ingestion of soil	2E-06	NC c	NC c
Inhalation of dust	4E-06	NC c	NC c
Ingestion of plants	1E-04	NC c	NC c
Ingestion of meat	1E-04	NC c	NC c
Ingestion of milk	4E-05	NC c	NC c
Total scenario risk	6E-03 a	NC c	NC c

Occupational (current)			
External exposure	1E-02	4E-03	3E-02
Ingestion of soil	2E-05	1E-09	4E-09
Inhalation of dust	5E-07	4E-09	3E-08
Total scenario risk	1E-02 a	4E-03	3E-02

Refer to footnotes at end of table.

Table 6. (continued)

Scenario Pathway	Deterministic risk	Probabilistic 50th percentile risk	Probabilistic 95th percentile risk
Occupational (site-specific #1)			
External exposure	2E-04	9E-05	5E-04
Ingestion of soil	2E-07	1E-11	4E-11
Inhalation of dust	7E-09	NC d	NC d
Total scenario risk	2E-04 a	9E-05	5E-04
Occupational (site-specific #2)			
External exposure	3E-05	2E-05	8E-05
Ingestion of soil	4E-08	2E-12	6E-12
Inhalation of dust	1E-09	NC d	NC d
Total scenario risk	3E-05 a	2E-05	8E-05
Occupational (future - 30 years)			
External exposure	7E-03	2E-03	2E-02
Ingestion of soil	8E-06	6E-10	3E-09
Inhalation of dust	5E-07	4E-09	4E-08
Total scenario risk	7E-03 a	2E-03	2E-02
Occupational (future - 100 years)			
External exposure	1E-03	5E-04	3E-03
Ingestion of soil	2E-06	3E-10	2E-09
Inhalation of dust	5E-07	4E-09	4E-08
Total scenario risk	1E-03 a	5E-04	3E-03

a. Cesium-137 (plus-137m) is the primary contributing radionuclide.

b. A probabilistic risk assessment was not performed for the groundwater pathway due to its small contribution to total risk and to the absence of published probability distribution functions for input parameters.

c. A probabilistic risk assessment was not performed for the subsistence farmer scenario due to the absence of published probability distribution functions for input parameters.

d. A probabilistic risk assessment was not performed due to its small contribution to total risk.

NC = Not calculated.

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The residential risk (30-year duration) estimated from radiological field measurements at the SL-1 burial ground, 9E-02, is only slightly higher than the risk due to the local background of 3E-02. At BORAX-I, the risk based on radiological field measurements is equal to local background (2E-02) and is only slightly higher than the national average background, which ranges from 2E-03 to 6E-03.

6.1.5 Uncertainty

Risk assessments are subject to uncertainty from assumptions about inventory estimates, fate and transport estimation, exposure estimation, and radioactivity data. Uncertainty was addressed by using health-protective assumptions that systematically overstate the magnitude of health risks. This process bounds the plausible upper limits of risk and facilitates an informed risk management decision. Table 7 is a summary of risk assessment assumptions and associated uncertainties.

In addition to uncertainty directly associated with the baseline risk assessment, two other issues were considered. The first was estimation of risk associated with the radiological field actually measured at the sites to evaluate the effectiveness of the soil shielding currently on the sites (the baseline risk assessment requires exposure of the receptor directly to the waste). The second issue was explored as a result of public comment received on the proposed plan and involved estimating the soil concentration of uranium-235 based on the quantity of unrecovered fuel.

Table 7. Summary of risk assessment assumptions and associated uncertainties.

Assumption	Description of uncertainty	Effect of uncertainty on risk estimates
Soil sample analytical results are representative of surface contamination.	Many samples at both sites were collected from hot spots, as opposed to a strictly random sampling strategy. Concentrations based on the 95% upper confidence limit of these biased results were assumed uniformly distributed throughout surface soil.	Results in higher estimated concentrations in surface soils and thus increased risk. (Note that Operable Unit 5-05 surface soils were found to not present an unacceptable risk subsequent to the base-line risk assessment in the remedial investigation.)
Computer-modeled radionuclide inventories (curies) converted to subsurface concentrations of radionuclides (pCi/g are representative of subsurface concentrations (and thus risk) within the waste are expected.	Radionuclide inventories were assumed uniformly distributed throughout the reported volumes at a material density of 1.5 g/cm3.	The actual nature and density of buried materials is not homogeneous. Areas of both higher and lower contamination.
Modeled inventories reduced by percent of uranium-235 recovered are representative of actual concentrations.	The reduced quantities are upper-bound estimates of inventories originally deposited on each site.	Results in higher estimated concentrations in the sub surface and thus increased risk.

No migration of contaminants has occurred.	Maximizes concentrations (no dilution) and minimizes volume.	Results in higher estimated concentrations in the sub-surface and thus increased risk.
Significant quantities of nonradioactive contaminants are not present at either site.	If any nonradioactive contaminants are present, they would represent an insignificant contribution to the total risk at each site.	May underestimate risk slightly.
Modeled receptor is in direct contact with the subsurface or subsurface contamination for time periods specified in the remedial investigation report	Shielding provided by existing soil cover is excluded from consideration; the EPA-default time and duration of exposure values are formulated for sensitive individuals.	Results in substantially higher exposure values for all receptors, and thus higher risks.
Groundwater modeling parameters and assumptions generic to the INEL are adequate to model groundwater.	Parameter and assumptions were selected to maximize concentrations of contaminants in the groundwater.	Results in overestimation of concentrations in aquifer and minimizes vadose zone travel times, resulting in higher estimated risk.

The uncertainties related to the measurement of radiological data in the field can lead to an under- or over-estimation risk. Field measurements are accurate at the time and location the reading is taken. However, factors such as detection limits, correlation of field measurements to specific radionu-clide concentrations, and perturbations resulting from radioactive fragments or particles add significant uncertainty to these risk estimates.

To address remarks received during the public comment period, hypothetical soil concentrations of uranium-235 were estimtated for the surface soil at BORAX-I using the assumption that the entire 3.7 kg of uranium-235 unrecovered at the site was uniformly distributed through two soil volumes.

The first, 84,000 cubic feet (2,400 m 3) was based on the extent of gravel-covered area and a depth of one foot. A second volume, 14,7000 cubic feet (416 m 3) by one foot deep, was based on the portion of the gravel-covered area which had a radiological field greater than 0.02 mR/hour during a survey conducted in 1980. Concentrations resulting from these calculations were 2.2 pCi/g (1 mg uranium-235/kg soil) and 13 pCi/g (6 mg uranium-235/kg soil). Although, these estimates were developed under the assumption that the entire 3.7 kg of uranium-235 was distributed in the surface soil, historical documentation indicates that some of the fuel remaining at the site was buried in the reactor structure foundation. In the risk assessment, the 95% upper confidence limit for uranium-235 (68.6 pCi/g), based on analytical results of biased samples, was used to represent surface soil concentrations. This concentration is much higher than either 2.2 or 13 pCi/g, demonstrating that use of the 95% upper confidence limit of biased sampling can result in over-estimation of actual soil concentrations, and therefore over-estimation of the risk.

6.1.6 Conclusions

An inspection of the risk values shows several important facets of the investigation:

- At the SL-1 burial ground, scenario total risks range from 6E-04 to 5E-01. At BORAX-I the scenario risks range from 3E-05 to 3E-02. The risks are dominated by cesium-137 plus its daughter barium-137m in the external exposure pathway for both sites.

- The risks due to external exposures estimated by deterministic or probabilistic methods are all greater than 1E-06, and in nearly all scenarios, greater than 1E-04; the only exception was the occupational site-specific #2 scenario for BORAX-I. Values greater than 1E-04 are considered indicative of conditions that may pose a threat to human health and the environment if not addressed by a response action.

- The risks attributable to soil ingestion for all radionuclides are generally on or more orders of magnitude lower than the risks from external exposure and considered a secondary concern; however, for the residential intrusion scenarios at SL-1, the risk from the soil ingestion pathway exceeds 1E-04.

- The risks of soil inhalation and groundwater ingestion for all scenarios are less than 1E-05 and generally less than 1E-06, and thus negligible.

- Decay of cesium-137 (plus its progeny) will result in a decrease of risk through time at both sites. After about 400 years, the risk will reach 1E-04 at SL-1; after 320 years, the risk at BORAX-I will be dominated by the long-lived uranium-235 in the external exposure pathway, and the risk will not drop below 2E-04.

- The external radiation exposure risks estimated using deterministic and probabilistic methods dominate the total risk. Although this calculated upper limit of the risk notably exceeds the 1E-04 risk value, the external exposure risks estimated from radiological field measurements were not much greater than the risk due to background radiation. The primary difference is that the baseline risk assessment was based on the assumption that the individual is exposed directly to the waste; that is, the dose that the individual receives is not adjusted to account for the shielding provided by the soil cover. The risk estimated from the field measurements was based on the actual measured dose that an individual at the surface receives.

- Although Operable Unit 5-05 surface soils were evaluated in the baseline risk assessment presented in the remedial investigation/feasibility study report and summarized in this section, a subsequent determination found the surface soils do not present an unacceptable risk to human health or the environment (see Section 11.1).

The main contributor to the deterministic and probabilistic risk is from external exposure to cesium-137 plus its daughter barium-137m. All other contributions to the total risk are very small, usually two, three, or more orders of magnitude below the risk due to external exposure to ionizing radiation and generally below the acceptable risk level of 1E-04.

6.2 Ecological Concerns

The ecological assement of the SL-1 and BORAX-I burial grounds is a qualitive evaluation of the potential effects of the sites on plants and animals other than people and domesticated species. A quantitive ecological assessment is planned in conjunction with the INEL-wide comprehensive remedial investigation/feasibility study tentatively scheduled for 1998. There are no critical or sensitve habitats on or nearby the burial grounds, and no endangered species or habitats of endangered species

are known to exist on either site. Based on the present contaminant and ecological information and the qualitive eco-evaluation performed for this Record of Decision, the preferred alternative remedial action presented herein will serve to further reduce the ecological risks posed by these sites. It is unlikely the 1998 INEL-wide comprehensive remedial investigation/feasibility study quantitative eco-logical assessment will result in the need for any additional actions at these sites.

6.2.1 Species of Concern

The only federally listed endangered species know to frequent the INEL is the peregrine falcon. The status of the bald eagle in the lower 48 Unted States was changed from endangered to threatened in July 1995. Several other species observed on the INEL are the focus of varying levels of concern by either federal or state agencies. Animal and avian species include the ferruginous hawk, the northern goshawk, the sharp-tailed grouse, the loggerhead shrike, the Townsend's big eared bat, the pygmy rab-bit, the gyrfalcon, the boreal owl, the flammulated owl, the Swainson's hawk, the merlin, and the bur-rowing owl. Plant species classified as sensitive include Lemhi milkvetch, plains milkvetch, wing-seed evening primrose, nipple cactus, and oxytheca.

6.2.2 Exposure Assessment

Three potential routes of exposure were identified for terrestrial and avian species: ingestion of soil, vegetation, or prey; inhalation of fugitive dust; and external exposure to radiation. Ingestion of contaminated water was not considered because there are no surface-water features on either burial ground and because groundwater is not accessible to ecological receptors. For plants, the uptake of contaminants through roots systems was considered.

The amount of exposure is directly related to the amount of time spent and the fraction of diet taken on the sites. Therefore exposure are greatest for permanent ecological residents, particularly plants and small burrowing animals. The small size of the burial grounds minimizes the exposures received by migratory species, which include most avian and large mammal species that inhabit the INEL.

6.2.3 Risk Characterization

The contamiants of concern at the burial grounds consist of radionuclide-contaminated soil and

debris, most of which is buried beneath a minimum of 2 feet (0.6 m) of soil. Both sites are relatively small. Some amounts of contamination may be brought to the surface through plant uptake and burrowing animals and insects, be ingested by herbivores and animals who take prey from the sites, and enter the food web. Individuals representing a small portion of the total population of burrowing and ground-dwelling animals may also receive direct exposures. However, risks due to these exposures would be limited to a small of individual ecological receptors and would have little impact on total populations. As a result, the potential for risk to ecological receptors is very small. In addition, the inaccessibility of contamination supports the conclusion that the sites do not present a significant risk to plant and animal life.

The small areas of the sites will not support sizeable populations relative to the area and populations of the entire INEL. The potential for cumulative effects throughout each waste area group and INEL-wide are of much greater concern than the effects from the individuals burial grounds. These issues will be addressed in the comprehensive remedial investigation/feasibility studies for each waste area group and the entire INEL.

6.3 Basis for Response

Actual or threatened release of contaminants from these burial grounds, if not addressed by implementing the response action selected in this Record of Decision, present a potential threat to public health, welfare, or the environment.

The results of the baseline risk assessment indicate that unacceptable risk exists at both burial grounds. The primary risk at both sites is from external exposure to cesium-137 and its daughter barium-137m. Decay of cesium-137 (plus its daughter) will result in a decrease of risk to acceptable levels after about 400 years at SL-1, and after 320 years at BORAX-I. Risk at both sites results from direct exposure to the contaminants. The shielding and control of intrusion can be accomplished through construction of a long-term engineered cap at each site designed to contain the radionuclides as they decay with time.

The risk to ecologcial receptors at both site is associated with intrusion into the wastes. This risk will decrease through time as the radionuclides decay. Long-term engineered caps can inhibit

intrusion
by plant roots, insects, and burrowing animals.

7. Description of Alternatives

7.1 Remedial Action Objectives and Applicable or Relevant and Appropriate Requirements

The description of alternative includes discussion of how remediation goals are satisfied by the actions undertaken. Similarly, the description explain how compliance with federal and state environmental laws is achieved. The remedial action objectives and environmental laws associated with the alternatives considered in the remedial investigation/feasibility study for the SL-1 and BORAX-I burial grounds are summarized below to support the description of alternatives.

7.1.1 Remedial Action Objectives

As part of the remedial investigation/feasibility study process, remedial action objectives were developed in accordance with the National Contingency Plan and EPA guidance. The intent of the remedial action objectives is to set goals for proctecting human health and the environment. The goals are designed specifically to mitigate the potential adverse effects associated witht the burial grounds.

Results of the remedial investigation and baseline risk assessment indicate that exposure to penetrating radiation from contaminated soils and materials within the burial grounds presents the most significant future risk to human health. Therefore, the primary remedial action objectives anbd the focus of the remedial action alternative development are to inhibit exposure to radioactive materials. Remedial action objectives established for protection of human health are:

- Inhibit exposure to radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

- Inhibit ingestion of radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

- Inhibit inhalation of suspended radioactive materials that would result in a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06)

- Inhibit degradation of the burial grounds that could result in exposure of buried wastes or migration of contaminants to the surface that would pose a total excess cancer risk (for

all cont-
aminants) of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06).

The remedial action objective for protection of the environment focuses on preservation of the local ecolgy by inhibiting the potential for contaminant migration. The remedial action objective established for protection of the environment is:

- Inhibit adverse effects to resident species from exposure to contaminants at the burial grounds.

7.1.2 Applicable or Relevant and Appropriate Requirements

CERCLA requires that remedial actions comply with federal and state laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable but are relevant and appropriate; in other words, the requirements pertain to situations sufficiently similar to those encountered at a CERCLA site so that their use is well-suited to the site. Combined, these are referred to as applicable or relevant and appropriate requirements (ARARs). State ARARs are limited to those requirements that are (a) promulgated, (b) uniformly applied, and (c) are more stringent than federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, location-, and action-specific ARARs or justification for a waiver.

During the remedial investigation/feasibility study for SL-1 and BORAX-I, ARARs were specified for the remedial action alternatives under consideration. Potential ARARs initially identified were screened on the basis of review by the DOE-ID, the EPA, and the IDHW. Table 8 provides a summary of the ARARs for the three alternatives considered. These regulations focus on protection of the public from radiation and control of emissions that may result from any remediation activities. As ARARs, these regulations govern potential radionuclide emissions and dust-generating activities (such as excavation, earth-moving, and heavy-equipment operation). Although DOE orders are not ARARs, established DOE orders would be considered to ensure radiation protection for the environment and the public. Such DOE orders are identified as "To-Be-Considered" (TBC) criteria. Currently no EPA or State of Idaho regulations exist that establish cleanup levels for radionuclide contaminants in soil. Based on the contaminants of concern at SL-1 and BORAX-I, the location of the burial grounds, and the remedi-

al actions evaluated, no other ARARs were identified.

Table 8. Summary of ARARs and criteria top be considered for alternatives.

Statute	Regulations	Alternative 1 No Action	Alternative 2 Contaminant Removal	Alternative 3
NESHAP	National Emission Standards for Radionuclide Emissions Other than Radon from DOE Facilities (40 CFR §61.90)	NA	NA	NA
IDAPA	Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.650 and .651)	NA	A	A
IDAPA	Idaho Rules for Toxic Air Pollutants (IDAPA 16.01.01.585 and .586)	NA	NA	A
	DOE Order 5400.5, "Radiation Protection of the Public and Environment"	TBC	TBC	TBC
	DOE Order 5820.2A, "Radioactive Waste Management"	TBC	TBC	TBC

A = Applicable; NA = Not applicable or relevant and appropriate; R = Relevant and appropriate; TBC = To be considered

7.2 Summary of Alternatives

The three types of alternatives submitted to detailed analysis include:

Alternative 1: No action

Alternative 2: Containment by capping with an engineered long-term barrier comprised primarily of natural materials

Alternative 3: Removal by conventional excavation with disposal at the Radioactive Waste Management Complex.

The no action alternative and the two alternatives that passed the screening criteria are decribed below. Remedial action at BORAX-I is expected to include management of contaminated surface soils. Surface soils presenting a potential human health excess risk of over 1 in 10,000 will be included in the remedial action. Action levels for the radionuclides of concern in BORAX-I soils are based on the Remedial Investigation/Feasibility Study Operable Unit 10-06 (Radionuclide-Contaminated Soils at

the INEL) and are identified as 16.7 pCi/g for cesium-137, 10.8 pCi/g for strontium-90, and 13.2 pCi/g for uranium-235. These activity concentrations correspond to a 1 in 10,000 risk level based on the external exposure and ingestion pathways and a residential scenario beginning in 100-years. Costs presented for remedial actions at BORAX-I are based on the assumption that all potentially contaminated surface soils will be included in the remedial action. A surface area as large as large as 84,000 square feet (7,800 m^2) would require management as part of the remedial action at BORAX-I. As presented in the proposed plan, remedial action at the SL-1 operable unit may have also required management of potentially contaminated surface soils. An assessment of those soils has since been completed that supports a no action decision for the surface soils within Operable Unit 5-05 outside of the exclusion fence. Section 11 contains more details regarding this assessment.

7.2.1 No Action

Under Alternative 1, no attempt would be made to contain, treat in place, or remove contaminated materials. Instead, environmental monitoring would be performed to assess contaminent migration from the burial grounds. Environmental monitoring would consist of those methods used to identify contaminant migration within environmental media (air, groundwater, and soil) and to identify the exposure resulting from those contaminated media. Monitoring results would be used to determine the need for any future remedial actions necessary to protect human health and the environment. Environmental monitoring would be conducted until future reviews of the remedial action determine such activities are no longer necessary. There were no ARARs identified for the no action alternative.

The estimated cost for implementing environmental monitoring for 30 years under this alternative is $188,000 at SL-1 and $180,000 at BORAX-I. Environmental monitoring may be required beyond 30 years, however CERCLA guidance specifies costing activities for only 30 years.

To extent practicable, environmental monitoring activities would be performed under WAG-wide and INEL-wide comprehensive monitoring programs. Radiological surveys would be performed at both SL-1 and BORAX-I as part of this remedial action until WAG-wide comprehensive environmental monitoring programs are in place. Groundwater monitoring needs would be identified in the WAG 5 Comprehensive RI/FS and the WAG 10 Comprehensive RI/FS (which encompasses WAG 6). Air monitoring at both sites would be conducted as part of the INEL-wide air monitoring program.

7.2.2 Containment

Alternative 2 is a containment action that consists of installing a long-term engineered barrier (cap) over a burial site to provide shielding from penetrating radiation, to inhibit contaminant migration, and to limit intrusion. Barrier technology is currently in use at several waste sites to provide long-term isolation of radioactive wastes that are disposed of in place, as is the case for both burial grounds. The cap can be designed for longevity and would be sufficient thickness to provide a shield from penetrating radiation, inhibit intrusion by burrowing animals and insects into the waste and discourage human intrusion. Contaminant migration would be inhibited by reducing erosion by the wind and water.

The barrier would be designed to provide shielding from penetrating radiation for at least 400 years at SL-1 and 320 years at BORAX-I. A multiple-layer cap comprised primarily of natural materials would be designed during the remedial design phase of the remedial action. Cap layers would likely consist of a combination of sand, gravel, silt, basalt, cobbles, or native soil. Constuction details for the engineered barrier would be identified during the remedial design phase. The barrier design would be based on site-specific characteristics and conditions at the INEL such that maintenance requirements are minimized. Site-specific considerations, such as annual precipitation, frost depth, and anticipated soil erosion, would be used to design the optimum barrier configuration for application at the SL-1 and BORAX-I burial grounds during the remedial action phase. Each cap system would also include surface-water diversion controls to direct runoff away from the burial grounds.

The capping system would be combined with institutional controls consisting of access and land use restrictions to prevent intrusion into the SL-1 and BORAX-I burial grounds. The DOE would be responsible for establishing and maintaining land use and access restrictions for at least 100 years. Access restrictions in the form of fences, warning signs, and permanent markers would be used to determine unauthorized entry into the burial grounds. Institutional controls would include placing written notification of the remedial action in the facility land use master plan; the notification would prohibit any activities that would interfere with the remedial activity. A copy of the notification would be given to the Bureau of Land Management, together with a request that a similar notification be placed in the Bureau of Land Management property management records. The DOE would provide EPA and IDHW with written verification that notification, including Bureau of Land Management notification, have been fully implemented.

Cap integrity monitoring and radiological survey programs would be established to verify the continued functionality of the containment systems and provide early detection of potential contaminant migration. Cap integrity monitoring for cracks, erosion, and other observable degradation would be conducted to identify maintenance requirements. Institutional controls and monitoring requirements would be the responsibility of the DOE and would be evaluated for adequacy, effectiveness, and necessity during each five-year review of the remedial actions.

The area requiring containment at SL-1 is the region extending from the trench to pit 1 in Figure 2. The area requiring containment at BORAX-I is based on the assumption that consolidation of all contaminated surface soil is necessary. The minimum area requiring containment at BORAX-I is the 100-by 100-foot (30- by 30-m) fenced area of the burial ground, or 10,000 square feet (929 m^2). The maximum area of contaminant require at BORAX-I is based on the assumption that the entire 84,000 square foot (7,800 m^2) area of contaminated surface soil would require containment. Although protective covers over this entire area are feasible, consolidation of contaminated surface soil to a location near the existing buried wastes is proposed. Consolidation of contaminated surface soil would ensure that the size of a protective cover is limited to the area containing the majority of contamination (e.g., the reactor foundation).

The ARAR identified for this alternative is the Idaho Rules for Control of Fugitive Dust (IDAPA 16.01.01.650 and .651). This ARAR would be met during soil consolidation activities at BORAX-I and construction of a barrier at either site by application of appropriate engineering controls to minimize generation of airborne contamination and dust.

The estimated cost Alternative 2 is $1.9 million at SL-1 and $1.5 million at BORAX-I. These costs are based on refinements to the estimates presented in the proposed plan for Alternative 2. The primary refinements include a cap design specific to the INEL and elimination of groundwater monitoring requirements. The cap design is based on research performed at the INEL by the Environmental Science and Research Foundation. Environmental monitoring has been specified by the agencies to consist of radiological surveys. Groundwater monitoring costs have not been included because groundwater monitoring needs will be determined by the WAG 5 Comprehensive RI/FS for WAG 5 as a whole

and the WAG 10 Comprehensive RI/FS for WAG 6. Responsibility for radiological surveys at SL-1 will be assumed by the WAG 5 Comprehensive RI/FS once the comprehensive program is in place. Similarly, responsibility for radiological surveys at BORAX-I will be assumed by the WAG 10-04 Comprehensive RI/FS once the comprehensive program is in place. The cost estimates include 30 years of radiological surveys at SL-1 and BORAX-I. (Air monitoring at both sites would be conducted as part of the INEL wide air monitoring program to eliminate that cost component from thsi remedial action.)

Direct costs for equipment and construction are approximately $0.90 million at SL-1 and $0.61 million at BORAX-I (including soil consolidation). Indirect costs for engineering design and management, construction management, and contractor overhead and profit are approximately $0.47 million at SL-1 and $0.45 million at BORAX-I. A contingincy cost to account for the conceptual level of design for Alternative 2 is approximately $0.27 million at SL-1 and $0.18 million at BORAX-I. Net present value cost to perform post-closure monitoring and maintenance activities for 30 years are approximately

$0.33 million at SL-1 and $0.21 million at BORAX-I. Monitoring and maintenance may be required beyond 30 years, however CERCLA guidance specifies costing such activities for no more than 30 years.

7.2.3 Removal and Disposal

Alternative 3 is the complete removal of all contaminated materials from the burial grounds using conventional excavation techniques, with cleanup levels established on the basis of excess risk at the INEL. Conventional excavation techniques utilize commercially available earth-moving equipment.

The volume of contaminated media at the SL-1 is approximately 265,182 cubic feet (7,509 m 3). The total volume of contaminated media at the BORAX-I is approximately 93,421 cubic feet (2,645 m 3). These estimates are based on the volumes of buried waste, backfill, and potentially contaminated surface soils at BORAX-I. Once removed, contaminated materials would be packaged and transported to the Radioactive Waste Management Complex for disposal.

Following the removal of contaminated soil and solid waste, the excavated area would be backfilled with clean fill material and compacted to prevent future subsidence or settling. A layer of topsoil would be placed over the compacted backfill, contoured to match the surrounding lanscape, and seeded with an appropriate mixture of native grasses and shrubs to facilitate revegetation.

The ARARs identified for this alternative include the National Emissions Standards for Radionuclide Emissions Other than Radon from DOE Facilities (40 CFR §61.90), Idaho Rules for Toxic Air Pollutants (IDAPA 16.01.01.585 and .586), and Idaho Rules and Control of Fugitive Dust (IDAPA 16.01.01.650 and .651). All three ARARs would be met by conducting excavation activities within an enclosed structure with a filtered ventilation system and by implementing dust-suppres-
sion measures.

The estimated costs of Alternative 3 are approximately $68.9 million at SL-1 and $20.5 million at
BORAX-I. The estimated cost for SL-1 is based on the no action decision for soils outside of the
600- by 300-foot (182.9- by 91.4-m) exclusion fence but inside the boundary of Operable Unit 5-05.
The lower end of the cost range presented in the proposed plan for Alternative 3 at SL-1 reflects this
situation. The estimated cost for BORAX-I is based on the anticipated need to include up to 84,000
square feet (7,800 m²) of contaminated surface soil in the remedial action. The upper end of the cost
range presented in the proposed plan for Alternative 3 at BORAX-I is representative of this scenario.

The estimates include an assumption that no additional costs are incurred once the contaminated
materials are removed from the sites and disposed at the Radioactive Waste Management Complex.
Therefore, post-closure activities such as monitoring are not required. Direct costs for equipment, con-
struction, and disposal at the Radioactive Waste Management Complex are approximately $34.0 mil-
lion at SL-1 and $10 million at BORAX-I. Indirect costs for engineering design and management,
construction management, and contractor overhead and profit are approximately $24.7 million at SL-1

and $7.4 million at BORAX-I. The contingency cost to account for the conceptual level of design for
Alternative 3 is approximately $10.2 million at SL-1 and $3.0 million at BORAX-I.

8. Summary of Comparative Analysis of Alternatives

Each of the three alternatives subjected to the detailed analysis were evaluated against the nine evalu-
ation critera identified under CERCLA. The criteria are subdivided into three categories: (a) threshold
criteria that mandate overall protection of human health and the environment and compliance with
ARARs; (b) primary balancing criteria that include long- and short-term effectiveness, implementability,
reduction in toxicity, mobility or volume through treatment, and cost; and (c) modifying criteria that mea-
sure the acceptability of alternatives to state agencies and the community. The following sections sum-
marize the evaluations of the three alternatives against the nine evaluation criteria.

8.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment, and compliance with ARARs. The selected remedial action must meet the threshold criteria. Although the no action alternative does not meet the threshold criteria, this alternative was used in the detailed analysis as a baseline against which the other alternatives were compared, as directed by EPA guidance.

8.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Results of the baseline risk assessment indicate that upper limit of exposure risk will decrease to below 1 in 10,000 after approximately 400 years at SL-1. This upper limit will further decrease to 3 in 1,000,000 after approximately 650 years and remain constant therafter. The upper limit of exposure risk at BORAX-I will decrease to approximately 2 in 10,000 after 320 years, then remain essentially unchanged far into the future.

Alternative 1 (no action) would not satisfy the criterion of overall protection of human health and the environment because acess to the site and contact with the waste is not prevented. The containment alternative, Alternative 2, would provide overall protection of human health and the environment. A protective cover would provide shielding from penetrating radiation, limit contaminant migration, and inhibit inadvertent intrusion into the wastes by humans, insects, and animals. Consolidated surface soil at BORAX-I would also be contained beneath the protective cover. Long-term protection would be ensured by incorporating design features engineered to last a minimum of 400 years at SL-1 and 320 years at BORAX-I. Alternative 3 (removal by conventional excavation with disposal at the Radioactive Waste Management Complex) would provide effective long-term protection of human health and the environment but could result in potentially significant short-term exposures for workers removing the radionuclide-contaminated wastes during the remedial action.

Both of the action alternatives would result in a reduction of excess lifetime cancer risk. Alternative 2 would result in an excess lifetime cancer risk of less than 1 in 1,000,000 for as long as the cap remains functional. A cap minimizes potential risks by shielding, limiting migration of contamination, and inhibiting instrusion into the waste. Alternative 3, the removal action, would reduce risk by managing contaminated materials removed from the burial grounds within an operating radioactive waste disposal facility.

8.1.2 Compliance with Applicable or Relevant and Approporate Requirements

There are no ARARs identified for the no action alternative. The two action alternatives meet the identified ARARs through engineering controls and operating procedures. Section 7.2, Summary of Alternatives, discusses the primary ARARs considered in this study. These ARARs focus on controlling exposures to the public and air emissions that may result from remediation activities at the SL-1 and BORAX-I operable units.

8.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the remedial alternatives and weight major trade-offs among alternatives. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

8.2.1 Long-Term Effectivess and Permanence

This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternative 1 (no action) provides the least possible level of long-term effectiveness and permanence because unacceptable risks would remain at both burial grounds. The long-term effectiveness and permanence of containment, Alternative 2, depends on the design-life of each protective cover. As described previously, the cover can be designed to last for the period of time required to allow radionuclide decay to decrease exposure risks to acceptable levels. Risks at SL-1 will fall below the 1 in 10,000 risk range in about 400 years. Risks at BORAX-I will decrease to about 2 in 10,000 in approximately 320 years and will remain constant, essentially forever, due to the presence of long-lived uranium-235. The

Alternative 3 removal action provides the highest degree of long-term effectiveness and permanence because contaminated materials would be completely removed. However, removing and transporting contaminated materials from one place to another within the INEL (from SL-1 or BORAX-I to the Radioactive Waste Management Complex) simply transfers the risk from one place to another.

8.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Treatment to reduce the toxicity of radionuclides is presently not feasible; therefore none of the remedial alternatives developed for the burial grounds involve the use of treatment to reduce the toxicity, mobility, or volume of contaminated materials.

8.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement remediation methods to reduce any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

The short-term effectiveness for any remedial action taken at the burial grounds would be enhanced to the maximum extent practicable through adherence to strict health and safety protocols for worker protection and use of engineering controls to prevent potential contaminant migration. However, the alternative that requires the least amount of disturbance of contaminated materials ranks the highest in terms of short-term effectiveness. As such, Alternative 1 (no action) provides the highest degree of short-term effectiveness because no additional on-site activities are required. Implementation of Alternative 2 (containment) would require disturbance to the surface of the burial grounds, however, no contact with buried waste would be involved. Alternative 2 does require contaminated surface soil at BORAX-I to be consolidated near the location of the reactor foundation. Assuming no protective measure were in place, workers installing the Alternative 2 cap would receive external exposure to penetrating radiation until sufficient construction material (such as soil, sand, and gravel) was placed over the burial ground to provide adequate shielding. Based on modeling and field measurements, approximately 3 inches (0.1 m)

of additional soil placed over the SL-1 burial ground and 9 inches (0.2 m) of additional soil placed over the BORAX-I burial ground would reduce external exposures to background radiation levels. Consequently, the soil required to form the foundation for a protective cover is likely to reduce external exposures to background levels. Alternative 3 (conventional excavation) offers the least short-term effectiveness due to direct contact with contaminated materials during excavation of the burial grounds and transport to the Radioactive Waste Management Complex. Short-term effectiveness for Alternatives 2 and 3 would be equally diminished if surface-soil consolidation is required at BORAX-I.

8.2.4 Implementability

The implementability criterion has the following three factors requiring evaluation: (a) technical feasibility, (b) administrative feasibility, and (c) the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. The ability to coordinated actions with other agencies is one factor for evaluating administrative feasibility, and the agencies have demonstrated this ability throughout the project to date. Other administrative activities that would be readily implementable include planning, use of administrative controls, and personnel training. In terms of services and materials, an evaluation of the following availability factors is required: necessary equipment and personnel, prospective technologies, and cover materials.

Alternative 1 (no action) is the simplest remedial action to implement from a technical perspective because environmental monitoring is all that is required. Monitoring would be required until future reviews of the remedial action indicated such activities are no longer necessary. Environmental monitoring services and equipment are readily available. However, Alternative 1 is administratively unacceptable due to the potential risks to human health and the environment posed by SL-1 and BORAX-I.

The containment option of Alternative 2 is technically implementable. Consolidation of contaminated surface soils at BORAX-I would involve standard earth moving equipment to perform excavation activities and water spray vehicles for dust suppression. Construction capabilities for engineered barri-

ers are commercially available, and such barriers have been used at many similar sites in both private industry and at government facilities. Specialized construction equipment and materials would be not be required. The engineering required to design and construct a cap meeting the requirements necessary to ensure protection of human health and the environment at SL-1 and BORAX-I would be specified during the remedial design phase. The general performance requirements of the cap are established in this Record of Decision.

Alternative 3 (excavation and removal) would be most difficult remedial option to implement because of the complexity of the remediation process. Containment of contamination during excavation and handling contaminated materials removed from the burial grounds would be required. Conventional excavation techniques to perform removal operations are commercially available and commonly used for earth moving applications. Administratively this alternative would require significant time and resources to perform environmental assessments, safety analyses, designs, and demonstrations prior to initiating any removal activity.

8.2.5 Cost

In evaluating project costs, an estimation of the direct and indirect costs in present-worth dollars is required. Direct costs include the estimated dollars for equipment, construction, and operation activities to conduct a remedial action. Indirect costs include the estimated dollars for activities that support the remedial action (such as construction management, project management, and management reserve). In accordance with remedial investigation/feasibility study guidance, the costs presented are estimates (-30% to +50%). Actual costs will vary based on the final design and detailed cost itemization.

Table 9 for SL-1 and Table 10 for BORAX-I summarize the estimated costs for each remedial action alternative. The costs presented are based on a specific set of assumptions and as those assumptions change so will the cost estimates. For example, CERCLA guidance specifies monitoring and maintenance costs to be estimated for 30 years. However, these activities may be required beyond 30 years and as a result may cost significantly more than estimated.

The cost estimates for Alternative 3 (excavation and removal) are based on the proposed plan and the remedial investigation/feasibility study prepared for SL-1 and BORAX-I. As indicated in Section 7.2.1, the estimated cost for no action (Alternative 1) differs from the proposed plan because monitoring requirements for the sites have been refined.

The cost estimates presented for Alternative 2 (containment) have been revised since the proposed plan. As part of the CERCLA process, estimated costs for the selected remedy have been refined based on further developments in the level of design detail for Alternative 2. Estimated costs for Alternative 2 have been revised based on a cap design specific to the conditions at the INEL and identification of specific environmental monitoring requirements at both sites. The cap design is based on research performed at the INEL by the Environmental Science and Research Foundation. Environmental monitoring has been specified by the agencies to consist of radiological surveys. Groundwater monitoring costs have not been included because groundwater monitoring needs will be determined by the WAG 5 Comprehensive RI/FS for WAG 5 as a whole and the WAG 10 Comprehensive RI/FS for WAG 6. Responsibility for radiological surveys at SL-1 will be assumed by the WAG 5 Comprehensive RI/FS once the comprehensive program is in place. Similarly, responsibility for radiological surveys at BORAX-I will be assumed by the WAG 10-06 Comprehensive RI/FS once the comprehensive program is in place. The cost estimates included 30 years of radiological surveys at both sites. (Air monitoring at both sites will be conducted as part of the INEL-wide air monitoring program. Therefore air monitoring costs are not included in the estimate.) The estimated costs presented for Alternative 2 reflect these refinements.

Table 9. SL-1 alternative cost and estimates. a

Cost Elements	Alternative 1 No Action	Alternative 2 Containment	Alternative 3 Removal
Construction and construction operations b	NA	$1,368,000	$58,724,000
Post-closure maintenance c	NA	115,000	NA
Post-closure monitoring d	150,000	150,000	NA
Contingency	38,000	337,000	10,149,000
Total c	$188,000	$1,970,000	$68,870,000

a. Costs are for 1995 for Alternatives 1 and 2 and 1994 for Alternative 3.

b. Includes operating costs (net present value) during remedial action.

c. Net present value assuming 5% interest (net of inflation) for 30 years.

d. Changed from proposed plan to include soil monitoring only. See Section 11.

e. Rounded to ten thousands.

NA = Not applicable (item is not included in the scope for the alternative).

Table 10. BORAX-I alternative cost estimates. a

Cost Elements	Alternative 1 No Action	Alternative 2 Containment	Alternative 3 Removal
Construction and construction operations b	NA	$1,058,000	$17,518,000
Post-closure maintenance c	NA	27,000	NA
Post-closure monitoring d	144,000	144,000	NA
Contingency	36,000	225,000	3,020,000
Total e	$180,000	$1,450,000	$20,540,000

a. Costs are for 1995 for Alternatives 1 and 2 and 1994 for Alternative 3.

b. Includes operating costs (net present value) during remedial action.

c. Net present value assuming 5% interewt (net of inflation) for 30 years.

d. Changed from proposed plan to include soil monitoring only. See Section 11.

e. Rounded to ten thousands.

NA = Not applicable (item is not included in the scope for the alternative).

8.3 Modifying Criteria

Two modifying criteria are used in the final evaluation of remedial alternatives: state acceptance and community acceptance. For both of these criteria, the factors that are considered include the elements of the alternatives that are supported, the elements of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

8.3.1 State Acceptance

The IDHW concurs with the selected remedial alternative, containment with an engineered cover

comprised primarily of native materials. The IDHW has been involved in the development and review of the remedial investigation/feasbility study, the proposed plan, and this Record of Decision. Comments received from IDHW were incorporated into these documents, which have been issued with IDHW concurrance.

8.3.2 Community Acceptance

This assessment evaluates the general community response to the proposed alternatives presented in the proposed plan. Specific comments are addressed in the Responsiveness Summary portion of Appendix A in this document.

Nine individuals provided comments on the proposed plan during the public comments period. One additional comment was received after the comment period. A total of nineteen comments were received. Public opinion on the preferred alternative, in no particular order, included, but was not limited to (a) Alternative 3, Removal, should have been selected; (b) Alternative 2, Containment, was the best choice; (c) models for groundwater fate and transport should be benchmarked and validated before proceeding; (d) maximum doses should be compared to maximum dose limits; (e) how were the laws addressing disposal of spent fuel, transuranic wastes, greater-than-Class-C wastes, and low-level wastes accounted for; (f) trials regarding partial cleanup, including ground scraping and removal, should be conducted and considered; (g) future land uses should be considered; (h) results of other capping studies should be used in this evaluation; (i) no further out-of-state shipments of radioactive wastes should be allowed to be deposited there; and (j) publications and the expenditures directed toward low-risk projects are a total waste taxpayers' dollars.

In summary, three commentors favored the preferred alternative, two preferred Alternative 3, and the others either requested additional or clarifying information or provided comments no specifically associated with the two sites in question. The additional information requested appears in the Responsiveness Summary in Appendix A.

9. Selected Remedy

Based upon consideration of the requirements of CERCLA, on detailed analysis, and on public comments, the DOE-ID, the EPA, and the IDHW have selected Alternative 2, Containment, as the most appropriate remedy for both the SL-1 and BORAX-I burial grounds. The agencies believe that this alternative represents the best balance of trade-offs with respect to the evaluation criteria. Alternative 2 provides overall protection of human health and the environment, complies with ARARs, provides long- and short-term effectiveness, is readily implementable, and is cost-effective. An engineered

barrier can effec-
tively isolate contaminated materials from the accessible environment. Isolation both inhibits migration
of contaminants from the burial grounds and allows time for radioactive decay of the primary contributor,
cesium-137 and progeny, to the overall risk. Engineered barriers can also inhibit biotic and inadvertant

human intrusion into burial grounds. The agencies believe that an engineered cover system can main-
tain isolation of contaminated materials while the overall risks decrease. Engineered barriers have been
used extensively for remedial actions involving radionuclide-contaminated wastes.

Results of the baseline risk assessment indicated that the exposure pathway dominates the overall risk for both burial grounds. The primary contributor to this risk at both sites is cesium-137 and
its progeny. Based on the time required for radionuclide decay to reduce the direct exposure risk to 1
in 10,000 at SL-1 and 2 in 10,000 at BORAX-I, a protective cover must be effective for approximately
400 years at SL-1 and for approximately 320 years at BORAX-I.

9.1 Description of Selected Remedy

The selected remedial action for both burial grounds is Alternative 2, containment by capping with
an engineered long-term barrier comprised primarily of natural materials. The cover will be designed
to maintain effective long-term isolation of contaminants. The number and thicknesses of layers designed in the cover depend on local climatic and geographic conditions, including precipitation rate,
freeze depth, indigenous plant and animal species, and local topography. A 25-foot (7.5-meter) buffer
zone will be established around the perimeter of the containment structures at each site. Additional
design considerations will include the engineered lifetime of each cap, a minimum of 400 years at SL-1
and a minimum of 320 years at BORAX-I, to allow decay of cesium-137 and to reduce exposure risks.
Surface-water diversion measures, including contouring and grading, will be used as necessary to direct
runoff away from the burial grounds and into nearby, naturally occurring drainage formations. The
specific cover design for each burial ground will be defined during final remedial design.

The cover system design will provide:

- Shielding from penetrating radiation
- A barrier to inhibit biotic and inadvertent human intrusion

- Longevity through the predominant use of naturally occurring materials

- Resistance to erosion that could expose buried waste and contribute to contaminant migration

- Containment of contaminated surface soils which pose an excess risk greater than 1 in 10,000 at BORAX-I

- Low maintenance requirements

The capping system will be combined with institutional controls consisting of access and land use restrictions to discourage intrusion into the SL-1 and BORAX-I burial grounds. The DOE would be responsible for establishing and maintaining land use and access restrictions for at least 100 years. Access restrictions in the form of fences, warning signs, and permanent markers would be used to deter unauthorized entry into the burial grounds. Institutional controls would include placing written notification of the remedial action in the facility land use master plan; the notification will prohibit any activities that would interfere with the remedial activity. A copy of the notification will be given to the Bureau of Land Management, together with a request that a similar notification be placed in the Bureau of Land Management property management records. The DOE will provide EPA and IDHW with written verification that notification, including Bureau of Land Management notification, have been fully implemented.

Cap integrity monitoring and radiological survey programs will be established to ensure the functionality of the containment systems and provide early detection of potential contaminant migration. These programs will be implemented annually for the first five years following completion of the caps. The necessity for continued monitoring will then be reevaluated and defined as determined appropriate by the agencies during subsequent five-year reviews. Groundwater monitoring needs at WAG 5 will be determined by the WAG 5 Comprehensive RI/FS. Radiological surveys at SL-1 will be conducted as part of this Record of Decision until such time the surveys can be included as part of the environmental monitoring program established for the WAG 5 Comprehensive RI/FS. Similarly, groundwater monitoring needs at WAG 6 will be determined during the WAG 10 Comprehensive RI/FS. Radiological surveys at BORAX-I will be conducted as part of this Record of Decision until such time the surveys can be included as part of the environmental monitoring program established for the WAG 10 Comprehensive RI/FS. Air monitoring will be conducted as part of the INEL-wide air monitoring pro-

gram. Cap integrity monitoring for cracks, erosion, and any observable degradation will be conducted to identify maintenance requirements. Institutional controls and monitoring requirements will be the responsibility of the DOE and will be evaluated for adequacy, effectiveness, and necessity during each five-year review of the remedial actions.

During implementation dust suppresion measures such as water sprays will be used to minimize dust generation and thereby ensure compliance with ARARs (IDAPA 16.01.01.650 and .651). Health and safety plans will be established to identify training requirements, specify personal protection equipment requirements, and define general safe work practices. The remedial design will include measures to ensure mitigation of potential contaminant migration during implementation.

Implementation of the selected remedy at BORAX-I includes consolidation of contaminated surface soils which pose an excess risk greater than 1 in 10,000 to a location near the reactor foundation. Any surface soils consolidated will then be isolated beneath the engineered barrier. Action levels for the radionuclides of concern in BORAX-I soils are identified as 16.7 pCi/g for cesium-137, 10.8 pCi/g for strontium-90, and 13.2 pCi/g for uranium-235.

Because this remedy will result in wastes remaining on site, five-year reviews of this Record of Decision and reviews of monitoring data will be conducted. Evaluation will be performed within five years of the Record of Decision signature and will be conducted at least every five years thereafter until such evaluations are determined by the agencies to be no longer necessary. The purpose of these reviews is to ensure that the remedy achieves the remedial action objectives set forth in this Record of Decision and continues to provide adequate protection of human health and the environment.

9.2 Remediation Goals

The purpose of this response action is to inhibit potential exposure for human and environmental receptors and to minimize the spread of contamination. This will be accomplished by constructing long-term covers (caps) and restricting access to the sites.

Performance standards will be implemented to ensure that the cover system provides protection against direct exposure to the wastes at the two sites. The performance standards identified for the containment alternative include:

- Installation of caps that are designed to remain in existence for at least 400 years at

SL-1 and 320 years at BORAX-I to discourage any individual from inadvertently intruding into the buried waste or from contacting the waste at any time after active institutional controls over the disposal sites are removed up to the design life of the cap.

- Application of maintenance and surface monitoring programs for the containment systems capable of providing early warning of releases of radionuclides from the disposal site before they leave the site boundary.

- Institution of restrictions limiting land use to the industrial applications for at least 100 years.

- Implementation of surface water controls to direct surface water away from the disposed wastes.

- Elimination, to the extent practicable, of the need for ongoing active maintenance of the disposal sites following closure so that only surveillance, monitoring, or minor custodial care are required.

- Placement of adequate cover to inhibit erosion by natural processes for the specified design lives of the caps.

- Incorporation of features to inhibit biotic intrusion into the waste disposal pits and trench at the SL-1 burial ground.

The inspection and maintenance of the cover system will be conducted concurrent with the radiological survey program. Implementation of the maintenance and survey programs will ensure protection of human health and the environment from any unacceptable risks. These programs will be implemented annually for the first five years following completion of the caps. The necessity for continued monitoring will then be reevaluated and defined as determined appropriate by the agencies during subsequent five-year reviews.

9.3 Estimated Cost Details for the Selected Remedy

A summary of the costs for each of the remedial action alternatives evaluated was presented in Tables 9 and 10. As noted in Section 8.2.5, additional design details for the engineered barrier and environmental monitoring requirements have enabled subsequent refinements in the original cost

esti-
mates for Alternative 2 (containment). Tables 11 and 12 provide detailed breakdowns of the estimated
costs for the selected remedy, based on refinements in the costs presented previously in the proposed
plan. Post-closure costs for maintenance and monitoring of the sites are net present value dollars for
1994. These costs are calculated based on a 5 percent interest rate (net of inflation).

Table 11. SL-1 selected remedy detailed cost estimate. a

Cost Elements	Estimated Cost
Construction	
Mobilize/demobilize cap subcontractor	$ 95,000
Construction of cap	543,000
Subsidence prevention	22,000
Surface water control	51,000
Air monitoring	50,000
Miscellaneous	141,000
Construction management	234,000
Engineering design and inspection	111,000
Contractor overhead and profit	121,000
Contingency	271,000
Construction subtotal b	$1,639,000
Post-closure costs	
Cap monitoring and maintenance	$ 108,000
Fence maintenance	7,000
Environmental monitoring	150,000
Post-closure contingency	66,000
Post-closure costs subtotal c	$331,000
Total d	$1,970,000

a. Costs are for 1995.

b. Includes net present value operating costs during remedial action.

c. Net present value assuming 5% interest (net of inflation) over 30 years.

d. Rounded to ten thousands.

Table 12. BORAX-I selected remedy detailed cost estimate. a

Cost Elements	Estimated Cost
Construction	
Mobilize/demobilize cap subcontractor	$ 95,000
Construction of cap	274,000

Surface soil consolidation b	---
Subsidence prevention	5,000
Surface water control	20,000
Air monitoring	50,000
Miscellaneous	162,000
Construction management	233,000
Engineering design and inspection	79,000
Contractor overhead and profit	140,000
Contingency	182,000
Construction subtotal c	$1,240,000
Post-closure costs	
Cap monitoring and maintenance	$ 24,000
Fence maintenance	3,000
Environmental	144,000
Post-closure contingency	43,000
Post-closure costs subtotal d	$214,000
Total e	$1,450,000

a. Costs are for 1995.

b. Costs for soil consolidation are covered by the other cost elements.

c. Includes net present value operating costs during remedial action.

d. Net present value assuming 5% interest (net of inflation) over 30 years.

e. Rounded to ten thousands.

10. Statutory Determinations

Remedy selection is based on CERCLA and the regulations contained in the National Oil and Hazardous Substances Pollution Contingency Plan. All remedies must meet the two threshold criteria (see Section 8.1) established in the National Oil and Hazardous Substances Pollution Contingency Plan: protection of human health and the environment, and compliance with ARARs. In addition, CERCLA requires that the remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action is cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy addresses these statutory requirements.

10.1 Protection of Human Health and the Environment

As described in Section 9, the selected remedy for both SL-1 and BORAX-I satisfies the criterion of overall protection of human health and the environment by isolating contaminated materials

from the accessible environment. The remedy will maintain isolation for a sufficient period of time to allow short-lived radionuclides to decay, thereby decreasing direct exposure risks. Decay of short-lived radionuclides (primarily cesium-137 and its progeny) will reduce direct exposure risks to 1 in 10,000 at SL-1 after approximately 400 years and to 2 in 10,000 at BORAX-I after approximately 320 years. The risk level at SL-1 will continue to dcrease to a lower limit of 3 in 1,000,000 after approximately 650 years, where it will remain due to the presence of long-lived uranium-235. The risk level at BORAX-I will decrease to 2 in 10,000 in about 320 years and will stabilize due to long-lived uranium-235.

Although the National Oil and Hazardous Substances Pollution Contingency Plan established the acceptability of risk to be within a range of 1 in 10,000 to 1 in 1,000,000, the estimated long-term risk levels cited above for SL-1 and BORAX-I are considered acceptable for several reasons. First, the Office of Solid Waste and Emergency Response Directive 9255.0-30, dated April of 1991, states that the upper boundary of this risk range is not a discrete line at 1 in 10,000 and that a specific risk estimate around 1 in 10,000 may be considered acceptable if justified based on site-specific conditions. On this basis, risk levels around 1 in 10,000 have been determined to be acceptable for remedial actions implemented at other INEL operable units. Second, there are no practial, safe, and cost-effective methods of removing the uranium-235 and its progenies from the contaminated materials associated with the burial grounds. Any uranium-235 and its progenies removed would still require long-term isolation because there are no technologies for accelerating radionuclide decay. Finally, the methodology used in the baseline risk assessment to determine potential risks at SL-1 and BORAX-I resulted in upper bound estimates; uncertainty analysis indicates that risk is likely over-estimated, not under-estimated. Therefore it is probable that the long-term risks at BORAX-I, estimated at 2 in 10,000, may actually be within the 1 in 10,000 to 1 in 1,000,000 range.

Several assumptions, as discussed in Section 6.1.4, were incorporated into the methodology of the baseline risk assessment to ensure an upper-bound estimate would be computed. The assessment of residential scenarios was based on the assumption that direct contact with buried waste would be maintained for 24 hours a day, 350 days per year, for 30 years. Similarly, occupational scenarios included the assumption that direct contact with buried waste would be maintained for 8 hours a day, 250

days per year, for 25 years. For subsurface exposures, the assessments also included an assumption of homogeneous contamination within soils, based on the highest radionuclide concentrations detected during samplings activities. The result of these assumptions is most likely an over-estimation of the potential risks associated with the SL-1 and BORAX-I burial grounds.

The remedy selected for both SL-1 and BORAX-I is containment by capping, with engineered barriers comprised primarily of natural materials. The selected remedy will include consolidation of contaminated surface soils at BORAX-I for isolation beneath the engineered barrier. The engineered barriers will shield against penetrating radiation, discourage human and biotic intrusion, resist erosion, require low maintenance, and provide long-term performance and durability. Until determined by the agencies to be no longer necessary, radiological surveys will be performed to ensure effective isolation of contamination at both sides. Monitoring of the engineering barriers will be performed until determined by the agencies to be no longer necessary to ensure the integrity of the caps is not compromised by erosion or other deteriorating mechanisms. Additionally, institutional controls consisting of access restrictions (e.g., fencing, warning signs, and permanent markers) and runoff controls (e.g., contouring and grading as determined necessary) will be implemented to enhance isolation of the burial grounds. Land use will be restricted to industrial applications for the duration of DOE operations at the INEL. The DOE will request that the U.S. Department of Interior, Bureau of Land Management imposes similar restrictions.

Because this remedy will result in waste remaining on site at both SL-1 and BORAX-I, reviews of this Record of Decision and monitoring data will be conducted. The initial review will be performed within five years of this Record of Decision signature with subsequent reviews conducted at least every five years thereafter until determined by the agencies to be no longer necessary. The purpose of these five-year reviews is to ensure the remedy provides adequate protection of human health and the environment.

10.2 Compliance with ARARs

The engineered caps for SL-1 and BORAX-I will be designed to meet all state and federal ARARs. The ARARs that will be satisfied by the selected remedy are explained below.

10.2.1 ARARs

No chemical- or location-specific ARARs were identified for the remedial action at either SL-1 or BORAX-I. A single action-specific ARAR was identified for the selected remedy at both SL-1 and BORAX-I (see Section 7.1.2, Table 8). The requirements of the rules for Control of Fugitive Dust

(IDAPA 16.01.01.650 and .651) will be satisfied at both SL-1 and BORAX-I by apllication of appropriate engineering controls to minimize generation of airborne contamination and dust during installation of the engineering barriers and consolidation of surface soil at BORAX-I.

10.2.2 To-Be-Considered Guidance

In implementing the selected remedy, the agencies have agreed to consider a number of procedures and guidance documents that are not legally binding. The following list of DOE orders are to be considered as guidance documents:

- DOE 5400.5, "Radiation Proctection of the Public and Environment"
- DOE 5820.2A, "Radioactive Waste Management."

These DOE orders provide guidance to ensure radiation protection for the environment and the public. DOE Order 5400.5 provides radiation protection standards to protect the general public from activities conducted at DOE sites. DOE Order 5820.2A addresses future control of sites; the DOE intends to maintain active institutional control of low-level radioactive waste disposal sites for 100 years following closure.

10.3 Cost Effectiveness

The selected remedy is cost-effective based on the overall protection to human health and the environment relative to the costs incurred. Due to the persistent toxicity associated with radionuclides, removing waste from SL-1 and BORAX-I simply results in the transfer of risk from one location to another with a significant increase in cost and short-term risk. Therefore, compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

10.4 Use of permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable for the SL-1 and BORAX-I burial grounds. The National Oil and Hazardous Substances Pollution Contingincy Plan prefers a permanent solution whenever possible. However, guidance established in the National Oil and Hazardous Substances Pollution Contingency Plan to assist in the selection and implementation of appropriate remedial actions states that EPA encourages the use of containment for waste that poses a relatively low long-term threat or where treatment is impracticable. Therefore, the selected remedy focuses on long-term containment, radiological monitoring, and institutional control of the burial grounds, due to the persistent radiotoxicity associated with radionuclides. The selected remedy provides protection by isolating contaminated materials from the accessible environment for a sufficient period of time to reduce potential exposure risks to acceptable levels. Based on analysis of the CERCLA remedial alternative evaluation criteria and in particular the five balancing criteria (see Section 8.2), containment provides the best remedy for both the SL-1 and BORAX-I burial grounds in

terms of long- and short-term effectiveness, cost, implementability, and reduction of toxicity, mobility, and volume. The following discussion highlights the tradeoffs among the alternatives considered for SL-1 and BORAX-I relative to the five balancing criteria.

Long-term effectiveness is equally achieved by either containment or removal and disposal, because both remedial actions involve isolation from the accessible environment to ensure long-term protection of human health and environment. However, removal action would involve significantly increased worker exposures during the short-term period of implementation. No action would not be effective in the short- or long-term.

The toxicity of radionuclides associated with the burial grounds can only be reduced by natural decay; there are currently no technologies available to accelerate the decay process. Therefore, evaluation of the remedial actions considered with respect to reduction in toxicity is not applicable. In addition, the alternatives evaluated do not effect the volume of contaminated material existing at the burial grounds. However, both the selected remedy and the removal and disposal alternative would result in significantly reduced mobility based on long-term isolation from the accessible environment. No action would no have an impact on toxicity, volume, or mobility of contaminants at SL-1 or

BORAX-I.

Implementability and cost are directly related to the complexity of the remedial actions considered. Removal and disposal is the most complex alternative due to health and safety concerns associated with handling the contaminated materials buried at SL-1 and BORAX-I. As a result, removal and disposal is the most difficult to implement and the most expensive alternative. Although no action would be unacceptable to the agencies, this alternative is technically easy to implement and the least expensive. The selected remedy is not complex and therefore is not difficult to implement and is much less expensive than removal and disposal.

Relative to the five balancing criteria, short-term effectiveness, implementability, and cost were the decisive factors in selecting the containment alternative. The containment alternative does not require intrusion into the burial grounds and therefore does no require worker exposure to the contaminated waste buried at SL-1 and BORAX-I. Furthermore, the containment alternative is not difficult to implement and does not involve significant cost when compared to the removal and disposal alternative. No action was not considered a viable option.

State and community acceptance were also included in the decision-making process for remedy selection. The IDHW participated in the development and review of all required CERCLA documentation, including the remedial investigation/feasibility study, the proposed plan, and this Record of Decision, and supports the selected alternative. The Environmental Management Site Specific Advisory Board for the INEL concurred with the selection of the containment alternative at both burial grounds and recommended that construction and monitoring costs be reduced to the extent possible to reflect the costs for similar actions performed within the private sector. In addition, public meetings were held at various locations throughout the state, and publications were made available to inform, educate, and encourage participation of the community regarding remedial activities associated with the SL-1 and BORAX-I burial grounds.

10.5 Preference for Treatment as a Principle Element

Treatment was not considered in the formulation of potential alternatives for SL-1 and BORAX-I based on review of remedial actions previously selected for similar CERCLA sites. In addition,

the nonhomogenous characteristics associated with the wastes buried at SL-1 and BORAX-I rendered standard treatment techniques inappropriate. Contaminated materials buried at these sites include construction debris, with physical properties ranging is size, shape, and material. Furthermore, based on the inability of treatment to reduce the toxicity of radionuclides, the remedy selected did not consider treatment as a principal element.

11. Documentation of Significant Change

Several refinements have been identified for the selected remedial action at the SL-1 and BORAX-I burial grounds. These refinements are related to surface soil consolidation, monitoring, cost refinements, the boundaries of Operable Unit 5-05, and other changes to the proposed plan and are described in the following subsections.

11.1 Surface Soil Consolidation

The information in the proposed plan indicated that the surface soils around the burial grounds could require consolidation due to the presence of wind-dispersed contamination. Costs in the proposed plan were developed as ranges to accomodate the potential for consolidation of surface soils and the types of caps under consideration. Refined cost estimates were prepared for this Record of Decision based on no surface soil consolidation at SL-1, and consolidation of the entire 84,00-square foot (7,800-square meter) area at BORAX-I.

Subsequent to finalization of the proposed plan an evaluation of new data in conjunction with historical sampling and survey data determined that surface soils surrounding the SL-1 burial ground do not pose an unacceptable risk to human health or the environment. Soil ingestion, dust inhalation, groundwater ingestion, and external exposure were evaluated for current occupational and 30-year future residential scenarios. Surface soil concentrations of identified contaminants of concern outside of the exclusion fence are at or below background values within Operable Unit 5-05. Dose equivalent rate measurements of the Operable Unit 5-05 surface soils indicate radiological field levels at or below the average INEL level of 20 µrem/hr. The agencies have reviewed this information and concur that no further action is appropriate for the surface soils outside of the exclusion fence within Operable Unit 5-05. Documentation in support of the decision can be found in the Administrative Record for Operable Units 5-05 and 6-01 specifically in an engineering design file titled "ARA Windblown

Area

Risk Evaluation" and an associated letter report titled "Assessment of Surface Soils Surrounding the SL-1 Burial Ground".

It is expected that surface soil consoldiation will be necessary at BORAX-I to appropriately manage soil contamination and minimize the potential for human or environmental exposure to unacceptable risks. Therefore the refined cost estimate for capping the BORAX-I site incorporates the consolidation of surface soil option discussed in the proposed plan.

11.2 Monitoring

Long-term monitoring to confirm isolation of the buried contaminants for the accessible environment and groundwater was described in the proposed plan. Environmental monitoring of air, soil, and groundwater, and cap integrity monitoring to assess erosion, cracking, or other observable deterioration were included. In the effort to refine costs the monitoring component was critically examined. It was determined that large components of the environmental monitoring could be incorporated into larger programs on the INEL at significant cost savings. Monitoring costs for the no action alternative were revised top be consistent with monitoring estimated for the selected Alternative 2. Therefore the no action alternative includes only soil monitoring. Alternative 3 did not include monitoring, and estimates have not changed.

11.2.1 Groundwater Monitoring

The results of the baseline risk assessment indicate risks via ingestion of groundwater of 1E-06 at the SL-1 burial ground and 3E-06 for the BORAX-I burial ground. These estimates, very low in the acceptable risk range, are upper bounds on risk because parameters for the groundwater modeling were selected to maximize the potential risk estimates. These estimates also represent the summation of risks due to all contaminants, regardless of modeled peak concentration time in the aquifer.

Uncertainty analyses support the conclusion that there is no risk to groundwater from either burial ground; therefore, costs for groundwater monitoring have been eliminated. Installation of groundwater monitoring wells specific to these sites, at an approximate cost of $200,000 per well, is not necessary.

Therefore, groundwater monitoring needs will be determined under the Waste Area Group 5 Comprehensive Remedial Investigation/Feasibility Study for WAG 5 and the Waste Area Group 10 Comprehensive Remedial Investigation/Feasibility Study for WAG 6. This approach will be more cost efficient because groundwater plans can be designed to cover much larger areas. Five-year reviews of monitoring data will be defined for the comprehensive remedial investigation/feasibility studies. In the unlikely event that either burial ground is suspected of contributing to groundwater contamination, additional site-specific monitoring wells or other means of contaminant migration detection can be installed in the future.

11.2.2 Air Monitoring

Costs for long-term monitoring of air have been eliminated for burial grounds for Alternatives 1 and 2. An INEL-wide program is in place that would make additional monitoring specific to either site redundant. In compliance with the identified ARARs, site-specific air monitoring will be performed during the construction of the caps; after the remedial action is complete, responsibility for air monitoring at each site will be assumed by the site-wide program.

11.2.3 Soil Monitoring

Under Alternative 2, surface soil will be monitored by radiological surveys. For SL-1, cost estimates include radiological monitoring until the Waste Area Group 5 Comprehensive Remedial Investigation/Feasibility Study monitoring program is in place. At that time, long-term responsibility for these surveys will be placed under the Waste Area Group 5 program. Monitoring results and the need for continued monitoring will be evaluated during subsequent five-year reviews by the agencies.

Because there will be no long term monitoring plan for Waste Area Group 6, estimates in this Record of Decision include costs for radiological monitoring of the BORAX-I site. The need for continued monitoring will be assessed periodically in the five-year reviews conducted by the agencies.

Estimates for monitoring under the No Action Alternative 1 were revised to be consistent with the approach formulated for Alternative 2.

11.3 Cost Refinements

The estimated costs for the selected remedy were presented in the proposed plan as ranges;

$3,684,000 to $8,775,000 for SL-1, and $2,340,000 to $4,690,000 for BORAX-I. The refined cost esti-
mates presented in this Record of Decision are $1,970,000 for SL-1 and $1,450,000 for BORAX-I.
The cost refinements result from the soil consolidation issues discussed in Section 11.1, monitoring
discussed in Section 11.2, and refinements in general desgn parameters applied to the extent possible
without specific engineering designs. Further refinements of costs will be achieved when the remedial
design is finalized and well-defined.

Removing costs for groundwater and air monitoring (see Section 11.2) results in estimates for the
No Action Alternative 1 of $188,000 for SL-1 and $180,000 for BORAX-I.

11.4 Operable Unit 5-05 Boundary

In the proposed plan the boundary of OU 5-05 was defined as the 1,200 by 1,500-foot (366- by
477-m) area around the SL-1 burial ground. The investigation of the surface soils and the external
exposure pathway discussed above in Section 11.1 was not limited to this region, but encompassed the
entire area defined by the isopleth illustrated in Figures 2 and 4. Rather than assess a region in the
middle of one of this isopleth, the agencies have agreed to expand the boundary of Operable
Unit 5-05 include the notheast portion, about 40% of the entire area defined by the aerial isopleth.
This approach avoids the necessity for future reassessment and expenditure of additional funds for the
administration of the additional evaluation. Based on recently acquired dose equivalent rates, there are
no unacceptable external exposure risks due to surface soils outside the exclusion fence but inside the
revise Operable Unit 5-05 boudary. There are no other pathways of concern for the surface soils in
the defined area. Therefore no remedial actions will be necessary. Expanding Operable Unit 5-05 to
include the surrounding surface soils efficiently addresses the region and saves significant time and
funds. The remaining 60% of the area defined by the aerial isopleth will be addressed in the WAG 5
comprehensive RI/FS as site ARA-23.

11.5 Other Changes to the Proposed Plan

Several other minor changes have been made due to refinement of elements presented in the pro-
posed plan.

- Institutional control: Institutional control will be maintained by DOE for at least 100 years to
  limit land use to industrial applications. Institutional controls will include placing

written notification of the remedial action in the facility land use master plan; the notification will prohibit any activities that would interfere with the remedial activity. A copy of the notification will be given to the Bureau of Land Management, together with a request that a similar notification be placed in the Bureau of Land Management property management records. The DOE will provide EPA and IDHW with written verfication that notification, including Bureau of Land Management notification, have been fully implemented.

- Remedial action objectives: The word "prevent" has been with word "inhibit" to more realistically describe each of the remedial action objectives.

- Biotic intrusion at BORAX-I: In the development of preliminary cap design, the agencies have reviewed the available data and concluded that a biotic barrier is not necessary for protection of human health and the environment at BORAX-I.

- Biotic intrusion at SL-1: In the development of preliminary cap design, the agencies have reviewed the available data and concluded that a biotic barrier is not necessary over the entire SL-1 burial ground. Layers to inhibit biotic intrusion will be placed only directly over the disposal pits and trench.

12. Decision Summary for No Action Sites

This Record of Decision includes determinations for 10 Track 1 sites. The agencies have evaluated each site and support decisions for no further action. Much of the information discussed in previous sections, particularly Sections 1 through 5, also applies to these 10 sites. Additional information specific to these sites is discussed in the remainder of this section, with individual descriptions of the 10 sites in Section 12.6. Further details can be found in the Administrative Record for Waste Area Group 5.

12.1 Site Name, Location, and Description

Waste Area Group 5 contains two groups of facilities: the Auxiliary Reactor Area and the Power Burst Facility (see Figure 9). The Auxiliary Reactor Area is comprised of four inactive facilities located along Fillmore Boulevard north of Highway 20. The Power Burst Facility is just north of the Auxiliary Reactor Area and consists of a total of five facilities spread radially around the Power Burst Facility Control Area at the end of Jefferson Boulevard. Section 1 describes the topography, meterology,

sur-
face-water hydrology, geology, ecology, demography, and land use for both areas. The general descrip-
tion of groundwater hydrology is also the same, with site-specific depths to groundwater of approximate-
ly 667 feet (203 m) at the Auxiliary Reactor Area and 483 feet (147 m) at the Power Burst Facility.

12.2 Site history and Enforcement Activities

The Auxiliary Reactor Area was originally constructed in 1957 for U.S. Army research and devel-
opment of a compact power reactor. The area consisted of four facilities called Auxiliary Reactor
Areas I through IV. In 1965 the Army program was discontinued. Technical support services, not
including reactor operations, were continued until 1985, when the facilities were shut down. Three
Track 1 sites, two at Auxiliary Reactor Area I and one at Auxiliary Reactor Area III, are included in
this Record of Decision.

The Power Burst Facility was orginally called the Special Power Excursion Reactor Test area.
Built in the late 1950s for reactor behavior and safety experiments, the facility consisted of five areas,
the Control Area and Special Power Excursion Reactor Test Areas I through IV. After this series of
experiments terminated, all of the reactors were removed, and the individual facilites within the area
were converted to other uses. With the construction of a new reactor in 1970, the area was renamed the
Power Burst Facility. The Special Power Excursion Reactor Test Control Area became the Power Burst
Facility Control Area; Special Power Excursion Reactor Test Area I through IV became, respectively,
the Power Burst Facility Reactor Area, the Waste Engineering Development Facility, the Waste
Experimental Reduction Facility, and the Radioactive Mixed Waste Storage Facility. Seven Track 1
sites located at the Power Burst Facility are included in this Record of Decision.

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12.3 Highlightes of Community Participation

All 10 Track 1 sites were included in the proposed plan for the SL-1 and BORAX-I burial grounds.
Public comments were solicited at the same meetings and in the same comment periods discussed pre-
viously. No comments were received.

12.4 Scope and Role of Operable Unit or Response Action

Ten sites in Waste Area Group 5 are presented in this Record of Decision with no further action determinations. As illustrated in Figure 9, three are located in the Auxiliary Reactor Area, and seven are within the Power Burst Facility. Of the twelve operable units in Waste Area Groups 5, four have one or more individual Track 1 sites presented here for no further action.

All 10 sites were identified in the Federal Facility Agreement and Consent Order and evaluated according to INEL-specific guidance for Track 1 sites. Qualitative Track 1 risk assessments evaluate all available existing information and data, including site operating, waste, and disposal histories, engineering drawings, and anecdotal evidence. These assessments examine only potential hazards to human health, utilizing the assumption that actions taken to protect human health will also be protective of the environment. The information was evaluated by representatives of the DOE, the IDHW, and the EPA, who agreed that the sites did not warrant remediation or further study.

As previously described, cumulative risks from each operable unit will be further evaluated in the comprehensive remedial investigation/feasibility study for Waste Area Group 5. Final evaluation of site-wide impacts will be performed in the Waste Area Group 10 assessment.

12.4.1 Auxialiary Reactor Area Sites

Operable Unit 5-01, located at the Auxiliary Reactor Area I, contains six sites; two of the six, ARA-05 and ARA-17, are included in this Record of Decision. Also addressed is site ARA-13, the only site in Operable Unit 5-11. This Operable Unit is located at the ARA-III.

12.4.2 Power Burst Facility Sites

All of the five sites in Operable Unit 5-03 (PBF-06, PBF-07, PBF-13, PBF-24) and PBF-28, are included in this Record of Decision. Of these five sites, four are located at the Power Burst Facility Reactor Area and the fifth, PBF-24, is at the Radioactive Mixed Waste Storage Facility. The other two Power Burst Facility sites are two of the three sites in Operable Unit 5-04, site codes PBF-14 and PBF-19. PBF-14 is located at the Waste Engineering Development Facility. PBF-19 is adjacent to the Waste Experimental Reduction Facility.

12.5 Site Characteristics

The complete Track 1 Decision Documentation Packages and other information supporting the evaluations for these sites can be found in the Administrative Record. Standard exposure pathways and scenarios were evaluated according to the INEL-specific guidance for assessing Track 1 sites. Potential exposure routes considered were external exposure to ionizing radiation, soil ingestion, inhalation of dust, inhalation of volatiles, and groundwater ingestion. Both current occupational and future residential scenarios were qualitatively evaluated. The following section summarizes the contaminants considered for each site and the results of the qualitative risk assessments.

12.6 Summary of Site Risks

The 10 sites were catogorized for discussion and summary into three different types: wastewater disposal sites, soil contamination sites, and underground storage tanks.

12.6.1 Wastewater Disposal Sites

The six sites discussed in the following subsections were associated with liquid waste discharges. During the intitial site identifications, several of these sites were only suspected of receiving hazardous or radioactive wastes. Subsequent evaluation determined that no disposal activities had occurred. Other sites were identified as recipients of contaminated wastes, but evaluation determined that discharges were neutralized, biodegraded, or in quantities too small to posed an unacceptable risk.

12.6.1.1 ARA-05. ARA-05 in Operable Unit 5-01 was originally decribed in the initial site identification as an evaporation pond northeast of ARA-I. The area is shallow natural depression in the ground that may have received some runoff from an adjacent small parking lot. There are no records of waste generation or disposal processes associated with this site, nor are there any records indicating that the site was ever the intended destination of any waste stream. Historical monitoring surveys detected the presence of random radioactive particles in both the pond area and the general vicinity around ARAs I and II. These hot particles were probably a result of the SL-1 accident and cleanup efforts. This site was prepared in 1993 for removal of radioactive particles, but the survey indicated that the area was free of radioactivity above the ambient background.

12.6.1.2 ARA-17. ARA-17 in Operable Unit 5-01 is a nearly flat drainage area south of ARA-I that received drainage from two sources: the boiler room blow-down from the Hot Cells building

and
the raw-water storage tank and pump house at the southwestern corner of the facility. Surface dimen-
sions are approximately 150 by 150 feet (46 by 46 m). There are no known concentrations of radiolog-
ical contamination above background levels at this site, as confirmed by radiological surveys, and no
evidence of nonradiological constituents. Historical documents and process information pertinent to
ARA-I do not indicate that this site was the intended destination of any waste stream except uncontam-
inated water.

12.6.1.3 PBF-28. PBF-28 in Operable Unit 5-03 consists of an overspray area of surface soils
north of the drainage ditch that is south and west of the Power Burst Facility Reactor Area cooling
tower. The reactor cooling tower began service in 1976 and received reactor secondary cooling water
until 1985. The drainage ditch was constructed in the early 1970s and is approximately 600 feet (183
m) in length. This drainage ditch was used for surface runoff drainage from the reactor area. It also
received water from the boiler blow-down tank and discharge or overflow of secondary cooling water
from the cooling towers. Soil samples were collected along the entire length of the drainage ditch and
the cooling tower area and analyzed for chromium, the primary contaminant of concern. Results indi-
cated a 100- by 100-foot (30- by 30-m) area was contaminated by aerosol overspray from the cooling
tower. However, the concentrations of chromium found at this site are substantially below risk-based
contaminant levels and surveys indicate no radiological activity above background levels for the cool-
ing tower area or the drainage ditch.

12.6.1.4 PBF-06. PBF-06 in Operable Unit 5-03 is a ditch located west of the Power Burst
Facility reactor building. A pipe running from the oil-fired boiler has emptied approximately 30 gal-
lons (114-liters) per day of blown-down water into the pit since 1970. Although the reactor was placed
in a standby status in 1985, the boiler is still being used to support ongoing activities at the facility,
which require continued release of the boiler blow-down water. The blow-down water contains some
chemicals that are used to inhibit corrosion in the boiler. However, the corrosion inhibitors used con-
tain no hazardous chemicals, are nontoxic, and are used in very small quantities. A radiological survey
conducted in 1991 found no radiological contamination above background levels at this site.

12.6.1.5 PBF-24. PBF-24 in Operable Unit 5-03 is a boiler blow-down pit that was used for drainage of the reactor building boiler waters from 1960 to 1971. The 2- by 2- by 6-foot (0.6- by 0.6- by 1.8-m) pit, located 30 feet (9 m) north of the reactor building, is a subsurface reinforced concrete structure and has an open gravel base for drainage. A pipe running from the oil-fired boiler emptied approximately 30 gallons (114 liters) per day of blown-down water into pit. The blow-down water contained some chemicals that were used to inhibit corrosion in the boiler. However, the corrosion inhibitors used contained no hazardous chemicals, were relatively nontoxic, and were used in very small quantities. Radiological surveys show no radiological contamination above background levels at this site.

12.6.1.6 ARA-13. ARA-13 in Operable Unit 5-11 consists of a septic tank, a distribution box, and a drain field at Auxiliary Reactor Area III. Sanitary wastes were disposed into the system from 1969 to 1980. Between 1980 and 1983, in addition to sanitary wastes, small quantities of hazardous laboratory wastes were diverted to this system. Sampling and analysis yielded low-level concentrations of arsenic, barium, beryllium, mercury, nickel, selenium, and thallium in four samples taken from the leach field. The metals were detected at depths from 1 to 6 feet (0.3 to 1.8 m). However, concentrations were lower than background metal concentrations found in soils at other operable units at the INEL. The contents of the system were sampled and analysis showed concentrations were below levels that would present an unacceptable risk.

12.6.2 Soil-Contamination Sites

The following two Track 1 sites were classified as potential soil-contamination sites. One site was suspected of having received hazardous waste and possible oil spillage, but subsequent site evaluation determined that no such disposal activities had occurred. The other site was a dump for a variety of materials, including piping with asbestos insulation and some heavy metals. The asbestos has been removed, and subsequent evaluation of the site indicated that remaining contaminant concentrations do not pose an unacceptable risk to human health or the environment.

12.6.2.1 PBF-07. PBF-07 in Operable Unit 5-03 is the location of an oil drum storage area at the Power Burst Facility Reactor Area. The site consists of a wholly enclosed 4- by 8-foot (1.2- by 2.4-m) concrete pad, which is used to temporarily store two or three 55-gallon (208-liter) drums of

used oil and lubricant until pick up for recycling. The site initially only had a steel roof covering the oil drums, but in 1990, the pad was enclosed with metal corrugated siding, and a drip pan was installed. There have been no recorded oil spills and the site shows no physical evidence of spillage. No hazardous substances have been stored on the site, and a radiological survey conducted in 1991 detected no radiological activity above background.

12.6.2.2 PBF-13. PBF-13 in Operable Unit 5-03 is a rubble pit located north of the Power Burst Facility Reactor Area cooling tower. The rubble pit was first used to dispose of soil and basalt pieces excavated during facility construction in the late 1960s and was later used as a dump for a variety of construction materials until approximately the mid-1970s. Fence posts mark the location of the 75- by 45- by 10-foot (23- by 14- by 3-m) dumping area. The dump received lumber, rusting empty barrels and cans, cable, concrete, and piping with asbestos insulation. All visable materials containing asbestos were removed from the pit in 1993. Any small quantity that remains was covered when the pit was backfilled with 3 to 12 feet (0.9 to 3.7 m) of clean soil and basalt rubble. Soil samples indicated the presence of cadmium, chromium, lead, nickel, and zinc in small amounts consistent with background levels. Volatile organic compounds detected at very low concentrations were acetone and toluene.

12.6.3 Underground Storage Tanks

The following two Track 1 sites were associated with underground storage tanks. One of the tanks, its contents, associated piping, and contaminated soil have been removed. This site is now paved and used for storage. The other tank was filled with sand, disconnected from the associated piping, and abandoned in place. Risk evaluations determined that possible residual soil contamination would not pose an unacceptable risk.

12.6.3.1 PBF-14. PBF-14 in Operable Unit 5-04 is the site of a buried 500-gallon (1,893-liter) gasoline tank once used to power an emergency generator. The tank was in service from 1960 to 1964, when the Special Power Excursion Reactor Test II reactor was functional. The tank was filled with sand and abandoned in place with the fuel line disconnected. Two posts prevent parking on the tank site. The top of the tank is about 2 feet (0.6 m) below the surface. During the Track 1 investigation,

soils were excavated down to the top of the tank to a depth of 2 to 2.5 feet (0.6 to 0.8 m). No stained soils were visible, volatile organic compounds were not detected and there were no holes observed in either the tank or associated piping.

12.6.3.2 PBF-19. PBF-19 in Operable Unit 5-04 was a 3,000-gallon (11,355-liter) underground fuel oil stroage tank associated with the furnace in the reactor building at the Special Power Excursion Test Reactor III. Documentation from 1986 indicates that the tank and any contaminated soil associated with the tank were scheduled for removal, but post-removal records were not found. Although evidence that the tank was removed versus abandoned in place is not confirmed, it is likely that the tank and any associated contaminated soil were removed in 1986. The area has since been paved and is now used for outside storage.

12.7 Description of the No Action Alternative

Based on the information summarized above from the supporting documents place in the Administrative Record, the 10 Track 1 sites described do not pose an unacceptable risk to either human health or the environment. No further action is warranted. Although no additional efforts will be expended to remediate or assess these sites individually, each will be considered again for cumulative effects in the comprehensive remedial investigation/feasibility study for Waste Area Group 5 and the site-wide assessment for Waste Area Group 10.

Appendix A
Responsiveness Summary

Appendix A

Responsiveness Summary

A.1 Overview

Operable Unit 5-05 is within Waste Area Group 5 of the Power Burst Facility/Auxiliary Reactor Area at the INEL. The unit comprises the SL-1 burial ground and surrounding area. Operable Unit 6-01 is within Waste Area Group 6 of the Experimental Breeder Reactor-I/Boiling Water Reactor Experiment at the INEL and comprises the BORAX-I burial ground and surrounding area. Both of these operable units are described in the Record of Decision to which this Responsiveness Summary is attached. Due to the similarities of the two operable units, they were investigated together. A proposed plan was released April 28, 1995, with a public comment period from May 3 to June 3, 1995. The preferred alternative recommended in the proposed plan is containment by capping with an engineered long-term barrier comprised primarily of natural materials. This Responsiveness Summary recaps and responds to the comments received during the comment period. Generally, the comments reflect a broad range of views, from strong support for the selected alternative to opposition and support for Alternative 3, Removal and Disposal.

A.2 Background on Community Involvement

In accordance with CERCLA § 113(k)(2)(B)(i-v) and 117, a series of opportunities for public information and participation in the remedial investigation and decision process for the SL-1 and BORAX-I burial grounds were provided to the public from September 1994 through May 1995. For the public, the activities included receiving fact sheets that briefly discussed the investigation to date, INEL Reporter articles and updates, a proposed plan, an availability session and public meetings. A few members of the public received telephone briefings

In September 1994, a kickoff fact sheet concerning the SL-1 nad BORAX-I remedial investigation/feasibility study was sent to about 6,700 individuals of the general public and to 650 INEL employees on the INEL Community Relations Plan mailing list. The fact sheet contained a postage-paid comment from to solicit early public input on the investigations.

The investigations were discussed at informal semiannual briefings in Twin Falls (October 11, 1994), Pocatello (October 13, 1994), Moscow (October 18, 1994), Boise (October 19, 1994), and Idaho Falls (October 20, 1994). During these briefings, representatives from the DOE and INEL discussed the projects with members of the community, answered questions, and listened to public comments.

Regular reports concerning the status of the project were included in the INEL Reporter and mailed to those who were on the mailing list. Reports also appeared in two Citizens' Guides.

In April 1995, a fact sheet concerning the project was sent to about 6,700 individuals of the general public and 650 INEL employees on the INEL Community Relations Plan mailing list. On April 11, 1995, the DOE issued a news release to more than 100 news media contacts concerning the beginning of a 30-day public comment period, which began May 3, 1995, and ended June 3, 1995, pertaining to the proposed plan for SL-1 and BORAX-I. Many of the news releases resulted in a short note in community calendar sections of newspapers and as public service announcements on radio stations. Both the fact sheet and news release gave notice to the public that documents for SL-1 and BORAX-I would be available before the beginning of the comment period in the Administrative Record section of the INEL Information Repositories located in the INEL Technical Library of Idaho Falls, the INEL Boise Office, as well as in public libraries in Idaho Falls, Fort Hall, Pocatello, Twin Falls, Boise, and the University of Idaho Library in Moscow. Also, table top displays were set up at the Grand Teton Mall in Idaho Falls (May 15-20), Burley Public Library (April 24-May 5), Twin Falls Public Library (May 5-26), Boise Towne Square Mall (April 29), and the Pocatello City Building (April 24-May 15).

Opportunities for public involvement in the decision process for SL-1 and BORAX-I were provided beginning in May 1995. For the public, the activities ranged from receiving the proposed plan, conducting one teleconference call, and attending open houses and public meetings to informally discussing the issues and offering verbal and written comments to the agencies during the 30-day public comment period.

Copies of the proposed plan for the burial grounds were mailed to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list on April 28, 1995, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the same information and the location of public meetings on May 16, 17, and 18, 1995, in Idaho Falls, Boise, and Moscow, respectively, appeared in seven major Idaho newspapers. All of the public meetings were held on the scheduled days. Large advertisements appeared in the following Idaho newspapers on April 26: Post Register (Idaho Falls); Idaho State Journal (Pocatello); South Idaho Press (Burley); Times News (Twin Falls); Idaho Statesman (Boise); Lewiston Morning Tribune (Lewiston); and The Daily News (Moscow).

Personal calls were made to stakeholders in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow the week of May 8 and 15 to remind individuals about the meetings. A post card was mailed on

May 10, 1995, to about 6,700 members of the public and 650 INEL employees on the INEL Community Relations Plan mailing list to encourage them to attend the public meetings and provide verbal or written comments. Both media, the news release and newspaper advertisements, gave public notice of public involvement activities and offerings for briefings, and the beginning of a 30-day public comment period that was to begin May 3 and run through June 3, 1995.

Written comment forms, including a postage-paid business-reply form, were made available to those attending the public meetings. The forms were used to turn in written comments at the meeting, and by some, to mail in comments later. The reverse side of the meeting agenda contained a form for the public to evaluate the effectiveness of the meetings. A court reporter was present at each meeting to record transcripts of discussions and public comments. Transcripts from the three public meetings were placed in the Administrative Record section for the SL-1 and BORAX-I burial grounds, Operable Units 5-05 and 6-01, in five INEL Information Repositories. A total of about 10 people attended the public meetings. Overall, eight provided formal comment; of these eight people, three provided oral comments and five provided written comments. For those who did not attend the public meetings but wanted to make formal written comments, a postage-paid comment form was attached to the proposed plan. All comments received on the proposed plan were considered during the development of this Record of Decision.

This Responsiveness Summary has been prepared as part of the Record of Decision. All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment. The Record of Decision presents the preferred alternative for the project, selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. The decision for this operable unit is based on information contained in the Administrative Record.

A.3 Summary of Comments with Responses

Comments and questions raised during the public comment period on the SL-1 and BORAX-I burial grounds proposed plan are summarized below. The public meetings were divided into an informal question-and-answer session and a formal public comment session. The meeting format was

described in published announcements and meeting attendees were reminded of the format at the beginning of each meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal question-and-answer period during the public meetings on the proposed plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during that part of the public meeting. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meeting were addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message by calling the INEL's toll-free number. Seven written comments were received and 12 verbal comments were offered during the public meetings. This Responsiveness Summary responds to those comments.

1. Comment: One commenter asked what the maximum doses are regardless of time, at least to 10,000 years, and how these compare to the maximum dose limits of Nuclear Regulatory Commission and the DOE for an unrecognized abandoned radiation waste disposal facility.

   Response: The annual dose was estimated for the SL-1 and BORAX-I burial grounds based on the residential intrusion scenario beginning 30 years in the future. This scenario was selected because it represents the "maximum dose" at the time of earliest possible public access to either site. Selection of this exposure scenario from the 10 scenarios modeled in the baseline risk assessment represents the highest risk to the public and is also consistent with the proposed plan.

   Risk spreadsheets generated for the baseline risk assessment provided the starting point for the estimation of dose. Radionuclides posing a risk less than 1 in 10,000,000 for a given pathway were screened from this evaluation as insignificant contributors to the total dose. The methodology, including formulae, source terms, and does conversion factors used to estimate annual dose rates, is presented in the technical memorandum titled Dose Conversions for the SL-1 and BORAX-I Burial Grounds, and can be found in the Administrative Record for Operable units 5 and 6.

   Results of the calculations for the 30-year residential intrusion scenarios are summarized below. A limit of 25 mrem/yr for members of the public has been established by the Nuclear Regulatory Commission and by the DOE.

Table A-1. Estimates of dose for the 30-year residential intrusion scenario.

Site	Pathway	Estimated Annual Dose Rate (mrem/yr)
SL-1	External exposure	34,000
	Soil ingestion	69
	Dust inhalation	0.31
	Groundwater ingestion	0.043
	Total (2 significant digits)	34,000
BORAX-I	External exposure	1,800
	Soil ingestion	7.0
	Dust inhalation	0.14
	Groundwater ingestion	0.64
	Total (2 significant digits)	1,800

2. Comment: Two commenters feel that models used for groundwater fate and transport must be benchmarked and validated before we can proceed with action or no action.

Response: GWSCREEN was the groundwater modeling code used to estimate groundwater concentrations and potential risks due to groundwater ingestion. This code was designed to EPA and IDHW specifications to address conditions and uncertainties pertinent to the INEL. Worst case upper bounds of concentrations and risks were generated by using EPA and IDHW approved default input parameters defined for evaluating Track 2 sites (sites about which little is known, and low risk is expected).

The code has been validated by benchmarking against the PORFLOW and GRDFLX codes, both of which are well known and accepted codes in groundwater modeling. GWSCREEN results were within 5% of both PORFLOW and GRDFLX results. Further information regarding the development, validation, and benchmarking of GWSCREEN can be found in the following documents which are available in the Administrative Record of Operable Units 5-05 and 6-01.

Rood, A.S. and R.C. Arnett, J.T. Barraclough. Contaminant Transport in the Snake River Plain Aquifer: Phase I, Part 1: Simple Analytical Model of Individual Plumes" EGG-ER-8623, May 1989.

Matthews, S.D., "Software Configuration Management Plan for Controlled Code Support System", EGG-CATT-10196, April 1992.

Rood, A.S., "Software Verification and Validation Plan for the GWSCREEN Code", EGG-GEO-10798, May 1993.

Smith, C.S., and C.A. Whitaker, "Independent Verification and Limited Benchmark Testing of the GWSCREEN Computer Code, Version 2.0", GEE-GEO-10799, June 1993.

Rood, A.S., "GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination Theory and User's Manual Version 2.0", EGG-GEO-10797, June 1994, Revision 2.

Rood, A.S., "GWSCREEN: A Semi-Analytical Model for Assessment of the Groundwater Pathway from Surface or Buried Contamination: Theory and User's Manual", EGG-GEO-10158, March 1992.

DOE, Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL, DOE/ID-10389, January 1994, Revision 6.

3. Comment: One commenter requested information regarding the water transport time from the surface to the aquifer, and flow rate in the aquifer used in the groundwater modeling. The commenter also inquired about the extremes examined in the uncertainty analysis, what kind of uncertainty analyses were done, and the resultant extremes of dosage imposed by the more significant radionuclides in the aquifer plumes from SL-1 and BORAX-I.

Response: Vadose zone water travel times used in the evaluation were 18 years for SL-1 and 66.3 years for BORAX-I. The GWSCREEN model (see comment #2) uses water travel times estimated using only sediment thicknesses in the vadose zone. Water travel time through the basalts was neglected because describing water movement through the basalts in the vadose zone is not scientifically well-defined. Neglecting the travel time through basalt results in conservative estimates. The average linear water velocity in the aquifer was specified as 570 m/yr for both facilities.

A parametric sensitivity/uncertainty analysis was performed for both SL-1 and BORAX-I for those parameters that were thought to most significantly affect the results. Sensitivity calculations were done only for the radionuclides with the highest estimated groundwater risk at each facility boundary using base case parameters. The radionuclides were technetium-99 for SL-1 and U-234 for BORAX-I. Parameters varied in the analysis were: infiltration rate, vadose zone sediment thickness, sediment moisture content, distribution coefficient, aquifer porosity, aquifer dispersivity, and well-screen thickness. Each parameter was varied over a range and only one parameter was varied at a time, except infiltration rate and moisture content which were related through the moisture characteristic curve for the sediment.

Vadose zone water travel times for base case calculations as well as minimum and maximum values investigated as part of the sensitivity/uncertainty analysis are shown in Table A-2. The minimum and maximum vadose zone water travel times were a result of varying the vadose zone thickness or infiltration rate.

Table A-2. Minimum and maximum vadose zone water travel times (years) considered in the sensitiv-
ity/uncertainty analysis.

Facility/Location	Base Case Value	Minimum Value	Maximum Value
SL-1	18	10.2 a	54.4 b
BORAX-I	66.3	42.5 a	156 c

a. Using minimum value of vadose zone sediment thickness and base case infiltration.
b. Using maximum value of vadose zone sediment thickness and base case infiltration.
c. Using minimum value of infiltration rate and base case vadose zone sediment thickness.

The average linear groundwater velocity was not varied as part of the sensitivity/uncertainty analy-
sis because the burial ground boundary receptor is so close to the source that the concentration and
corresponding risk values are relatively insensitive to changes in this parameter. The term average
linear groundwater velocity is the average speed traveled by water in the aquifer, and is often
referred to as aquifer pore velocity.

The results of the sensitivity/uncertainty analysis were presented as a percent change from the base
case peak groundwater concentration. This comparison can be extended to risk because the rela-
tionship between concentration and risk is linear. For SL-1, the changes in concentration ranged
from a minimum of 19% (of based case concentration) using the maximum well screen thickness
(vertical mixing zone) to a maxiumum of 301% (of base case concentration) using the minimum
aquifer dispersivities. For BORAX-I, the changes ranged from a minimum of 8% to a maximum of
970%. Both of these are the results of using the minimum and maximum distribution coefficents.
A more complete discussion of the sensitivity/uncertainty analysis as well as a discussion of the
effect of each parameter and assumption can be found in Appendix C, Section C-5, of the remedial
investigation/feasibility study report.

Because annual dose due to groundwater ingestion is insignificant (see Comment #1), sensitivity
analyses to generate the extremes of dose by radionuclide, as requested by this commenter, were
not generated.

4. Comment: One commenter requested more information regarding potential contaminant plumes and
stated that cumulative impacts from various facilities must be considered to at least 10,000 years in
the future, not contributions from individual sites for only 100 or 1,000 years. Specific questions
included "Will the SL-1 contaminant plume in the aquifer overlap the plume from BORAX-I?", and

"Will these plumes overlap the plume from the previously evaluated RWMC Pad A?"

Response: It is unlikely that potential groundwater plumes from SL-1 and BORAX-I will overlap and cause siginificant concentrations. Figure 1 in the Record of Decision shows the locations of the INEL site boundary receptors for SL-1 and BORAX-I. These locations were determined based on the regional groundwater flow direction which is to the southwest. Radionuclide concentrations from both SL-1 and BORAX-I were predicted to decrease several orders of magnitude by the time they reached the INEL site boundary receptors. It is doubtful that the plumes would overlap on the INEL unless there were an uncharacteristically large degree of spreading. Any plume overlap would likely occur off the INEL site. At that point, the additive concentrations of any plume over-lap would be much less than those predicted at the burial ground boundary, facility boundary, and probably the INEL site boundary. Nevertheless, overlap of plumes will be considered in the sitewide groundwater assessment in conjunction with the Waste Area Group 10 remedial investiga-tion/feasibility study.

The possibility of potential groundwater plumes from other facilities was not evaluated. It is likely however, that a plume from BORAX-I would overlap a plume from Pad A given the relatively close proximity of the two sites. Any impact of overlaps will be evaluated in Waste Area Group 10.

The peak radionuclides groundwater concentrations were calculated irrespective of any time frame. Several radionuclides were predicted to take more than 10,000 years to reach the aquifer. For con-servatism, the peak groundwater concentrations of each radionuclide were assumed to occur at the same time for each receptor.

5. Comment: One commenter wanted to know how the requirements of 40 CFR 193, particularly 10,000 year disposal requirements, and the Low-Level Waste Policy Act of 1985 are being met for these two sites, described by the commenter as "inactive disposal sites for spent fuel transurnic waste, greater than Class C waste, and low-level waste."

Response: The preproposal draft of 40 CFR 193 states explicitly that "The management and stor-age standards are not intended to apply to remedial actions at LLW facilities which were closed prior to the effective date of 40 CFR part 193...". The draft acknowledges that it may be years before 40 CFR 193 is finalized. 40 CFR 193 does not qualify as an ARAR until it becomes law.

Capping of the two burial grounds does, however, satisfy the intent of the preproposal draft.

The draft states that "The only practical method of reducing the radiation hazard from LLW is to isolate it from people and the environment until the radioactivity has decayed," and the proposed standards should consider "...the protection provided by the engineered and natural barriers of a disposal system." The caps will be designed to prevent human or environmental exposure to the wastes for 400 years at SL-1 (when the external exposure risk will reach 1E-04) and 320 years at BORAX-I (when the long-lived uranium-235 becomes the primary risk contributor at 2E-04).

In terms of possible intrusion into the waste, the draft states that "the standards have not been devised to protect individuals who purposefully or inadvertently farm on the superjacent land or penetrate into the waste. They do apply outside the area delineated by permanent markers and in records of government ownership." It is anticipated that these restrictions will be specified in the remedial design phase which follows the signing of this Record of Decision.

The EPA proposes a standard of 15 mrem committed effective dose per year (equivalent to a fatal cancer risk of 5E-04) to the public, outside of the area delineated by permanent markers and recorded government ownership. Shielding provided by the caps, will be adequate to keep exposures below 15 mrem/yr above background.

The commenter referred to disposal requirements for spent fuel, transuranic waste, and greater-than-Class C waste. The wastes buried at both SL-1 and BORAX-I do not meet the definition of these waste types. All wastes associated with the SL-1 and BORAX-I burial grounds are considered low-level waste. The following paragraphs clarify this point.

Spent nuclear fuel is defined in DOE order 5820.2A (Radioactive Waste Management), Attachment 2, as "Fuel that has been withdrawn from a nuclear reactor following irradiation, but that has not been reprocessed to remove its constituents elements." Neither the SL-1 or BORAX-I reactor operated for long enough to achieve burn-up to the design core lifetime prior to destruction of the facilities. Thus, the fuel never became "spent".

Transuranic waste is defined in DOE Order 5820.2A, Attachment 2, as "Without regard to source or form, waste that is contaminated with alpha emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time assay." The concentrations of transuranium radionuclides at SL-1 are estimated to be in the pCi/g range and no transuranium radionuclides were identified as contaminants of concern at BORAX-I. Thus, no

transuranic wastes exist at either burial ground.

A comparison of the radionuclide concentrations associated with the SL-1 and BORAX-I burial grounds with Class C waste determination criteria revealed that no waste containing concentrations in excess of Class C levels exists at either site. This determination is based on the assumption of uniform distribution of contaminants throughout the estimated volume. Therefore, it is possible that localized areas of higher concentrations could exceed Class C criteria. However, based on the comparison performed, contaminant concentrations are below the lower end of the Class B criteria range.

All the waste associated with both burial grounds does meet the definition of low-level waste, as defined in DOE Order 5820.2A, Attachment 2:

> "Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or 11 (e) byproduct material as defined by this Order. Test speciments of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less that 100 nCi/g."

Therefore, only low-level radioactive waste management and disposal requirements are considered relevant to the SL-1 and BORAX-I burial grounds.

The commenter also referenced disposal requirements specified in the Low-Level Waste Policy Act of 1985. The act specifically excludes low-level waste owned or generated by the DOE. DOE Order 5820.2A sepcifies requirements for managing and disposing DOE owned and generated low-level waste. This DOE Order specifies that inactive sites such as SL-1 and BORAX-I be managed in conformance with CERCLA, which is the process currently being undertaken. The Order does not specify retrofitting such inactive sites to meet the requirements that would apply for new or operating disposal facilities.

6. Comment: One commenter calls the reports "excellent and interesting" but thinks cost estimates are too high, especially for construction management and contractor overhead and profit. The commenter states that competitive bidding on a fixed price design that is simple and clear should reduce estimated costs by 25 to 50%.

Response: Cost estimates for the alternatives analyzed were developed for comparison purposes only, and will not likely reflect the actual cost of implementing the selected alternative. The cost estimates were developed on the basis of a preliminary conceptual design, and therefore have omitted many specific details of the alternatives that were not well defined. These specific details are accounted for within a contingency cost element included in each estimate. However, the commenter judged the estimates as being excessive by 25 to 50 percent. This evaluation by the commenter is consistent with CERCLA guidance for preparing such cost estimates, which calls for accuracy within the range of -30 to +50 percent.

The commenter specifically identified Construction Management and Contractor overhead & Profit costs as being "very high". These cost elements are computed on a percentage basis. The percentage rate used was developed from INEL-specific construction cost history.

Costs were refined in preparation for public meetings with the EM Site-Specific Advisory Board-INEL. These refined estimates include additional specific items, such as foundation preparation and acquisition and transportation of materials, thus reducing the contingency factor percentage. These refinements result in estimates of $1.97 million for SL-1 and $1.45 million for BORAX-I. Although these estimates are better than those that appeared in the proposed plan, they are still fairly rough. Anticipated actual costs can not be presented until remedial design is complete.

7. Comment: Three commenters expressed opinions that Alternative 2 is the best choice.

Response: The agencies agree that Alternative 2, containment by capping with an engineered barrier comprised primarily of natural materials, is the preferred alternative based on effectiveness, cost, and the other evaluation criteria discussed in the proposed plan and Record of Decision. Consequently, this alternative appears in the Record of Decision as the selected remedial action for both the SL-1 and the BORAX-I burial grounds.

8. Comment: Two commenters favor Alternative 3. One commenter felt that Alternative 2 would leave us vulnerable to natural disasters, vandalism, or cutbacks in monitoring. The other commenter was worried that the INEL, being situated above the Snake River Plain Aquifer and in an eathquake sensitive area, is "a disaster awaiting its own fulfillment."

Response: The excavation and removal discussed in Alternative 3 does not return the sites to natural

conditions; however, this remedy essentially moves the problem from one location to another within the INEL with significant risks to workers and the public and at very high cost. This action would only forestall a timely decision regarding the final disposition of the wastes and would not alleviate the commenters' concerns. The prediction regarding "a disaster awaiting its own fulfillment", refers to events such as earthquakes and other natural disaster. A very small probability exists that such events could occur; therefore design features such as slop minimization will be evaluated and incorporated into the engineered covers as determined appropriate during the Remedial Design phase.

9. Comment: One commenter stated that the Special Power Excursion Reactor Test I reactor program was also concluded with a destructive test similar to the BORAX-I experiment. The commenter concludes that this experiment must also have resulted in contaminated debris and soil, and wanted to know why it is not included in any proposed clean-up plan.

Response: The Special Power Excursion Reactor Test I facility was decommissioned in 1964. The reactor pit was demolished in 1985 and the site returned to its original state. No known contaminated debris remains at the site. The Power Burst Facility reactor was built just north of the Special Power Excursion Reactor Test I location, and the facility is now known as the Power Burst Facility Reactor Area. The only two remediation sites identified within this facility are a seepage pit)site code PBF-11) and a leach pond (site code PBF-12). Both have received no further action recomcomendantions.

10. Comment: One commenter expressed the opinion that taxpayers money is being wasted by producing publications and expending funds on "low risk projects."

Response: The SL-1 and BORAX-I burial grounds can not be considered low risk projects in view of the risks estimated in the baseline risk assessment and summarized in the proposed plan. In response to Superfund guidance and the INEL Community Relations Plan, the agencies have directed that program funds be used to communicated information concerning the investigations to the public. The preparation of the INEL Reporter, fact sheets, and proposed plans are traditional methods of updating citizens on project specifics. The object of these publications is to decribe how the agencies are approaching the work outlined in the Federal Facility Agreement and what new information is learned about the sites. The invitation for citizens to interact with the agencies con-

cerning this process is an important part of finding out what citizens think of the agencis' con-
mendations. The result of interaction between the public and the agencies is the formulation of a
decision that considers the issues raised by citizens through a fair and reasonable process.

11. Comment: One commenter stated that trials should be conducted to determine if scraping surface
soils and extracting the uranium-235 results in recovery of significant amounts of uranium. If suc-
cessful, the method should be applied more extensively at the sites because recovery of the uranium
would return it to secure and reduce the long-term impacts from these sites.

Response: The commenter referred to the use of technologies which could be used to extract ura-
nium-235 from surface soils if soils were scraped from the areas surrounding the burial grounds.
The technology being referred to is called "soil washing". This technology has been demonstrated
for the removal of uranium from soil, but was not considered for application at either SL-1 or
BORAX-I. As described in Section 11, the surface soil associated with the SL-1 burial ground will
not require remedial action. In addition, uranium was not identified as a contaminant of concern in
SL-1 surface soils. This technique for BORAX-I is described below.

The effectiveness of soil washing is dependent on site-specific soil characteristics and the chemical
behavior of contaminants in the environment. Soil washing studies performed at the Hanford site
indicated that uranium would typically be concentrated in the smaller soil size fractions (silts and
clays). Therefore, removal of uranium from BORAX-I soils would intitially require separation into
specific soil size fractions such as gravel, sand, silt, and clay. The larger soil size fractions, gravel
and sand, would then be analyzed and either returned to the site or treated, depending on the results
of the analysis. If necessary, mechanical agitation or scrubbing would be used to phsically remove
uranium from the surfaces of the larger size fractions. The smaller soil size fractions, most
likely to contain the majority of uranium, would then be leached by chemical extractant such as
sulfuric acid. Studies have shown such leaching processes can reduce uranium concentrations in
the smaller soil size fractions to levels between approximately 20 and 70 parts per million. The
chemical extractant and wash water would require additional treatment to remove uranium extract-
ed from the soils.

Separating uranium from the soil surrounding BORAX-I is not considered feasible based on the extremely low concentrations anticipated in the surface soils, and the small mass of uranium actually contained in the soil. Scraping contaminated surface soils would result in considerable mixing of the existing gravel cover and the clean soil immediately beneath the contaminated soil. Assuming the entire mass of unrecovered uranium at BORAX-I, about eight pounds 3.7 kilograms), is uniformly distributed throughout the 84,000 square feet of potentially contaminated soil area, removal of the top foot of soil and gravel from this area would result in a maximum uranium concentration of one part per million. For the sake of argument, assuming the smaller soil size fraction represented 20 percent of this volume and was effectively separated by the initital soil washing stage, then a maximum of only five parts per million could be obtained. Assuming the entire eight pounds 3.7 kilograms) were distributed in a much smaller area, perhaps one-sixth the entire 84,000 square feet, the uranium concentration would be approximately six parts per million. If the smaller soil size fraction represented 20 percent of this volume and were effectively separated by the initial soil washing, then a maximum of 30 parts per million could be obtained. Such low concentrations would not be amendable to effective leaching in the final stage of the soil washing process.

Soil washing could be effective for removing larger particles if the majority of uranium were not in the form of uniformly distributed fine particles. However, historical documentation indicates the fuel fragments (larger particles) were collected from the surface soils and the majority of remaining contamination interred in the reactor foundation. Therefore the actual mass of uranium in the BORAX-I surface soils is probably significantly less than the unrecovered eight pounds (3.7 kilograms).

The focused remedial investigation/feasibility study performed for SL-1 and BORAX-I was based on remedial actions identified in previous CERCLA Records of Decision, and although soil washing technology exists and is currently in use under the EPA Superfund Innovative Technology Evaluation Program, the technology has not been specified for use in previous CERCLA Records of Decision involving radionuclide contaminated soils.

12. Comment: One commenter suggested that selection of an alternative should be deferred until the methods and costs associated with the Pit 9 action are available. The commenter felt the cost estimates for SL-1 and BORAX-I and the decision for these two sites could change if some of the

waste could be processed through the Pit 9 treatment facilities.

Response: The situation at Pit 9 is sufficiently different from that at the SL-1 and BORAX-I burial grounds to eliminate the possibility of similar treatment. The limited production tests at Pit 9 are directed at transuranic wastes in concentrations greater than 10 nanocuries per gram; wastes at the SL-1 and BORAX-I burial grounds are described in terms of picocuries, three orders of magnitude smaller. In addition, Pit 9 wastes include hazardous substances and some mixed waste, unlike the SL-1 and BORAX-I burial grounds where radionuclides are the only contaminants of concern. Preliminary information regarding cost and effectiveness of the limited production tests being performed for the Pit 9 treaments will not be available before January, 1997. the agencies do not anticipate that delaying this remedial action until the Pit 9 cost and effectiveness data are available will alter their preference for capping the sites as described in Alternative 2 of the proposed plan.

13. Comment: One commenter stated that partial cleanup including ground scraping and removal of contamination in excess of 10 CFR 61 Class A limits should be considered as an additional alternative.

Response: Removal of contaminated surface soil is a potential aspect of the final remedial design phase. Three potential options for disposition of contaminated surface soils surrounding the burial grounds were identified in the remedial investigation/feasibility study. These options include:

- No action or restricted access
- Removal followed by disposal at Radioactive Waste Management Complex
- Consolidation near the location of buried waste for inclusion beneath the protective cover.

10 CFR 61 defines the criteria under which the Nuclear Regulatory Commission issues licenses for land disposal of radioactive waste. The disposal at the SL-1 and BORAX-I burial grounds took place prior to the effective date of 10 CFR 61, so the licensing requirements do not apply.

14. Comment: Two commenters indicated that future land use scenarios should be established before decisions are made so that exposures scenarios could be determined on the basis of realistic project-

ed land use.

Response: The INEL is in the process of establishing land use scenarios for areas surrounding Site facilities. Certain areas may be designated for future industrial land use; these scenarios will be used to form the basis of risk calculations in the future. In the meantime, the agencies have decided to take the cautious approach to protect workers, the public, and the environment by applying the most protective land use scenarios in current risk assessments.

15. Comment: One commenter expressed the opinion that results of capping studies from the old dairy farm and other studies should be used in this evaluation.

Response: INEL-specific research involving capping design has been included in the preliminary conceptual designs of the caps evaluated for SL-1 and BORAX-I. The Environmental Science and Research Foundation is currently conducting cap design experiments at the INEL. These experiments, called the Protective Cap/Biobarrier Experiments, focus on "low-cost, natural systems to effectively isolate municipal, industrial, and low-level radioactive wastes and contaminated soil surfaces from the environment, for centuries." The results obtained thus far in the experiments were incorporated in the Uranium Mill Tailings Remedial Action type cap design presented in the remedial investigation/feasibility study report. This included a 5-foot (1.6-m) soil layer for water balance, a 1.5-foot (45-cm) rock/cobble layer in combination with a 1-foot (30-cm) gravel layer for

biotic control. During the remedial design phase, such INEL-specific information will be included in the final cap design.

16. Comment: One commenter demands that Alternative 3 be selected for SL-1 and BORAX-I and that no further out-of-state shipments of radioactive waste be "allowed to be deposited there".

Response: Alternative 3 is the removal of wastes from the burial ground with disposal at the INEL's Radioactive Waste Management Complex. Removal and disposal only relocates the contamination within the INEL at a high cost and potentially high risk to workers and the public; it does not eliminate the problem. Alternative 2, covering and controlling the contamination through time while radioactive decay decreases the risk, is a safer and more cost-effective approach. The SL-1 and BORAX-I sites have never received waste shipped into the state from other sources. To receive information

or ask
questions concerning possible transportation of waste to the INEL from out-of-state, citizens can call
the INEL's toll-free number, 1-800-708-2680, to request additional details and assistance.

17. Comment: One commenter suggested that "debris treatment" should be utilized to reduce volumes
of mixed waste.

Response: Mixed wastes have not been identified at either burial ground. Also see responses 11,
12, and 13.

18. Comment: One commenter asked what considerations to reduce volumes of contaminated soils
were being exercised.

Response: Under the preferred alternative, capping with an engineered barrier, contaminated sur-
face soils will be consolidated at BORAX-I based on field screening and sample data acquired dur-
ing the remedial design phase of the remedial action. No other applicable minimization efforts
have been identified.

A.4 Comment and Response Index

Because comments are summarized in the Responsiveness Summary for response, an index is included to assist in identifying responses to specific comments. Al oral comments, as received at the public meetings, and all written comments are included verbatim. Each comment is coded with a W, meaning a written comment, or a T for an oral comment transcribed during the public meetings. Seven people submitted written comments and three rendered oral comments during the meeting. A total of 19 comments were received.

To locate a response to a specific comment, identify the comment on the index, note the associated response number and page number, and turn to that response in the Summary of Comments and Responses in Section A.3.

Table A-3. Index of comments.

Page Code Number	Response Number	Comment
W-1 A-11	7	Alternative 2 is adequate.
W-2	6,7	Excellent & interesting reports. Cost estimates seem high! I agree with the

preferredalternatives. Estimated costs for capping landfills seem very high; if design
is simple and clear, I think competitive bidding (fixed price) should reduce
estimated costs shown here in by (25 to 50)%. in particular, const. mg't &
contractor ov'h'd & profit seem very high compared to the direct
"Construction of Cap" costs. Possibly this is due to high liability insurance costs, or other job
risk costs that I am not familiar with. At any rate, I recommend "working"
the cost reduction possibilities very hard.
A-10

W-3 9 The SPERT I reactor program was also concluded with a destruct test which
occurred in the early to mid 1960s, smililar to the BORAX-I destruct test.
The SPERT I destruct test must have resulted in contaminated debris and soil.
Why is SPERT I not included in any proposed clean-up plan?
A-11

W-4 10 Why do you continue to waste taxpayers $. Your publications plus the
expenditures directed towards low risk projects are a total waste. You guys are out-of-control.
A-12

W-5 8 I favor Alternative 3 as the only permanent solution for decontamination of
the SL-1 and BORAX-I sites. I fear that Alternative 2 would leave us vulnerable
to natural disasters, vandalism, or cutbacks in monitoring in the long run.
A-11

W-6 8,16 The INEL, being situated above the Snake River Aquifer and in an earthquake
sensitive area, is a disaster awaiting its own fulfillment. I demand that
A-11
Alternative 3 be instated and that no further out-of-state shipments of
radioactive waste be allowed to be deposited there.
A-15

W-7 14,17,18
- Utilize "debris treatment" for reducing vol. of mixed waste
- Closure goals must be established considering future "land use' criteria
- DOE must establish "land use" criteria for the INEL

A-14
- What considerations are being exercised to minimize volume of contaminated soils to be disposed

A-15

T-1 2 There's been a lot of discussion on these plumes, and what might reach the
groundwater. Of course, that's one of the major things that the citizens of the
State of Idaho are concerned about. I heard tonight that it was going to be
10,000 years before the heavy metals, U-235 would reach the groundwater by
modeling by a code named GWSCREEN. My understanding is there's been very
little benchmarking of these codes done. Last summer there was what
was called the aquifer stress test to try and do some benchmarking. There's
been considerable work to validate codes - we've heard about the NRC -
to validate computer codes to make sure that they predict what's right. The
codes that are being used at the INEL are not benchmarked. They are not
validated. And I think we're getting the cart before the horse on this and
going out and taking actions before we really know what we've got as far as
contaminants. Let's get some good computer codes. Let's get some good
modeling. I see fate and transport modeling in here. And again it's the old adage

of "garbage in, garbage out." And I think that's what we've got here. We don't know the ion exchange ot these metals between the soil. Conservative values most largely are being used, but ther's a lot of unknowns, and there needs to be some overall benchmarking of those computer codes that are being used similar to what the NRC has done with the RELAP models, the Skadat (sic) (TRAC?) models. We talk about us spending huge sums of money on reactor safety, and we're talking about risk here supposebly, according to the EPA of 5 in 10,000. This is much greater than what the NRC is saying you're going to have from some of these spare reactor accidents. So let's get some codes validated and benchmarked, and then let's proceed with what we have - either a No Action or Alternative Actions.

A-6

T-2 2 I heartily agree with what's just been said when it comes to the need for the improvements that he's (Robert Wadkins, comment T-1). There's certainly a real need there.

A-6

T-3 11 According to DOE's reports regarding remediation of these sites, considerable uranium-235 remains unrecovered - about two pounds at the SL-1 site and about eight pounds at the BORAX-I site. Because of U-235's very long half-life, as practical matter it will never decay away, and there is enough there to make one or more nuclear weapons. With today's improved equipment, scraping an inch or two of topsoil from the ground surface and passing scrapings and any other appropriate excavated soil through soil decontamination equipment and a heavy metal particle separation device could probably recover a considerable amount of the uranium and other radionuclides for disposition elsewhere. And before replacing more cover material, it appears that this shoul be tried on a limited scaled and used more extensively if the trials prove successful. Removal of uranium-235 will not only restore this uranium to secure storage, it will also decrease these sites'long-term impacts that will not be reduced appreciably during the limited lifetime of an engineering barrier.

A-12

T-4 3 What water transport time (from the surface to the aquifer) and what flow rate in the aquifer were used in the evaluation? Since these are uncertain, what extremes were considered in the uncertainty analyses? What kind of uncertainty analyses were done, and what were the resultant extremes of dosage

A-7

impose by the more significant radionuclides in the aquifer plumes from SL-1 and BORAX-I?

Table A-3. (continued)

Page Code Number	Response Number	Comment
T-5	4	Will the SL-1 contaminant plume in the aquifer overlap the plume from BORAX-I? Wil these plumes overlap the plume from the previously evaluated

RWMC Pad A? (Pad A is downstream from BORAX-I and SL-1. And for Pad A, DOE previously concluded that a cap will be installed over about 18,000 55-gallon drums and 2,000 4x4x7 foot boxes of alpha-contaminated Rocky Flats waste that is to be left buried there.) My concern is the combined impact of these on a future member of the public since it is the combined impact on the maximally exposed individual that counts. And this combined impact is what should be considered in deciding what to do about the waste at each disposal site. In addition, the following locations emit plumes that may overlap the plumes from SL-1 and BORAX-I and Pad A: waste buried from 1984 through the end of RWMC waste disposal operation, the Test Reactor Area, the Idaho Chemical Processing Plant, and the portion of the RWMC that was used for rad waste disposal from 1952 to 1984. The impact of all of the plumes that overlap should be considered in reaching a conclusion regarding the appropriate remediation action for waste at any one of the locations. Morever, the extent of time in the future that should be addressed should not be restricted to a relatively short time period like 100 years or 1,000 years but should extend much further to at least 10,000.

A-9

T-6 5 These sites are essentially inactive disposal sites for spent fuel, transuranic waste, greater than Class C waste, and low level waste. There are laws against disposal of such waste - that is, 40 CFR 193 and Low Level Waste Policy Act of 1985 - unless the waste can be shown to be adequately confined for at least 10,000 years. How are these requirements accounted for?

A-9

T-7 1 Considering the Nuclear Regulatory Commision scenarios regarding a future inadvertent intruder onto an in-future abandoned waste disposal site - that is, the well drilling scenario, basement excavation and home construction, farming and excavation and discovery of buried articles - what would be the maximum dosage to such and intruder at the times of maximum dosage regardless of how far these are in the future? Or at least to 10,000 years? How do these dosages compare with DOE and NRC dosage limits for a future inadvertent intruder onto an unrecognized abandoned rad waste facility?

A-6

T-8 12 The planned cleanup of Pit 9 could provide experience-derived information on which to base cost estimates for cleaning up the SL-1 and BORAX-I sites. And changes to their cost estimates could influence the decision regarding which remediation alternative to pursue. Consideration should be given to deferring the final decision regarding these issues until Pit 9 cleanup has progressed sufficiently to permit better assessment of the methods and costs that should be involved in their cleanup. Also possibly some of the waste generated in these cleanups could best be prepared for disposal by processing them through the Pit 9 treatment facilities.

A-14

T-9 13 The Site Dispostion Alternatives considered apparently only one involving waste removal - removal of all contaminated materials, the most expensive of all. Partial cleanup involving the above mentioned ground scraping plus removal of materials contaminated beyond 10 CFR 61 Class A limits deserves consideration as an alternative. Such a partial cleanup could substantiall reduce the very long half-lived portion of these sites'radioactivity plumes in the aquifer and their

impacts on future inadvertent intruders, and the cost should be substantially less than that of total cleanup.
A-14

T-10 14 I still have a question on the land use and the industrial scenario, and I think that any further action or closing out or accepting of any alternatives be delayed until we get a land use plan for the INEL so we know where we're going and what we're going to do with it. The one in ten scenario - again I believe on the industrial, the risk scenario, I believe there's a direct exposure driving that, and it's a direct exposure to an individual with no capping, no asphalt, or something like that. I believe it needs to be realistic scenario on the industrial scenario, and that factors again into this land use. I think that we're just sitting here spinning our wheels and perhaps spending a lot of money along with the wheel spinning if we proceed with some of these alternatives before we've got a land use plan in place for these areas that we're considering tonight, and perhaps even the total INEL. The soil consolidation variables that were mentioned, I think that if you're picking up any contamination out there under the EPA criteria, if you're going to say that it's going to be exposed and there's no cover on it, you're going to have to consolidate the soil. I don't think you've got any choice with the cesium-137 out there.
A-14

T-11 15 The other question I have, is there's a number of studies going on various capping things on what was called the old dairy farm out there. I don't know what those studies are called, but they've done a number of studies and looking at animals burowing into the soil and things like that. I think those should be factored in. Here there's a lot of research going on out there, and I keep seeing these things and none of it factored in here. Here we're proposing some things, that of capping and that - let's use what work we've done and what research we've done out there.
A-15

T-12 7 Looking at and having read this and having a pretty good grasp about the natural sciences, having degrees in it, I think the Containment Number 2 would be my opinion the Preferred Alternative in this situation. I think that No Action is - I think that we craeted this mess in our lifetime, we need to cleanup this mess in our lifetime. I don't think we need to leave it for future generations. Plus I think that there is a good possibility that we could have airborne particulate activity with this thing as far as with wind erosion, and that is really what I'm mostly concerned about in this situation, in all of these sites, really, is the possibility of having wind erosion take place. I think that in any of these sites I would prefer that nothing that is contaminated is ever touched again and everything is left in place. I you're going to mound on top of it sufficient weight where the shaking of the earthquake - I mean, there is a fault line that is running through this area - you wouldn't worry about it sloughing off and creating even a larger problem than is already there. I think it'll indicated to whoever happens upon it in the future generations, it will indicate to them that this wouldn't be proper place to put a foundation for a home or put a garden in. Whether we are able to communicate to those future generations or not, in 400 years Lord knows where we'll be as far as the human race, we all know that, so that's about all I have to say about that.
A-11

Appendix B

Adminstrative Record File Index

Idaho National Engineering Laboratory
Administrative Record File Index for the Track 2 Scoping of the
ARA-II SL-1 Burial Ground OU 5-05 and 6-01
6/26/95

File Number

AR1.1 Background

- Document #: EGG-GEO-10068
  Title: A Modeling Study of Water Flow in the Vadose Zone beneath the RWMC
  Author: Baca, R.G.
  Recipient: N/A
  Date: 0/01/92

*Note: This Document is filed in the Pad A Administrative Record Binder
Operable Unit 7-12 Volume I

- Document#: EGG-BG-9175
  Title: Independent Verification and Benchmark Testing of the Porflo-3 Computer Code, Version 1.0
  Author: Baca, R.G.
  Recipient: N/A
  Date: 08/01/94

- Document#: KJH-09-94
  Title: Interviews with Darrell Hanni Regarding the SL-1 Burial Ground
  Author: Holdren, K.J.
  Recipient: Halford, V.E.
  Date: 07/06/94

- Document#: 10022
  Title: Record of Meeting with Roger G. Jensen, U.S.G.S., Regarding Depth to Aquifer near BORAX-I/SL-1
  Author: VanDerpoel, G.
  Recipient: N/A
  Date: 02/17/94

- Document#: 10023
  Title: Record of Meeting with Dick Meservey, EG&G Idaho, Regarding BORAX-I
  Author: Tucker, J.
  Recipient: N/A

Date: 02/17/94

ARA-II SL-1 Burial Ground OU 5-05 and 6-01
6/26/95

File Number

AR1.1 Background (continued)

- Document#: 10024
  Title: Record of Meeting with Roger Wilhelmson, EG&G Idaho, Regarding Pipes in SL-1 Burial Ground
  Author: Meadows, G.
  Recipient: N/A
  Date: 04/15/94

- Document#: 10025
  Title: Record of Meeting with Eddy Chew, DOE-Idaho Regarding SL-1 Burial Ground Pipes
  Author: Meadows, D.
  Recipient: N/A
  Date: 04/14/94

- Document#: 10026
  Title: Record of Meeting with Glenn Briscoe, Regarding SL-1 Burial Ground
  Author: Meadows, D.
  Recipient: N/A
  Date: 01/25/94

- Document#: 10027
  Title: Record of Meeting with Craig Kwamme, LITCO, Regarding Basis for RWMC Disposal Costs
  Author: Vetter, D.
  Recipient: N/A
  Date: 12/02/94

- Document#: 10028
  Title: Memo of Conversation with Richard Green, Regarding Pipes in the SL-1 Burial Ground
  Author: Holdren, K.J.
  Recipient: N/A
  Date: 04/14/94

- Document#: 10133
  Title: Support Documentation: Estimation of Uranium-235 Surface Soil Concentrations Based on Mass Unrecovered at the BORAX-I Burial Ground
  Author: R. Filemyr
  Recipient: J. Holdren
  Date: 08/30/95

- Document#: 10134

Title: Errata for the Remedial Investigation/Feasibility Study Report for Operable Units 5-05
and 6-01 (SL-1 and BORAX-I Burial Grounds)
Author: R. Filemyr
Recipient: N/A
Date: 08/30/95

- Document#: 10135
  Title: Support Documentation: Annual Dose Calculation for Selected Scenarios at the SL-1
  and BORAX-I Burial Grounds
  Author: R. Filemyr
  Recipient: J. Holdren
  Date: 08/30/95

- Document#: 10136
  Title: SL-1/BORAX-I Class C Waste Equivalency Determination
  Author: R. Filemyr
  Recipient: J. Holdren
  Date: 08/30/95

ARA-II SL-1 Burial Ground OU 5-05 and 6-01
6/26/95

File Number

AR1.7 Initial Assessments

- Document#: 2984
  Title: ARA-06, ARA II SL-1 Burial Ground
  Author: N/A
  Recipient: N/A
  Date: 09/15/86

- Document#: 2629
  Title: BORAX-02, BORAX-I Burial Site
  Author: N/A
  Recipient: N/A
  Date: 10/03/86

AR3.8 Risk Assessment

- Document#: MISC-94001
  Title: Preliminary Baseline Risk Assessment for the OU-5-05 and 6-01, SL-1 and BORAX-I Burial Grounds RI/FS
  Author: N/A
  Recipient: N/A
  Date: 10/01/93

- Document#: 5662
  Title: Overview of Exposure Scenarios for the Baseline Risk Assessment for the OU 5-05 and 6-01, SL-1 and BORAX-I Burial Grounds RI

Author: N/A
Recipient: N/A
Date: 10/01/93

- Document#: INEL-95/103 Rev 2
  Title: ARA Windblown Area Risk Evaluation
  Author: D. Jorgensen
  Recipient: N/A
  Date: 09/07/95

- Document#: 10137
  Title: Assessment of Surface Soils Surrounding the SL-1 Burial Grounds
  Author: K.J. Holdren
  Recipient: N/A
  Date: October, 1995

ARA-II SL-1 Burial Ground OU 5-05 and 6-01
6/26/95

File Number

AR3.10 Scope of Work

- Document#: EGG-ER-10998
  Title: Scope of Work for Operable Units 5-05 and 6-01 (SL-1 and BORAX-I Burial Grounds) Remedial Investigation Feasibility Study (RI/FS)
  Author: Halford, V.E.
  Recipient: N/A
  Date: 03/01/94

AR3.12 Remedial Investigation/Feasibility Study

- Document#: OPE-ER-157-94
  Title: Transmittal of the Draft Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX-I Burial Grounds RI/FS); Volume 1 of 2
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/15/94

- Document#: INEL-95/0027
  Title: Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX Burial Grounds)
  Author: Holdren, K.J.; Filemyr, R.G.; Vetter D.W.
  Recipient: N/A
  Date: 03/01/95

AR4.3 Proposed Plan

- Document#: 10011

Title: Proposed plan for Operable Units 5-05 and 6-01 Stationary Low-Power Reactor-1 and the Boiling Water Experimental-I Burial Grounds
Author: DOE, EPA, IDHW
Recipient: N/A
Date: 05/01/95

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 12/17/1997
Operable Unit: 06
ROD ID: EPA/541/R-98/035

Media: Debris, Groundwater, Sediment, Sludge, Soil

Contaminant: Inorganics, Metals, PCBs, Radioactive, VOC

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The INEEL lands are within the aboriginal land area of the Shoshone-Bannock Tribes. These lands and waters provided the Tribes their home and sustained their way of life. DOE has documented an excess of 1,500 prehistoric and historic archaeological sites at the INEEL. Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing. In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government.

Public access to the INEEL is strictly controlled by fences and security personnel. State highways 22, 28, and 33 cross the northern portion of the INEEL. A total of 90 miles of paved highways pass through the INEEL and are used by the general public. The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. Most INEEL facilities are currently operated by one of three Government contractors. These contractors conduct various programs at the INEEL under the supervision of three DOE offices: DOE-Idaho (DOE-ID), Department of Defense (DoD)-Pittsburgh Naval Reactors Office, and DOE-Chicago (DOE-CH).

The INEEL was established in 1949 as the National Reactor Testing Station by the U.S. Atomic Energy Commission as a site for building, testing, and operating nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the area was designated as the Idaho National Engineering Laboratory to reflect the broad scope of engineering activities conducted there. The name was changed to the INEEL in 1997 to reflect the redirection of its mission to include environmental research. The U.S. Government occupied portions of the INEEL prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 square miles of the site as a gunnery range. The U.S. Army Air Corps once used an area southwest of the naval gunnery area as an aerial gunnery range. The present INEEL site includes all of the former military areas and a large adjacent shop withdrawn from the public domain for use by the DOE. The former Navy administration shop, warehouse, and housing area are presently the Central Facilities Area of the INEEL.

To better manage environmental investigations, the INEEL was subdivided into ten Waste Area Groups (WAGs). Identified contaminant release sites in each WAG were in turn divided into Operable Units (OUs) to expedite the investigations and any required remedial actions. The term "site" will herein refer to a named release site in one of the OUs. While "area" will herein be used to define all or a portion of an identified OU release site. In July 1989, the Environmental Protection Agency (EPA) proposed listing the INEEL on the National Priorities List (NPL). The EPA issued a final ruling that listed the INEEL as an NPL site in November 1989.

OU1:
The Test Area North (TAN) complex is located approximately 80 km (50 miles) northwest of Idaho Falls in the northern portion of the INEEL and extends over an area of approximately 30 square km (12 square miles). The Technical Support Facility (TSF) is centrally

located within TAN and consists of several experimental and support facilities that are for conducting research and development activities on reactor performance. The TSF-05 Injection Well islocated in the southwest corner of TSF. Three other major test facilities are located near TSF and are considered part of TAN. These facilities are the Specific Manufacturing Capability/Containment Test Facility, the Initial Engine Test Facility, and the Water Reactor Research Test Facility. The Big Lost River and Birch Creek are the only natural surface water features present near TAN. Surface water can occur at TAN during and following periods of heavy rainfall and snowmelt. However, the presence of diversion systems, and playas located at the terminal points of the Big Lost River and Birch Creek, typically prevent surface water from reaching TAN.

Operations at TAN were initiated in the early 1950s to support the U.S. Air Force aircraft nuclear propulsion (ANP) project. The objectives of the ANP project were to develop and test various designs for nuclear-powered engines and fuels for use on aircraft. The principal source of groundwater contamination at TAN is the TSF-05 Injection Well, which was used from 1953 to 1972 to dispose of TAN liquid wastes into the fractured basalt of the Snake River Plain Aquifer. Releases to TAN groundwater were first identified in August 1987, in the production wells that supply drinking water to TSF. To mitigate potential risks to personnel at TAN, an air sparging system was installed on the drinking water supply system. A Record of Decision (ROD) was completed in August 1995, addressing the groundwater in the immediate vicinity of TAN as OU 1070B.

OU2:
OU2 is the 1-07A TAN Injection Well OU. The TSF-05 Injection Well is the principal source of groundwater contamination at TAN. In 1990, an initial effort removed process sludge from the bottom 17 m (55 feet) of the TSF-05 Injection Well. An Interim Action ROD was completed in September1992, addressing the groundwater contaminants near the injection well to prevent further degradation of groundwater while the OU 1-07B RI/FS was being completed.

OU4:
OU4 is the 2-12 Test Reactor Area (TRA) Perched Water OU. The TRA is located in the southwestern portion of the INEEL approximately 47 miles west of Idaho Falls. The TRA covers an area of approximately 1,700 by 1,900 feet and is surrounded by a double security fence. Located inside the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, laboratories and offices. The facility contains three high neutron flux nuclear test

reactors: the Materials Test Reactor, the Engineering Test Reactor, and the Advanced Test Reactor. Only the Advanced Test Reactor is currently operational. WAG 2 covers the TRA.

The TRA was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Wastewater generated during operations is disposed of in the wastewater ponds at the TRA. Six disposal units have been used that have contributed to the formation and contamination of the Perched Water System; four of which are currently active. The active units include the warm waste pond, which receives radiologically contaminated wastewater; the cold waste pond, which receives primarily reactor cooling water with no radiological activity; the chemical waste pond, which is used for disposal of wastewater from ion exchange units and water softeners; and the sanitary waste ponds, which are used for sanitary wastes. A number of groundwater investigations have been conducted since 1949 in the vicinity of the TRA to characterize the quality of the Snake River Plain Aquifer. The Perched Water System RI was conducted in 1992, and a ROD for no remedial action was completed in December 1992.

OU5:
OU5, also designated as OU 2-10, addresses the Warm Waste Pond sediments. The Warm Waste Pond consists of three wastewater infiltration cells excavated in 1952, 1957, and 1964, for the disposal of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange.

The release of radioactive and/or hazardous contaminant to the Warm Waste Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action requirements of the July 1987 DOE, State, and EPA Consent Order/Compliance Agreement. Additional sampling was conducted in 1990 in accordance with Superfund protocol. The Warm Waste Pond was proposed for an interim action under the Consent Order, and a ROD for the interim action was completed in December 1991.

OU6:
OU6, also designated as OU2-13, addresses the 55 known or suspected contaminant release sites that have been identified within WAG 2. Groundwater monitoring has been conducted at a network of Snake River Plain Aquifer wells in the vicinity of TRA and for selected deep perched water zone wells. Localized areas of radionuclide-contaminated soil were located in and north of the North Storage Area. The soil contamination was removed in the

summer of 1995 and 1996 as part of an INEEL-wide cleanup of radioactively contaminated surface soil. The OU 2-13 comprehensive RI/FS conducted at the TRA was completed in February 1997 and resulted in the identification of eight sites with potential risk to human health and requiring some type of remedial action. A ROD was completed in December 1997, providing for remedial action at the eight sites and no action for the remaining 47 sites.

OU8:
OU8, which is also known as the OU 4-12, consists of the Central Facilities Area (CFA) Landfills. The CFA is located in Butte County in the south-central portion of the INEEL. CFA Landfills I, II, and III are located approximately 0.5 miles north of the CFA proper. The Snake River Aquifer beneath the CFA is at about 480 feet. Flow of the aquifer in this region is generally to the south-southwest. The only naturally occurring surface water at CFA results from heavy rainfall or snowmelt, usually during the period from January to April.

The original facilities at the CFA were built in the 1940s and 1950s to house personnel. The facilities have been modified over the years to fit the changing needs of the INEEL and now provide craft, office, service, and laboratory space. The CFA landfills were operated as municipal-type landfills for the INEEL. CFA Landfill I was operated as a disposal facility from the early 1950s until the mid-1980s. The landfill covers a total surface area of approximately 8.25 acres. The landfill is composed of three major units, commonly referred to as the rubble landfill, the western waste trench, and the northern waste trench. CFA Landfill II, in use from 1970 until 1982, was a fill operation encompassing 15 acres in the southwestern portion of an abandoned gravel pit. CFA Landfill III, encompassing 12 acres, was opened in October of 1982, when operations at CFA Landfill II were terminated, and continued as a cut-and-fill operation until December 1984, when it also was terminated. An expansion to Landfill III was opened west of the original Landfill III and continued to handle the same type of waste. It was operational until 1993 and is no longer in use. This expansion is not considered part of OU 4-12. A ROD was completed in September 1995, documenting the results of the OU 4-12 RI/FS and the selected remedy for CFA Landfills I, II, and III.

OU9:
OU9, also referred to as OU 4-11, addresses the CFA Motor Pool Pond, that is located in an abandoned gravel pit approximately 366 m (1,200 feet) east of the CFA Equipment Yard. A small pond, approximately 36 by 18 meters (120 by 60 feet), formed in the low spot when wastes were being discharged. Currently, the pond is typically dry; however, runoff may temporarily accumulate in the

pond after storm events and during spring thaws. Wastewater discharged to the pond originated at the CFA Service Station. A 20-cm (8-inch) diameter concrete pipe extends southeast from the Service station and discharges to a ditch.

From 1951 until 1985, the CFA Motor Pool Pond received wastes from two sumps located at the CFA Service Station. One of the sumps collected wastes from bus washes and floor drains in the adjacent Service Bay, and the second sump collected wastes from the Steam Cleaning Bay. In late 1985, the wastes were diverted through an oil/water separator to a sanitary sewer line connected to the Sewage Treatment Plant, and discharge to the Motor Pool Pond ceased. The CFA Motor Pool Pond was sampled as part of an INEEL-wide preliminary assessment of waste streams conducted in 1982 and 1983. The pond was sampled again in 1988 as part of a DOE Environmental survey, and in 1989 in support of RCRA closure activities. Radiation surveys of the CFA Motor Pool Pond were conducted during periods when the pond contained water and when the pond was dry. The survey performed in September 1991 indicated only background levels of radiation. An RI risk assessment of the excavated sediments along the ditch and the sediments at the discharge pipe outlet, in the ditch, and in the pond, indicated that the contaminated sediments within these areas do not present an acceptable risk to human health and the environment. A ROD was completed in December 1992, for no further action at the CFA Motor Pool Pond.

OU12:
OU12 is the Auxiliary Reactor Area (ARA)-I Chemical Evaporation Pond, which is designated as OU 5-10 of WAG 5. The ARA is located in Butte County on the southern portion of INEEL, and consists of four separate facilities; ARA-I is the southernmost and oldest facility. The ARA facilities have been used for research reactor operations and support activities. All ARA reactors have been removed, and each facility has undergone partial decontamination and decommissioning. ARA-I was a support facility and has not been used for operations since 1988.

The ARA-I Chemical Evaporation Pond is an unlined surface impoundment that was previously used to dispose of laboratory wastewater from building ARA-627. The pond was constructed in 1970 by excavating native soil to create a topographic depression. Discharges to the pond ceased in 1988. The pond is now typically dry except after precipitation events. A sampling effort was conducted in 1990 to better characterize the ARA-I Chemical Evaporation Pond. Results of the sampling were documented in a RI

Report. A ROD was completed in December 1992, for no remedial action for pond sediments and sediments under the discharge pipe.

OU14:
OU14 addresses Pad A within the Radioactive Waste Management Complex (RWMC) of WAG 7. The RWMC encompasses 144 acres in the southwestern portion of INEEL and consists of two main disposal and storage areas: Transuranic (TRU) Storage Area and Subsurface Disposal Area (SDA). Pad A is located in the north-central portion of the SDA. Surface water is present at the RWMC only during periods of heavy rainfall and snowmelt. To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. To further enhance surface water diversion from the pits and trenches, berms have also been constructed immediately around the SDA.

The RWMC was established in the early 1950s as a disposal site for solid, low-level waste generated by INEEL operations. Within the RWMC, is the SDA where hazardous substances have been disposed in underground pits, trenches, soil vault rows, and Pad A (an aboveground pad). TRU waste was disposed in the SDA from 1952 to 1970. Approximately 13,341 cubic yards of containerized solid wastes were placed on Pad A from September 1972 to August 1978. Pad A was closed in 1978 and presently has a soil cover. A ROD was completed in January 1994, documenting the results of the RI/FS and the remedy selected for Pad A.

OU15:
OU15, which is designated as OU 7-08, addresses the organic contamination in the vadose zone (OCVZ) beneath and within the immediate vicinity of the RWMC (WAG 7). The presence of organic contaminants in the vadose zone is a result of the burial, and breach, at the SDA of containerized organic wastes from the Rocky Flats Plant, a DOE facility located west of Denver Colorado. The OCVZ OU only includes organic compounds that have migrated from the wastes, and does not address the waste materials disposed of in the pits of the SDA. Organic contaminants that are part of the OCVZ are present in the subsurface fractured basalt and sedimentary interbeds beneath and within the immediate vicinity of the RWMC, above the Snake River Plain Aquifer. The highest contaminant concentrations are found immediately beneath the SDA. Data from shipping records, along with process knowledge, written correspondence, and existing monitoring data, were available to allow OCVZ, OU 7-08, to be evaluated in an expeditious manner. A ROD was completed in

December 1994, addressing this OU.

OU18:
OU18, which is designated OU 7-10, addresses Pit 9 in the SDA of RWMC. Waste was placed in Pit 9 from November 1967 to June 1969. It presently has an overburden that averages about 1.8 m (6 feet) thick. Approximately 7,079.2 cubic meters of overburden, 4,247.5 cubic meters of packaged waste, and 9,910.9 cubic meters of soil were between and below the buried waste at the time of Pit 9 closure. No waste disposal has occurred in Pit 9 at the SDA since its closure in 1969. Pit 9 was identified for an interim action under the1987 Consent Order, and a ROD was completed in September 1993, documenting this interim action.

OU19:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to 3,300 people. NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

The NRF is designated as WAG 8, and consists of nine OUs. OU19 applies only to that portion of the Industrial Waste Ditch (IWD)outside the NRF perimeter (OU 8-07, the IWD), and the Landfill Units (OUs 8-06 and 8-05), which include nine separate locations situated on the west and northeast sides of the facility. Different landfill units were used at various times from 1951 through 1971. NRF discontinued use of the last landfill unit in 1971. Non-radioactive non-hazardous industrial waste water from water treatment operations and storm water runoff has been discharged to the IWD since 1953. In 1980, the NRF ceased the discharge of all wastes to the IWD except the acidic and basic ion exchange regenerant solutions, which were self-neutralizing. A ROD addressing ten sites in OUs 8-05 and 8-06, Landfill Areas, and OU 8-07, Exterior IWD, was issued in September 1994.

OU20:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to 3,300 people. NRF consists of three Naval nuclear reactor prototype

plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

NRF is designated as WAG 8. A total of 87 known or suspected contaminant release sites, of which 71 were classified in nine OUs, were identified at NRF as requiring further study under the CERCLA process. Thirteen of the 87 sites were evaluated prior to the FFA/CO under the COCA and were not part of an OU. These 13 sites were identified as no action sites in the FFA/CO. A previous ROD addressed ten sites in OUs 8-05, 8-06, and 8-07. Eight of the nine OUs had been investigated prior to the NRF Comprehensive RI/FS. OU 8-08 represented the last OU to be investigated.

A total of 44 sites are associated with OUs 8-01, 02, 02, 04, and 09. OU 8-08 includes 18 sites that were not previously investigated under other OUs. The two new sites were not associated with any OU. OU 8-08 sites were grouped together because of similar constituents, release mechanisms, and migration paths. The OU 8-08 sites represent areas where past controlled releases of low-level radioactive water were discharged and areas where inadvertent releases to the environment occurred because of leaks from corroded piping, leaks in underground concrete basins, surface releases, and cross-contamination of non-radiological systems with radiological systems. A ROD addressing these 64 sites at NRF was completed in September 1998.

OU21:
OU21, which is designated OU 9-04, addresses the Argonne National Laboratory-West (ANL-W), which is part of WAG 9 and located in the southeastern portion of the INEEL. ANL-W houses extensive support facilities for three major nuclear reactors: Transient Reactor Test Facility (TREAT) Experimental Breeder Reactor II (EBR-II), and the Zero Power Physics Reactor (ZPPR). Drinking water for employees at ANL-W is obtained from two production wells located in the west-central portion of the ANL-W facility. Within the ANL-W site is a number of research and support facilities that contribute to the total volume of waste generated at ANL-W. These facilities currently generate radioactive low-level waste, radioactive TRU, hazardous waste, mixed waste, sanitary waste, and industrial waste. Approximately 750 people are employed at ANL-W facility.

The ANL-W was established in the mid1950s. The first reactor to operate at the ANL-W site was TREAT, which was built in 1959, and was designed for overpower transient tests of fuel. TREAT is now used mainly for safety tests for various fuel types as well as for non-reactor experiments. The EBR-II, a 62.5-megawatt thermal

reactor, went into operation in 1964 capable of producing 19.5 megawatts of electrical power in the liquid metal reactor plant. The ZPPR was put into operation at ANL-W in 1969 and is large enough to enable core-physics studies of full-scale breeder reactors that will produce up to 1,000 megawatts. ANL-W began a redirected nuclear research and development program in FY 1995. ANL-W is also currently in the process of conducting shutdown and termination activities for the EBR-II. ZPPR was placed in programmatic standby in fiscal year 1989.

Various chemical and radioactive wastes were generated from these three reactors and the support facilities at ANL-W. The operation of these facilities and the corresponding waste streams have been evaluated and documented in the Facility Assessment and Screening document of 1973. A total of 37 WAG 9 sites were evaluated during the OU 9-04 Comprehensive RI/FS completed in October 1997. A ROD was completed in September 1998.

OU22:
OU22, which is designated OU 5-13, addresses the Power Burst Facility (PBF) Evaporation Pond, Corrosive Waste Sump, and discharge pipe. The PBF, which operated from 1972 to 1985, is located in the south-central portion of the INEL. The reactor was built to support the Thermal Fuel Behavior Program's testing of pressurized-water reactor fuel rods under hypothetical reactor accidents. The PBF Evaporation Pond is a 140 by 140-foot lined surface impoundment enclosed by a cyclone fence, that was constructed in 1978 by borrowing native soil from a source located east of the pond. The Evaporation Pond is used to receive reactor secondary cooling water from the PBF reactor following neutralization in the Corrosive Waste Sump, an unlined concrete structure. The discharge pipe that leads from the Corrosive Waste Sump to the Evaporation Pond may also be contaminated.

The release of radioactive or hazardous contaminants to the Evaporation Pond was identified and evaluated during RCRA investigations. The PBF Evaporation Pond sediments have been sampled several times (1988 and 1989). A ROD was completed in September 1992, for an interim action at OU 5-13.

OU23:
OU23, which is designated as OU 10-05, addresses six ordnance areas in or near areas frequented by INEEL site personnel and therefore pose an immediate unacceptable risk to human health from the threat of uncontrolled detonation of unexploded ordnance. The ordnance are primarily a result of past activities associated with the

former Naval Proving Ground (NPG), which is an area of approximately 270 square miles within the INEEL. These activities included naval artillery testing, explosives storage bunker testing, and ordnance disposal. The NPG was used primarily during World War II. In addition, there are three suspected ordnance areas outside of the NPG that have been identified at the INEEL. A ROD was completed for an interim action at OU 10-05 in June 1992.

OU24:
The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approximately 38 and 52 miles west of Idaho Falls. The Sl-1 site is located about 1,600 feet northeast of the Auxiliary Reactor Area II and includes the surface-soil contamination area surrounding a 600 by 300-foot fenced burial ground. Approximately 99,000 cubic feet of radionuclide-contaminated debris, soil, and gravel are disposed of in the burial ground, with an estimated 2 feet of soil with a thick grass cover over the waste. The BORAX-I burial ground is located about 2,730 feet northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a 200 by 420-foot surface-soil contamination area surrounding the 100 by 100-foot fenced burial ground. The volume of buried radionuclide-contaminated soil and debris is approximately 6,336 cubic feet. The 84,00 square foot area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then. The SL-1 and BORAX-I burial grounds are historical disposal areas and do not host any current programs.

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-I burial ground was established in 1954; the SL-1 burial ground was established in 1961. Existing data were available to expedite evaluation of these sites. Therefore, the scope of the RI for the SL-1 and BORAX-I burial grounds did not include any sampling or acquisition of new data, and a focused FS was performed. A ROD was completed in December 1995.

Remedy: The selected remedy for the Warm Waste Pond (Test Reactor Area-03 (TRA-03)) 1952 and 1957 cells is containment with an engineered cover and institutional controls. These institutional controls are to include soil cover integrity monitoring. Institutional controls are assumed to remain in effect for at least 100 years. Five-year reviews will be used to ensure that the remedy remains protective and appropriate. Before placement of the final cover, the 1957 cell may be filled to grade with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) -contaminated soils from surrounding USDOE Idaho National Engineering Lab (INEEL) sites. For the 1964 cell, where previous interim remedial action has already been completed, a basalt riprap or cobble gravel layer will be placed on top of the current native soil surface to inhibit intrusion or future excavation and to increase the permanence of the remedy. Performance standards will be implemented to ensure that the engineered cover provides protection against direct exposure to the contaminated waste. Recent investigations have determined that Resource Conservation and Recovery Act (RCRA)-listed waste may have been present in the TRA warm waste system when discharges from the warm waste system to the pond occurred. In addition, because RCRA-listed waste may have been present in the TRA warm waste system, the Warm Waste Pond soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action.

The selected remedy for the Chemical Waste Pond (TRA-06) is containment with a native soil cover and institutional controls with possible excavation, treatment, and disposal. The need for excavation, treatment, and disposal will be determined on the basis of additional sampling to be performed during the remedial design phase. The agencies have concurred that excavating and disposing of contaminated sediments in the bottom of the pond before filling the pond to grade or constructing a native soil cover will meet the cleanup goals for the Chemical Waste Pond. However, it is not clear which is most cost effective. If only small amounts of contaminated soil would need to be excavated and disposed, and the level of mercury in that soil is below levels that would require treatment, then excavation and disposal would likely be more cost effective. If larger amounts of soils would need to be excavated and disposed, and the levels of mercury in the soil would require treatment by stabilization or retorting to meet hazardous waste regulation, the the soil cover would be the more cost-effective remedy. In order to make the final determination, further sampling and analysis needs to be completed in the pond to define the amount of soils that would require excavation and how the soil would have to be managed. Performance

standards will be implemented to ensure that the native-soil cover provides protection against direct exposure to the contaminated wastes.

The selected remedy for the Cold Waste Pond (TRA-08) is excavation and disposal. It is anticipated that a hot spot removal will be performed on the basis of field measurements and laboratory data collected. Performance standards will be implemented to ensure that the excavation and disposal of contaminated soil provide protection against direct exposure to the contaminated wastes.

The selected alternative for the Sewage Leach Pond (TRA-13) is containment with a native soil cover and institutional controls. Institutional controls will be required to remain for the length of time that the contaminants pose an unacceptable risk to human health or the environment (at least 100 years). Before the barrier is constructed, the pond will initially be backfilled with soils from the contaminated berms, then filled with clean soil to grade. The final cover design will consist of a sloped surface with a 1-ft peak. The cover surface would be completed with gravel mulch and vegetated with crested wheatgrass. Five-year reviews will be used to evaluate the effectiveness and appropriateness of this alternative. Performance standards will be implemented to ensure that the native-soil cover provides protection against direct exposure to the contaminated wastes.

The selected alternative for Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15) is Limited Action. Existing administrative and institutional controls will continue to be used to be protective of occupational scenarios. These controls would be maintained for a period of 100 years. Performance standards will be implemented to ensure protection against direct exposure to the contaminated wastes while the site is under institutional control.

The selected alternative for the Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19) is Limited Action, with the contingency that if controls established under the Limited Action are not maintained then an excavation and disposal option would be implemented. Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. If soil is excavated for disposal, a hazardous waste determination will be required. Therefore, the TRA-19 soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of excavation and disposal. Excavation would occur to a maximum depth of potential intrusion (10 ft or the maximum depth

at which contaminant concentration exceed Preliminary Remedial Goals [PRGs] whichever, is less). The excavated soil will be transported to an approved disposal facility. Performance standards will be implemented to ensure that protection against direct exposure to the contaminated wastes while the site is under institutional control. When excavation and disposal take place at some point in the future, the performance standards for excavation and disposal will be implemented.

The selected alternative for Brass Cap Area
As with TRA-19 is Limited Action, with the contingency that if controls established under the Limited Action are not maintained then an excavation and disposal option would be implemented. RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. If soil is excavated for disposal, a hazardous waste determination will be required. Therefore, the Brass Cap Area soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of excavation and disposal. Performance standards will be implemented to ensure that protection against direct exposure to the contaminated wastes while the site is under institutional control.

The selected remedy for the Sewage Leach Pond Berm and Soil Contamination Area is Limited Action, consisting of existing administrative and institutional controls. The contaminated berms will be placed in the bottom of the pond before completion of the final, clean native soil cover. The remaining low-level radionuclide-contaminated soils will be left in place, and exposure to these contaminants will be minimized through the use of fences, signs, and monitoring. Institutional controls will be maintained for a period of at least 100 years. A CERCLA five-year review will be conducted to ensure that the administrative controls are being properly maintained and that the predicted decrease in contaminant concentrations does occur.

The following sites have been selected as No Action sites.
No Operable Unit (OU): TRA-10 Materials Test Reactor (MTR) Construction Excavation Pile, TRA-23 Experimental Test Reactor (ETR) Excavation Rubble Pile, Tra-24 Guardhouses Construction Rubble Pile; TRA-25 Sewer Paint Settling Pond Rubble Pile, TRA-26 Rubble United States Geological Survey (USGS) Pond Rubble Pile, TRA-27 North Storage Area Rubble Pile, TRA-28 North (Landfill) Rubble, TRA-29 Advanced Test Reactor (ATR) Construction Pile, TRA-32 West Road Rubble Pile, TRA-33 West Staging Area/Drainage Ditch Rubble.

OU2-01: TRA-02 Paint Shop Ditch

OU2-02: TRA-14 Inactive Gasoline Tank at TRA-605, TRA-17 Inactive Gasoline Tank at TRA-616, TRA-18 Inactive Gasoline Tank at TRA-619, TRA-21 Inactive Tank North Side of MTR-643, TRA-22 Inactive Diesel Fuel Tank at ETR-648.

OU2-03: TRA-614 Oil Storage North, TRA-01 Acid Spill Disposal Pit, TRA-11 French Drain at TRA-645, TRA-12 Fuel Oil Tank Spill (TRA-727B), TRA-20 Brine Tank (TRA-731) at TRA-631, TRA-40 Tunnel French Drain (TRA-731).

OU2-04: PCB Spill at TRA-619, PCB Spill at TRA-626, TRA-627 #5 Oil Spill, PCB Spill at TRA-653, TRA-670 Petroleum Product Spill, PW 13 Diesel Fuel Contamination, TRA-09 Spills at TRA Loading Dock (TRA-722), TRA-34 North Storage Area.

OU2-05: TRA-603/605 Tank, TRA-16 Inactive Radionuclide Contaminated Tank at TRA-614.

OU2-06: TRA-30 Beta Building Rubble, TRA-31 West Rubble, TRA-35 Rubble East of West Road near Beta Building Rubble Pile.

OU2-07: TRA-653 Chromium-Contaminated Soil.

OU2-08: TRA-37 MTR Canal in basement of TRA-603.

OU2-09: TRA-07 Sewage Treatment Plant (TRA-624) and Sludge Pit (TRA-07).

OU2-10: Warm Waste Pond (Sediments).

OU2-11: TRA-03A Warm Waste Leach Pond (TRA-758), TRA-04 Warm Waste Retention Basin (TRA-712), TRA-05 Waste Disposal Well, Sampling Pit (764) and Sump (TRA-703).

OU2-12: Perched Water Remedial Investigation/Feasibility Study (GW).

OU2-13: TRA-41 French Drain, TRA-42 Diesel Unloading Pit, Hot Tree, ETR Stack Area.

Estimated Capital Cost: not provided
Estimated Annual O&M Cost: not provided
Estimated Present Worth Cost: $22,179,317

Text: Full-text ROD document follows on next page.

EPA 541-R98-035

<IMG SRC 980350>

<IMG SRC 98035A>

DOE/ID-10586

Record of Decision
Test Reactor Area

December 22,1997

Operable Unit 2-13
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Test Reactor Area, Waste Area Group 2
Operable Unit 2-13
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Statement of Basis and Purpose

The Test Reactor Area (TRA) Waste Area Group (WAG) 2 is one of the ten Idaho National Engineering and Environmental Laboratory (INEEL) WAGs identified in the Federal Facilities Agreement and Consent Order (FFA/CO) by the U.S. Environmental Protection Agency (EPA) Region 10, the Idaho Department of Health and Welfare (IDHW), and the U.S. Department of Energy (DOE). Operable Unit (OU) 2-13 is listed as the "WAG 2 Comprehensive Remedial Investigation (RI)/Feasibility Study (FS), including TRA Chemical Waste Pond" in the FFA/CO. The RI/FS task was to assemble the investigations previously conducted for WAG 2, to thoroughly investigate the sites not previously evaluated, and to determine the overall risk posed by the WAG. This resulting comprehensive Record of Decision

(ROD)
document presents the selected remedial actions for eight contaminant release sites at the TRA of the
INEEL, Idaho Falls, Idaho. It provides information to support remedial actions for these eight sites where
contamination presents an unacceptable risk, and a "No Action" decision on 47 additional sites at the
TRA. These remedial actions have been chosen in accordance with the Comprehensive Environmental
Response, Compensation, and Liability Act (CERCLA) of 1986, as amended by the Superfund
Amendments and Reauthorization Act, and to the extent practicable, with the National Oil and Hazardous
Substances Pollution Contingency Plan. It is also designed to satisfy the requirements of the FFA/CO.
This decision is based on the administrative record for the site.

The DOE is the lead agency for this decision. The EPA and the IDHW have participated in the
evaluation of the final action alternatives. The EPA and IDHW both concur with the selection of the
preferred remedy for the TRA eight sites of concern and with the No Action determinations for the
remaining sites.

Assessment of the Site

Eight of the 55 identified release sites within TRA have actual or threatened releases of hazardous
substances, which, if not addressed by implementing the response actions selected in this ROD, may
present an imminent and substantial endangerment to public health, welfare, or the environment. These
sites include four disposal ponds |Warm Waste Pond- 1952, 1957, and 1964 cells (TRA-03). Chemical
Waste Pond (TRA-06). Cold Waste Pond (TRA-08), and the Sewage LEach Pond (TRA-13|, three
subsurface contaminant release sites |soil surrounding Hot Waste Tanks at Building 613 (TRA-15),
Tanks 1 and 2 at Building 630 | (TRA-19), and the Brass Cap Area|, and one area of surficial windblown
contamination (Sewage Leach Pond Berms and Soil Contamination Area). The response actions selected
in this ROD are designed to reduce the potential threats to human health and the environment to acceptable
levels. The remaining 47 sites as part of the following OUs either were determined not to present an
unacceptable risk to human health or the environment, and therefore require no further action, or were part

of a previous ROD. These OUs are: Rubble Piles (no OU specified), Paint Shop Ditch (OU 2-01);
Inactive Fuel Tanks (OU 2-02); Miscellaneous Spill Sites (OU 2-03); Petroleum and Polychlorinated
Biphenyl Sites and the North Storage Area including the North Storage Area, Soil Contamination Area
(OU 2-04); Hot Waste Tanks (OU 2-05); Rubble Sites (OU 2-06); Cooling Tower Sites (OU 2-07);

Materials Test Reactor Canal (OU 2-08); Sewage Treatment Plant (OU 2-09); Retention Basin, Injection Well, Cold Waste Sampling Pit and Sump (OU 2-11); Perched Water (OU 2-12); and Hot Tree Site, Engineering Test Reactor Stack, French Drain Assoicated with TRA-653 and Diesel Unloading Pit (OU 2-13).

Description of the Selected Remedies

The selected remedy for the Warm Waste Pond (TRA-03), 1952 and 1957 cells, is containment of the pond contents using an engineered cover consisting of several layers of geologic materials to reduce potential exposure to contaminated pond sediments by human and environmental receptors. This remedy also includes the following institutional controls that are assumed to remain in effect for at least 100 years: long-term environmental monitoring, soil cover integrity monitoring and maintenance, surface water diversions, and access restrictions (e.g., fencing and signage). Before cover construction, the Warm Waste Pond 1957 cell may be filled to grade with bulk CERCLA-contaminated soils from the INEEL. For the Warm Waste Pond 1964 cell, where an interim remedial action was previously completed, a riprap or cobble gravel layer will be placed over the existing native soil cover to inhibit future intrusion or excavation and to increase the degree of permanence of the remedy. In addition, institutional controls as described above will be implemented for the Warm Waste Pond 1964 cell.

The major components of the selected remedy for the Warm Waste Pond are:

- Containment by cover, with an engineered cover constructed primarily of native materials
- Implementation may include consolidation of INEEL CERCLA-generated contaminated materials similar to those already in the Warm Waste Pond for containment under the 1957 cell engineered cover
- Implementation will include consolidation of clean native soil from an appropriate borrow source located at the INEEL
- Contouring and grading of surrounding terrain to direct surface water runoff away from the covers
- Periodic aboveground radiological surveys following completion of the covers to assess the effectiveness of the remedial action
- Periodic inspection and maintenance following completion of the covers to ensure cover integrity and surface drainage away from the covers

- Access restrictions consisting of fences, posted signs, and permanent markers

- Restrictions limiting land use for at least 100 years following completion of the covers

- Review of the remedy no less than every 5 years until determined by the regulatory agencies to be unnecessary.

The selected remedy addresses the principal risks posed by the Warm Waste Pond by providing shielding from ionizing radiation, a cover to inhibit ecological and human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

The selected remedy of the Chemical Waste Pond (TRA-06) is containment with a native soil cover and institutional controls with possible excavation, treatment, and disposal after sampling. This remedy will provide a sufficient thickness of soil to effectively reduce the potential for human and/or biological intrusion or excavation into the contamination.

The EPA's preference for sites that pose relatively low long-term threats or where treatment is impractical (e.g., TRA radionuclide contamination) is engineering controls, such as containment. In the case of low-level mercury contamination in the Chemical Waste Pond, containment is a protective and cost-effective option to remediate the exposure pathway (homegrown food crop ingestion) determined to pose an unacceptable risk. Based on sampling to be conducted during the remedial design phase to determine the nature and extent of contamination, remediation of the Chemical Waste Pond may include excavation, treatment, and disposal prior to containment with a native soil cover.

A revised cost comparison based on the above-identified sampling will be reviewed by the agencies during the Remedial Design Phase.

The major components of the selected remedy for the Chemical Waste Pond are:

- Containment with a soil cover constructed primarily of native materials

- Implementation will include consolidation of clean native soil from the berms surrounding the Chemical Waste Pond and from an appropriate borrow source located at the INEEL

- Contouring and grading of surrounding terrain to direct surface water runoff away from the cover

- Final cover layer materials will be determined in the Remedial Design/Remedial Action Work Plan but may include a vegetated crested wheatgrass and a gravel mulch layer

- Periodic inspection and maintenance following completion of the cover to ensure integrity and surface drainage away from the cover

- Access restrictions consisting of fences, posted signs, and permanent markers

- Restrictions limiting land use for at least 100 years following completion of the cover

- Review of the remedy no less than every 5 years until determined by the regulatory agencies to be unneccssary.

The selected remedy addresses the principal risks posed by the Chemical Waste Pond by isolating the contaminants, providing institutional controls to inhibit human intrusion, and a long-lasting cover to inhibit the effects of wind and water erosion.

The selected remedy for the Sewage Leach Pond is containment using a native soil cover and institutional controls as described above. This remedy will provide a sufficient thickness of soil to effectively reduce the potential for intrusion or excavation into the contaminated area and will provide shielding against exposure to radionuclide contamination. Prior to placement of the final clean soil cover, contaminated soil will be removed from the sewage leach pond berms for placement in the bottom of the Sewage Leach Pond. The berms of the pond will then be placed into the pond to ensure that any contaminated soil is contained. Additional fill material will be used, as needed, to bring the ponds to grade.

The major components of the selected remedy for the Sewage Leach Pond are:

- Containment by capping with a native soil cover constructed primarily of native materials

- Contaminated soil from the berms will be placed in the bottom of the Sewage Leach Pond cells

- Implementation will include consolidation of soil from the berms surrounding the Sewage Leach Pond and from an appropriate borrow source located at the INEEL

- Contouring and grading of surrounding terrain to direct surface water runoff away from the

cover

- Final cover layer materials will be determined in the Remedial Design/Remedial Action Work Plan but may include a vegetated crested wheatgrass and a gravel mulch layer

- Periodic aboveground radiological survey's following completion of the cover to assess the effectiveness of the remedial action

- Periodic inspection and maintenance following completion of the cover to ensure cover integrity and surface drainage away from the cover

- Accesss restrictions consisting of fences, posted signs, and permanent markers

- Restrictions limiting land use for at least 100 years following completion of the cover

- Review of the remedy no less than every 5 years until determined by the regulatory agencies to be unnecessary.

The selected remedy addresses the principal risks posed by the Sewage Leach Pond by providing, shielding from ioninzing radiation, institutional controls to inhibit human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

For the Cold Waste Pond (TRA-08), the selected alternative is excavation followed by disposal at an appropriate facility. Additional field and laboratory data will be obtained beforehand to optimize.

excavation activities. Current administrative controls designed to protect worker health and safety will be maintained.

The major components of the selected remedy for the Cold Waste Pond are:

- Sampling to identify hot spots

- Excavation of hot spots that are above acceptable levels

- Disposal at an appropriate location (e.g., Warm Waste Pond, 1957 cell).

The selected remedy addresses the principal risks posed by the Cold Waste Pond by effectively removing the source of contamination and thus breaking the pathway by which a future receptor may be exposed.

The selected remedy for the Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15) is Limited Action, consisting of continued use of existing administrative controls and implementation of long-term environmental monitoring for a period of at least 100 years to protect current and future occupational receptors. On the basis of predicted radioactive decay, no further action is expected at the end of 100 years. Five-year reviews would be conducted to ensure that the remedy remains protective for the entire period of administrative controls.

Major components of the selected remedy for TRA-15 are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls

- Access restrictions (e.g., fences, posted signs, and permanent markers)

- Restrictions limiting land use for at least 100 years

- Periodic inspection and maintenance to ensure integrity of institutional controls

- Review of the remedy no less than every 5 years until determined by the regulatory agencies to be unnecessary.

The selected remedy addresses the principal risks posed by the Soil Surrounding Hot Waste Tanks at Building 613 by effectively preventing access to the area and exposure to contaminated media.

For the Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19) and the Brass Cap Area, the selected alternative is Limited Action, with the contingency that when controls established under the Limited Action are not maintained, then an excavation and disposal option would he implemented (to a maximum of 10 ft.). This Limited Action alternative is preferred because the contamination associated with these two sites is located under the ground surface in and around active radioactive waste piping and tank systems and buildings where access is physically limited. Therefore, excavation alternatives are not fully implementable at thuis time, because it cannot be ensured that adequate contamination could be removed to eliminate the need for the controls that would be in place under the Limited Action alternative.

If during a 5-year reviews it is determined that the controls established under the Limited Action alternative could not be maintained or do not continue to be protective, then the contingency of excavation and

disposal would be implemented. Selection of the Limited Action alternative requires that existing administrative controls such as access restrictions and worker protection programs, be maintained to prevent exposure to workers or future inhabitants above acceptable levels and long-term environmental monitoring to be implemented.

Major components of the selected remedy for TRA-19 and the Brass Cap Area are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls

- Access restrictions (e.g., fences, posted signs, and permanent markers)

- Restrictions limiting land use for at least 100 years

- Periodic inspection and maintenance to ensure integrity of institutional controls

- Review of the remedy no less than every 5 years, until determined by the agencies to be unnecessary

- Once controls established under the limited action are not maintained (no longer than 100 years) or do not continue to be protective, then excavation and disposal of contaminated soil will be implemented.

The selected remedy addresses the principal risks posed by the Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19) and the Brass Cap Area by effectively preventing access to the area so that exposure to contaminated media resulting in an unacceptable risk to human health and the environment would not be possible. In addition, if controls established under the Limited Action were not maintained, then excavation and removal of contaminated media would effectively remove the source of contamination and thus break the pathway by which future receptors may be exposed.

The identification of Limited Action as the preferred alternative with an excavation and disposal contingency is based on the 100-year industrial land use assumption for TRA. The validity of this assumption will be evaluated during the 5-year review process. However, the maximum duration of time for which this assumption may be considered valid is up to 100 years from the signing of this ROD.

For the Sewage Leach Pond Berms and Soil Contamination Area, the selected remedy is Limited Action (existing administrative/institutional controls, including implementation of long-term environmental monitoring,) for a period of at least 100 years to protect current and future occupational

receptors. However, through radioactive decay, it is estimated that no further action would be needed at the end of the 100-year periiod. Consistent with the Sewage Leach Pond remedy, however, the windblown radionuclide-contaminated soil berms will be placed in the bottom of the pond as part of the native soil cover. This remedy will continue to prevent or reduce potential occupational exposure to acceptable levels for the 100-year period that institutional controls are in place. The 5-year review process would be used to ensure that the remedy remains effective.

Major components of the selected remedy for Sewage Leach Pond Berms and Soil Contamination Area are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls
- Access restrictions (e.g., fences, posted signs, and permanent markers)
- Restrictions limiting land use for at least 100 years
- Periodic inspection and maintenance to ensure integrity of institutional controls
- Review of the remedy no less than every 5 years until determined by the agencies to be unnecessary.

The selected remedy addresses the principal risks posed by the Sewage Leach Pond Berms and Soil Contamination Area by effectively preventing access to the area so that exposure to contaminated media would result in an unacceptable risk to human health and the environment while radioactive decay occurs.

For the Snake River Plain Aquifer and the Deep Perched Water System, the OU 2-12 ROD remains in place. The Warm Waste Pond, which was the major source of contamination in the perched groundwater, has been replaced by a new lined pond. A monitoring plan will be developed in accordance with the OU 2-13 Remedial Design/Remedial Action Scope of Work, which integrates the monitoring needs of both OU 2-12 and OU 2-13. Until that time, monitoring will continue to be performed as prescribed in the OU 2-12 monitoring plan. Groundwater monitoring will be conducted to verify that contaminant concentration trends follow those predicted by the groundwater model. Computer modeling shows that through natural radioactive decay, natural attenuation, and dispersion, contaminants in the groundwater will steadily decrease to acceptable levels within the next 20 years, which is consistent with the time of continued operations at the TRA. Existing institutional controls, which include land

use and
property access restrictions, will continue to be maintained. The CERCLA 5-year review process will be
used to verify that this recommendation remains protective.

The No Action alternative is reaffirmed and selected as the appropriate alternative for the remaining
47 sites at the TRA on the basis of risks being at an acceptable level or due to the lack of known or
suspected contaminant releases to the environment.

The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO
or in this comprehensive investigation will be discovered in the future as a result of routine operations,
maintenance activities, and decontamination and dismantlement activities at TRA. Upon discovery of a
new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and
appropriate response action taken in accordance with the FFA/CO. In addition, legacy waste that has been
generated as a result of previous sampling activities at WAG 2 (i.e., investigation derived waste) will be
appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to
achieve remediation goals consistent with remedies established for sites under this ROD.

Statutory Determination

The selected remedy for each site has been determined to be protective of human health and the
environment, to comply with federal and state requirements that are legally applicable or relevant and
appropriate (applicable or relevant and appropriate requirements to the remedial actions), and to be cost
effective.

These remedies use permanent solutions and alternative treatment technologies to the maximum
extent practicable. However, because treatment of radionuclide-contaminated soil is not found to be
practical, these remedies do not satisfy the statutory preference for treatment as a principal element of the
remedy. The EPA's preference for sites that pose relatively low long-term threats or where treatment is
impractical is engineering controls, such as containment. In the case of mercury contamination at the
Chemical Waste Pond, the preference for treatment will be fulfilled if the post-ROD sampling indicates
that excavation, treatment, and disposal are necessary.

For those sites where contaminants are to be left in place (containment and Limited Action) in excess

of health-based levels, a review will be conducted every 5 years after ROD signature (statutory 5-year review) to ensure that the remedy is still effective in protecting human health and the environment and to assess the need for future long-term environmental monitoring, and administrative/institutional controls. These comprehensive statutory 5-year reviews will be conducted to evaluate factors such as contaminant migration from sites where contamination has been left in place, effectiveness of institutional controls, and overall effectiveness of the remedial actions. For the Limited Action remedy, it is assumed that the institutional controls will remain in place for at least 100 years. The identification of Limited Action with an excavation and disposal option contingency as the selected alternative for TRA-19 and Brass Cap Area is based on the 100-year industrial land use assumption for the TRA. However, the maximum duration of time for which this assumption may be considered valid for purposes of this ROD is up to 100 years, from the signing of this ROD.

The agencies agree that no action be taken at 47 additional sites. For those sites for which no action is being taken based on land use assumptions, those assumptions will be reviewed as part of the 5-year review.

Signature Sheet

Signature sheet for the Record of Decision for OU 2-13, located in Waste Area Group 2, Test Reactor Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 98035B>

Signature Sheet

Signature sheet for the Record of Decision for OU 2-13, located in Waste Area Group 2, Test Reactor Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

<IMG SRC 98035C>

Signature Sheet

Signature sheet for the Record of Decision for OU 2-13, located in Waste Area Group 2, Test Reactor Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
ATR	Advanced Test Reactor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COCA	Consent Order and Compliance Agreement
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment

ETR	Engineering Test Reactor
FFA/CO	Federal Facility Agreement and Consent Order
FRG	final remediation goal
FS	feasibility study
HQ	hazard quotient
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
IRIS	(EPA) Integrated Risk Information System
LMITCO	Lockheed Martin Idaho Technologies Company
MCL	maximum contaminant level
MTR	Materials Test Reactor
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
OU	operable unit
PCB	polychlorinated biphenyl
PRG	preliminary remediation goals
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
SRPA	Snake River Plain Aquifer
SVOC	semivolatile organic compound
TBC	to be considered
TCLP	toxicity characteristic leaching procedure

TRA	Test Reactor Area
TSCA	Toxic Substances Control Act
UCL	upper confidence level
USGS	United States Geological Survey
VOC	volatile organic compound
WAG	Wastes Area Group

Waste Area Group 2
Record of Decision

1. DECISION SUMMARY

1.1 Site Name, Location, and Description

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 mi (51.5 km) west of Idaho Falls, Idaho, and occupies 890 mi -2 (2,305 km -2) of the northeastern portion of the Eastern Snake River Plain. The Test Reactor Area (TRA) is located in the west-central portion of the INEEL, as shown in Figure 1-1. To better manage environmental investigations, the INEEL is divided into ten Waste Area Groups (WAGs). Identified contaminant release sites in each WAG were in turn divided into operable units (OUs) to expedite the investigations and any required remedial actions. Waste Area Group 2 covers the TRA and contains 13 OUs that were investigated for contaminant releases to environmental pathways. Within these 13 OUs, 55 known or suspected contaminant release sites have been identified. This Record of Decision (ROD) applies to these 55 sites, which, on the basis of the comprehensive remedial investigation(RI)/feasibility study (FS) for WAG 2, were identified as posing a potential risk to human health and/or the environment. Of those 55 sites, 47 are being recommended for "No Action." The locations of the eight sites where remedial action is proposed are shown in Figure 1-2.

Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 500-mi -2 (1,295-km -2) buffer zone used for cattle and sheep grazing. Communities nearest to the TRA are Atomic City (south), Arco (west), Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Sheep,

cattle, hogs, poultry, and dairy cattle are produced; and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government, as shown in Figure 1-3.

Public access to the INEEL is strictly controlled by fences and security personnel. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL approximately 20 mi (32.2 km) away, and U.S. Highways 20 and 26 cross the southern portion approximately 5 mi (8 km) away. A total of 90 mi (145 km) of paved highways pass through the INEEL and are used by the general public.

The TRA was established in the early 1950s for studying the effects of radiation on materials, fuels, and equipment. Three major reactors have been built at the TRA, including the Materials Test Reactor (MTR), the Engineering Test Reactor (ETR), and the Advanced Test Reactor (ATR). The ATR is currently the only major operating reactor at the TRA. Approximately 420 people are employed at the TRA.

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<IMG SRC 98035G>

The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. The aquifer is approximately 200 mi (32 km) long, 20 to 60 mi (32.2 to 96.5 km) wide, and covers an area of approximately 9,600 mi -2 (24,853 km -2). The depth to the SRPA varies from approximately 200 ft (61 m) in the northeastern corner of the INEEL to approximately 900 ft (274 m) in the southeastern corner, a distance of 42 mi (67.6 km). Depth to groundwater is approximately 480 ft (146.3 m) below TRA. Drinking water for employees at TRA is obtained from production wells in the northeastern part of the facility.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The TRA was established in the 1950s as a testing area for studying the effects of radiation on materials, fuels, and equipment. In July 1989, the Environmental Protection Agency (EPA) proposed listing the INEEL on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The EPA issued a final ruling that listed INEEL as an NPL site in November 1989. The Federal Facility Agreement and Consent Order (FFA/CO) was developed to establish the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act. The FFA/CO identified 13 OUs within TRA WAG 2 that required further study under the CERCLA process. An additional 10 sites were determined to need no further action at the time the FFA/CO was signed.

The DOE, EPA, and Idaho Department of Health and Welfare (IDHW) decided that hazardous waste release sites at TRA would be remediated through the CERCLA process, as defined in the FFA/CO, which superseded the existing RCRA-driven Consent Order and Compliance Agreement requirements. An investigation was conducted in 1990 at the TRA Warm Waste Pond to support a remedial decision required under CERCLA. An Interim Action ROD was signed in 1991, and an interim action was conducted at the Warm Waste Pond in 1993. The interim action consisted of (1) consolidating sediments contaminated above the action level of 690 pCi/g cesium (Cs)-137 for the Warm Waste Pond 1964 cell and backfilling the 1964 cell with clean material; (2) placing the contaminated Warm Waste Pond 1964 cell sediments into the Warm Waste Pond 1952 cell; (3) collapsing the contaminated sidewalls into the base of the Warm Waste Pond 1957 cell; and (4) covering the contaminated Warm Waste Pond 1957 cell sediments with clean material.

In December 1992, the ROD was issued for OU 2-12, the TRA Perched Water System. The selected remedy was "No Action" with continued groundwater monitoring and a 3-year review of the monitoring system. After 3 years of post-ROD monitoring, chromium and tritium concentrations in two of the SRPA monitoring wells remain above drinking water standards. Overall, good agreement between actual and expected concentrations for other contaminants exists on the basis of the 3 years of study since the OU 2-12 ROD was signed. The deep perched water system wells show that removing the Warm Waste Pond from service has reduced concentrations with time. In general all monitoring wells show a decreasinig contaminant concentration trend with the exception of one well with chromium and one well with tritium, which show a statistical increase with time. The objectives of the monitoring program are to

verify contaminant concentration trends in the SRPA, as predicted by computer modeling, and to evaluate the effect that discontinuing discharge to the Warm Waste Pond has had on contaminant concentrations in the SRPA and the deep perched water system. Since July 1993, groundwater monitoring has been conducted at a network of SRPA wells in the vicinity of the TRA and for selected deep perched water zone wells. This monitoring, currently conducted semiannually, is anticipated to continue until January 1998, at which time the scope of continued future monitoring under the OU 2-13 ROD is anticipated to have been established and implemented.

Localized areas of radionuclide-contaminated soil were located in the North Storage Area and north of the North Storage Area fence at TRA. This soil contamination was removed in the summer of 1995 and 1996 as part of an INEEL-wide cleanup of radioactively contaminated surface soil. Confirmation samples show that removal of this contamination was effective.

The OU 2-13 comprehensive RI/FS conducted at the TRA resulted in the identification of eight sites with potential risk to human health and requiring some type of remedial action (DOE/ID-10531), February 1997). The Proposed Plan (March 1997) identified the agencies preferred alternatived for each site of concern.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA §113(k)(2)(B)(i-v) amd §117, a series of opportunities for public information and participation in the RI and decision process for the WAG 2, TRA, was provided to the public from September 1995 through May 1997. The opportunities to obtain information and provide input included "kick-off" and "update" fact sheets, which briefly discussed the status of the comprehensive investigation, numerous INEEL Reporter newsletter articles (a publication of the INEEL's Environmental Restoration Program), two Citizens' Guide supplemental updates, a proposed plan, and focus group interactions, which included teleconference calls, briefings and presentations to interest groups, and public meetings. In addition, many public involvement activities were conducted during two previous investigations and RODs at the TRA. The RODs for the Warm Waste Pond Interim Action (1991) and the Perched Water Remedial Investigation (1992) contain summaries of the public involvement activities that were associated with these two former investigations at TRA.

In September 1994, a kick-off fact sheet concerning the WAG 2, TRA comprehensive RI/FS was sent to about 6,700 individuals of the general public and to 60 INEEL employees on the Community Relations Plan mailing list. Included in the fact sheet was a postage-paid return mailer comment form. A total of five comments were received from the public. These comments were evaluated and considered in the preparation stage of the project workplan. In fall of 1994, three public open houses, held in Idaho Falls, Boise, and Moscow allowed citizens an opportunity to interact with DOE Idaho Operations Office (DOE-ID) and Lockheed Martin Idaho Technologies Company employees concerning the nature and extent of the investigation. It was the initial opportunity for the public to be involved in how the investigation would be conducted.

The project was discussed at an informal availability session in Twin Falls (October 11, 1994) and in Pocatello (October 13, 1994). The same opportunity for informal interactions with agency and INEEL representatives was provided for Moscow (October 18, 1994), Boise (October 19, 1994), and Idaho Falls (October 20, 1994). During these briefings, representatives from the DOE and the INEEL discussed the project, answered questions, and listened to public comments and concerns.

Regular reports concerning the status of the project were included in bimonthly issues of the INEEL Reporter and were mailed to those on the mailing list. Reports also appeared in two issues of a Citizens Guide to environmental restoration at the INEEL (a supplement to the INEEL Reporter) in early 1996 and 1997.

In March 1997, another update fact sheet concerning the project was sent to about 6,700 people on the INEEL Community Relations Plan mailing list. On March 10, 1997, DOE-ID issued a news release to more than 100 media contacts concerning the beginning of a 30-day public comment period pertaining to the WAG 2 TRA proposed plan. This period began March 10, 1997. In response to a request from the public, the comment period was extended 30 days and ended May 9, 1997. Many of the news releases resulted in a short note in community calendar sections of newspapers and in public service announcements on radio stations. Both the fact sheet and news release gave notice to the public that WAG 2 TRA investigation documents would be available before the beginning of the comment period. These documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls, in the INEEL Boise OFfice, and in public libraries in Fort Hall, Pocatello, and Moscow.

Opportunities for public involvement in the decision-making process concerning the WAG 2 TRA

proposed plan began in September 1996 with the establishment of a citizens "focus group" to review the INEEL's Community Relations Plan. The focus group of eight citizens was convened to critique the adequacy of the Community Relations Plan in meeting the public's need for information on the "comprehensive" investigations for an entire WAG. As a result of group interaction with DOE-ID, the State of Idaho, and EPA Region X project managers, it was decided that, for the first time, draft documents being prepared for the upcoming public involvement activities could be reviewed by focus group members. Two teleconference calls to review and discuss the layout and user-friendliness of the information contained in the WAG 2 documents were held in early January for the draft fact sheet and in early February for the draft proposed plan. As a result of focus group recommendations, many of the suggestions identified by the focus group were incorporated into the documents prior to their release to the general public.

For the general public, the activities associated with participating in the decision-making process included receiving the proposed plan, receiving telephone calls, attending the availability sessions one-half hour before the public meetings to informally discuss the issues, and submitting verbal and written comments to the agencies during the 60-day public comment period. At the request of the Shoshone-Bannock Tribes, the three agencies met at Fort Hall in January and March 1997 to give Tribal members and their technical staff a briefing on this proposed plan, as well as on other RIs underway at the INEEL. It was during the second briefing that the Tribes submitted a request for the 30-day extension of the comment period.

Copies of the proposed plan were mailed to 6,700 members of the public on the INEEL Community Relations Plan mailing list on March 7, 1997, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the same information concerning the availability of the proposed plan and the locations of public meetings, and the comment period extension, appeared in six regional newspapers during the weeks of March 9, 16, and 23 in Idaho Falls, Boise, Moscow, Fort Hall, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Post Register (Idaho Falls), the Sho-Ban News (Fort Hall); the Idaho State Journal (Pocatello); the Times News (Twin Falls); the Idaho Statesman (Boise), and the Daily News (Moscow).

The update fact sheet was mailed on March 21, 1997 to about 6,700 members of the public on the INEEL Community Relations Plan mailing list to encourage them to attend the public meetings and

to
provide verbal or written comments. Notice was provided in the fact sheet and on its back cover, explaining that the comment period had been extended to May 9, 1997. A series of three news releases
and newspaper advertisements, including the notice of the extension of the comment period, provided
public notice of these public involvement activities. Offerings for briefings and the 30-day public
comment period (including the 30-day extension of the comment period) that was to begin March 10 and
end May 9, 1997, were also announced. Personal calls were made to stakeholders in the Idaho Falls,
Pocatello, Ketchum, Boise, and Moscow areas the weeks of MArch 10, 17 and 24 to remind individuals
about the meetings and to see if a briefing was desired.

Written comment forms avaliable at the meeting locations including a postage-paid business-reply
Repositories. For those who could not attend the public meetings, but wanted to make formal written
comments, a postage-paid written comment form was attached to the proposed plan.
the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each
meeting to keep transcripts of discussions and public comments. The meeting transcripts were placed in

the Administrative Record section for the WAG 2, TRA, OU 2-13 in five INEEL Information
Repositories. For those who could not attend the public meetings, but wanted to make formal written
comments, a postage-paid written comment form was attached to the proposed plan.

A Responsiveness Summary has been prepared as part of the ROD. All formal verbal comments presented at the public meetings and all written comments are included in Appendix A and in the Administrative Record for the ROD. Those comments are annotated to indicate which response in the
Responsiveness Summary addresses each comment.

A total of about 20 people not associated with the project attended the public meetings. Overall,
twenty citizens provided formal comments; of these, six citizens provided verbal comments, and fourteen
provided written comments. All comments received on the proposed plan were considered during the development of this ROD. The decision for this action is based on the information in the Administrative
Record for these OUs.

On March 19, 1997, project managers from DOE-ID gave a brief presentation on the projects to the
INEEL Environmental Management Site-Specific Advisory Board. The advisory board is a group of 15 individuals, representing the citizens of Idaho, who make recommendations to DOE, EPA, and the State

of Idaho regarding environmental restoration activities at the INEEL.

4. SCOPE AND ROLE OF OPERABLE UNITS AND RESPONSE ACTIONS

The primary source of contamination at WAG 2 is past discharges and releases associated with the TRA warm waste system. For example, radiologically contaminated wastewater was discharged to the Warm Waste Pond. Discharges to the Warm Waste Pond caused contamination of the sediments in the cells of the unit. The Warm Waste Pond was taken out of service and an interim remedial action has been completed (OU 2-10). Infiltration of water from the cells caused the migration of contaminants to the TRA Deep Perched Water System, and ultimately to the SRPA beneath TRA. A ROD has been signed for the Perched Water System (OU 2-12), and post-ROD monitoring is in progress. Windblown contamination, principally from the Warm Waste Pond, is the suspected source of contaminations at the Sewage Leach Pond Berm and Soil Contamination Area. In addition, minor areas of contamination are associated with waste lines and storage tanks in the warm waste system. The tanks in OU 2-05 are, or were, part of the warm waste system, and they have associated releases of contamination (TRA-15 and TRA-19). Radiological contamination at the Brass Cap Area is attributed to leaks from the warm waste lines. Waste Area Group 2 also includes sites that have been contaminated as a result of other operational processes such as the Chemical Waste Pond, Sewage Leach Pond, and Cold Waste Pond. Contaminated sediments remain in these unlined disposal ponds.

The TRA is designated as WAG 2 at the INEEL. Each of these OUs contains a number of contaminant release sites. A total of 13 OUs were investigated under a comprehensive RI/FS to evaluate contamination of environmental pathways (soil, air, and groundwater) and the potential risks to human health and the environment from exposure to contaminated media. Each site has been evaluated comprehensively in relation to the other sites to determine the overall risk posed to human health and the environment. A total of 55 known or suspected contaminant release sites were identified. In order to satisfy the broader objective of INEEL comprehensive risk assessments, an analysis of risk produced through the air and groundwater exposure pathways is evaluated in a cumulative manner. A cumulative analysis of these two exposure pathways involves calculating one WAG-wide risk number for

each contaminant of potential concern (COPC) in each air and groundwater exposure route. Analyzing the air and groundwater pathways in a cumulative manner is necessary because contaminations from all release sites within a WAG are typically isolated from one another with respect to the soil pathway exposure routes. Therefore, the soil pathway exposure route is analyzed on a release site specific or "noncumulative" basis in the INEEL comprehensive risk assessments. Monitoring data, process knowledge, written correspondence, interviews with current and previous employees, previous agency investigations and decisions, and site characterization data were used to determine the nature and extent of contamination at each site and to evaluate potential risks to human health and the environment. Eight of the 55 sites were found to pose risks to human health that exceed acceptable risk levels and were therefore evaluated for remedial action. The screening, development, and detailed analysis of remedial alternatives resulted in the selection of preferred alternatives for each of the eight sites. These alternatives met the goals established for reducing or eliminating risks to human health and the environment and for complying with applicable or relevant and appropriate requirements(ARARs).

In addition to the eight sites that require some type of remedial action, this comprehensive ROD also addresses 47 sites that do not pose an unacceptable risk to human health or the environment, based on evidence compiled during the comprehensive RI/FS. These sites are being recommended for No Action and with approval of this ROD, the No Action decision is formalized. Table 4-1 contains a complete listing of the sites at WAG 2: Section 5.2.5 provides a description of the proposed No Action sites.

Table 4-1. List of WAG 2 sites.

Operable Unit	Site Number	Site Name
None	TRA-10	TRA MTR Construction Excavation Pile
	TRA-23	TRA ETR Excavation Site Rubble Pile
	TRA-24	TRA Guardhouse Construction Rubble Pile
	TRA-25	TRA Sewer Plant Settling Pond Rubble Pile
	TRA-26	TRA Rubble Site by U.S. Geological Survey Observation Well

	TRA-27	TRA North Storage Area Rubble Pile
	TRA-28	TRA North (Landfill) Rubble Site
	TRA-29	TRA ATR Construction Rubble
	TRA-32	TRA West Road Rubble Pile
	TRA-33	TRA West Staging Area/Drainage Ditch Rubble Site
OU 2-01	TRA-02	TRA Paint Shop Ditch (TRA-606)
OU 2-02	TRA-14	TRA Inactive Gasoline Tank at TRA-605
	TRA-17	TRA Inactive Gasoline Tank at TRA-616
	TRA-18	TRA Inactive Gasoline Tank at TRA-619
	TRA-21	TRA Inactive Tank, North Side of MTR-643
	TRA-22	TRA Inactive Diesel Fuel Tank at ETR-648
OU 2-03	None	TRA-614 Oil Storage North
	TRA-01	TRA Acid Spill Disposal Pit
	TRA-11	TRA French Drain at TRA-645
	TRA-12	TRA Fuel Oil Tank Spill (TRA-727B)
	TRA-20	TRA Brine Tank (TRA-731) at TRA-631
	TRA-40	TRA Tunnel French Drain (TRA-731)
OU 2-04	None	TRA PCB Spill at TRA-619
	None	TRA PCB Spill at TRA-620
	None	TRA-027 No. 5 Oil Spill
	None	TRA PCB Spill at TRA-653
	None	TRA-670 Petroleum Product Spill
	None	TRA PW 13 Diesel Fuel Contamination
	TRA-09	TRA Spills at TRA Loading Dock (TRA-722)
	TRA-34	TRA North Storage Area

Table 4-1. (continued).

Operable Unit	Site Number	Site Name
OU 2-05	None	TRA-603/605 Tank
	TRA-15	TRA Hot Waste Tanks Nos. 2, 3, and 4 at TRA-613
	TRA-16	TRA Inactive Radioactive Contaminated Tank at TRA-614
	TRA-19	TRA Radioactive Tanks 1 and 4 at TRA-630, replaced by Tanks 1, 2, 3, and 4
OU 2-06	TRA-30	TRA Beta Building Rubble Site
	TRA-31	TRA West Rubble Site
	TRA-35	TRA Rubble Site East of West Road near Beta Building Rubble Pile
OU 2-07	None	TRA-653 Chromium-Contaminated Soil
	TRA-36	TRA ETR Cooling Tower Basin (TRA-751)

	TRA-38	TRA ATR Cooling Tower (TRA-771)
	TRA-39	TRA MTR Cooling Tower North of TRA-607
OU 2-08	TRA-37	TRA MTR Canal in basement of TRA-603
OU 2-09	TRA-07	TRA Sewage Treatment Plant (TRA-624) and Sludge Pit (TRA-07)
	TRA-08	TRA Cold Waste Disposal Pond (TRA-702)
	TRA-13	TRA Final Sewage Leach Ponds (2) by TRA-732, including SLP-Berm and Soil Contamination Area
OU 2-10	TRA-03B	TRA Warm Waste Pond (sediments)
OU 2-11	TRA-03A	TRA Warm Waste Leach Pond (TRA-758)
	TRA-04	TRA Warm Waste Retention Basin (TRA-712)
	TRA-05	TRA Waste Disposal Well, Sampling Pit (764) and Sump (703)
OU 2-12	None	Perched Water RI/FS
OU 2-13		WAG 2 Comprehensive RVFS including:
	TRA-06	TRA Chemical Waste Pond (TRA-701)
	TRA-41	French Drain Site
	TRA-42	Diesel Unloading Pit
	None	Brass Cap Area
	None	Hot Tree Site
	None	ETR Stack Area

5. SUMMARY OF SITE CHARACTERISTICS

5.1 Physiography, Geology, and Hydrology

The INEEL is located on the northeastern portion of the Eastern Snake River Plain, a volcanic plateau that is composed primarily of silicic and basaltic volcanic rocks and relatively minor amounts of sediment. Underlying the INEEL is a series of basaltic flows with sedimentary rock interbeds. The basalts beneath the TRA are relatively flat and are covered by 30 to 75 ft (9 to 23 m) of alluvial materials and loess. The alluvial materials are composed primarily of well to poorly graded gravel and contain minor amounts of fine-grained materials.

The depth to the SRPA varies from 200 ft (61 m) in the northern portion to 900 ft (274 m) in the southern portion of the INEEL. At TRA, the depth to the SRPA is approximately 450 ft (137 m).

Regional groundwater flow is to the southwest. Above the main aquifer, there are both shallow and deep zones of perched water created by lenses of low permeability sediments (containing silts and clays) within an interbedded basalt-sediment sequence overlying the primary basalt flows, These perched zones are discontinuous and are found at varying depths throughout the TRA.

The climate of the INEEL region is characterized as semidesert with hot summers and cold winters. Normal annual precipitation is 8.71 in. (22.1 cm). The only natural sources of surface water present at the INEEL are Birch Creek, the Little Lost River, and the Big Lost River, which is approximately 1 mi (1.6 km) southeast of the TRA. However, the Big Lost River is typically dry because of the arid climate and high infiltration rates of the alluvium. The only other natural source of surface water at the TRA is occasional heavy precipitation, which results in surface water runoff in natural drainage areas, usually during the period of January through April of each year.

Fifteen distinctive vegetative cover types have been identified at the INEEL, with sagebrush being the dominant species. There are five vegetation types surrounding the TRA: sagebrush-steppe on lava, sagebrush/rabbitbrush, grassland, playa-bareground/disturbed, and juniper. The variety of habitats on the INEEL supports numerous species of reptiles, birds, and mammals. Several bird species warrant special concern because of their threatened status or sensitivity to disturbance. These species include the ferruginous hawk (Buteo regalis), bald eagle (Haliaeetus leucocephalus), prairie falcon (Falco mexicanus), merlin (Falco columbarius), long-billed curlew (Numenius americanus), and the burrowing owl (Athlene cunicularia). The ringneck snake, whose occurrence is considered to be INEEL-wide, is listed by the Idaho Department of Fish and Game as a Category C sensitive species. It should be noted, however, that the TRA is a highly disturbed industrial area with almost continuous human activity that contains little suitable habitat for most of these species. No areas of critical habitat, as defined in 40 Code of Federal Regulations (CFR) Part 300, are known to exist in or around the TRA.

The TRA is located in the south-central portion of the INEEL. The land surface at TRA is relatively flat, with elevations ranging from 4,945 ft (1,507 m) on top of a rubble pile near the Cold Waste Pond to 4,908 ft (1,496 m) at the bottom of the Chemical Waste Pond. Generally, the land surface gently slopes from the west-southwest corner [4,930 ft (1,503 m)] to the east-northeast corner [4,915 ft (1,498 m)].

Much of the INEEL's surface is covered by Pleistocene and Holocene basalt flows. The second most prominent geologic feature is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the INEEL, where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks make up a very small area of the INEEL along the northwest boundary. Three large silicic domes and a number of smaller basalt cinder cones occur on the INEEL and along the southern boundary.

A complex sequence of basalt flows and sedimentary interbeds underlie TRA. From basalt flow samples collected, petrographically similar basalt flows were correlated into 23 flow groups that erupted from related source areas. Known source vents occur to the southwest, along what is referred to as the Arco volcanic rift zone, to the southeast along the axial volcanic zone, and to the north at Atomic Energy Commission Butte. Surficial material at TRA consists of alluvial and terrace deposits of the Big Lost River and is composed of unconsolidated fluvial deposits of silt, sand, and pebble-sized gravel. The uneven alluvial thickness and undulating, basalt surface at TRA are common of basalt flow morphology The basalt flows that underlie the surficial alluvium are separated by sedimentary interbeds that vary in thickness and lateral extent.

The TRA is located on the alluvial plain of the Big Lost River. The thickness of surficial sediment in the vicinity of TRA ranges from 30 to 75 ft (9 to 23 m) and is greatest south of the facility. The surficial sediments at TRA are primarily composed of well to poorly graded gravel and contain minor amounts of fine-grained materials. Most of the soil textures are sandy loams and the primary soil type is mapped as Bannock sandy loam. The TRA is not located in a 100-year flood plain. An extensive flood control system has been built at the INEEL that uses a diversion gate and a series of spreading areas to control high flows from the Big Lost River, which typically occur in the late spring or early summer.

An area north of TRA where surface runoff accumulates contains some damp areas with

sedges and wetland grasses; however, the area is not mapped by the INEEL wetland inventory. It is not expected that any remedial activities would impact these potentially sensitive areas.

The area surrounding TRA has been surveyed in the past, and no sites of archaeological or historical value were found. All potential remedial areas within the fenced area of TRA are considered disturbed areas that do not contain material of archaeological or historic significance. Therefore, the regulatory requirements associated with the preservation of antiquities and archaeological materials/sites are not a concern.

The TRA is not known to be located within a critical habitat of an endangered or threatened species, including, bald and golden eagles, nor are such species known to frequent the TRA proximity. However, bald eagles, golden eagles, and American perigrin falcons have been observed at the INEEL. In addition eight species of concern to the Idaho Department of Fish and Game and Bureau of Land Management have been observed at the INEEL. Remedial activities at WAG 2 are not expected to affect any endangered species because activities are anticipated to be conducted entirely in previously disturbed areas, and limited in both duration and affected area.

No fish or wildlife addressed by the Threatened Fish and Wildlife Act are found at WAG 2, nor do the planned activities at WAG 2 involve the modification of a stream becuase no streams are located on the site. Occasionally, migratory waterfowl are observed at WAG 2. However, the area contains no critical habitat, and remedial activity does not appear to have a potential for adverse impacts to migratory waterfowl.

Several sites located within the WAG 2 area have been deemed potentially eligible for the National Register of Historic Places by the Idaho State Historical Society. The sites include the MTR, the ETR, and the ATR. These sites must be accorded the same protection under the National Historic Preservation Act as if they were listed sites under the Act. Remedial activities within WAG 2 are not expected to adversely affect the sites; however, should future planning identify activities that would potentially impact the sites,

proper mitigative measures would be identified through discussion with the Idaho State Historical Preservation Office.

The SRPA occurs approximately 450 ft (137 m) below TRA and consists of a series of saturated basalt flows and interlayered pyroclastic and sedimentary materials. The EPA designated the SRPA as a sole-source aquifer under the Safe Drinking Water Act on October 7, 1991. The aquifer is relatively permeable because of the presence of fractures, fissures, and voids such as lava tubes in the basalt. Groundwater flow in the SRPA is to the south-southwest at rates between 5 and 20 ft (1.5 and 6 m) per day.

Two perched water zones have been recognized below TRA. In the vicinity of the ponds and retention basin, a shallow perched water zone is formed at a depth of approximately 50 ft (15.2 m). Finer grained sediments and fracture infilling at the alluvium and basalt interface areas impede the downward movement of water, resulting in perched conditions: The shallow perched water eventually percolates through the underlying basalt to a deeper perched water zone. The deep perched water is also caused by low-permeability sediments within the interbedded basalt-sediment sequence and occurs at a depth of approximately 140 to 200 ft (43 to 61 mi). These sediments include silt, clay, cinders, and gravel and appear to be laterally continuous in the vicinity of TRA. The shallow and deep perched waters are two separate zones, with the possible exception of the area of the ponds where they may become one zone depending on the volume of wastewater discharge to the ponds. The perched water bodies are present because approximately 200 million gal (757 million L) per year of water have been sent to the TRA disposal ponds over the past several decades. A major contributor to contamination in the perched water bodies resulted from discharges to the old Warm Waste Pond. Low-level radioactive waste discharges were discontinued on August 12, 1993, when the former Warm Waste Ponds were replaced with a lined evaporation pond. The Cold Waste Pond currently receives an average of approximately 300 gal (1,135 L) per minute of uncontaminated wastewater. There appears to be a strong correlation between hydraulic head patterns in the Perched Water System and the discharge rates to the Cold Waste Pond. In addition, discharges to the Chemical Waste Pond, an unlined surface impoundment designed as an infiltration pond to receive chemical waste from the demineralization plant, average approximately 15 gal (57 L) per

minute.

Waste Area Group 2 encompasses approximately 74 acres (30 hectares), with the majority of the acreage associated with extensive facilities consisting of buildings, graveled parking areas, roads, and cleared fence lines. Surrounding the TRA, however, are several pond areas that were used for the conveyance and discharge of wastewater from facility operations as shown in Figure 1-2. These ponds contain a variety of potentially hazardous contaminants with the primary contaminants being radionuclides. After several of the ponds were removed from service, exposed sediments were subjected to winds resulting in the surrounding surficial soils being contaminated with low levels of radionuclides. An interim cleanup action occurred at the former warm waste disposal pond.

In addition to the disposal ponds and associated windblown contamination, several other types of potentially contaminated sites were identified at the TRA. These sites include: rubble piles, a paint shop

ditch, petroleum tanks, a disposal pit, french drains, brine tank, petroleum and polychlorinated biphenyl (PCB) spills, radiological tanks, cooling towers, a reactor canal, sewage treatment facility, a retention basin, disposal well, and a sampling pit and sump. Possible contaminants consist of organic compounds including petroleum hydrocarbons and PCBs, acids, bases, heavy metals, and radionuclides,

5.2 Nature and Extent of Contamination

The following sections describe the nature and extent of contamination at the eight sites that have been determined to pose an unacceptable risk to human health or the environment. These eight sites within TRA have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

5.2.1 Disposal Pond Sites

5.2.1.1 Warm Waste Pond (TRA-03). The source of contamination in sediments of the three cells [1952], 1957, and 1964, (Figure 5-1)] was low-level radionuclide contaminated wastewater discharged to the three cells from TRA reactor operations. The wastewater included cooling tower

effluent,
wastewater from hot cell drains, laboratory solutions, and floor drainage from the ATR and other test reactors. The resulting contamination consisted primarily of radionuclide-contaminated sediments in the pond bottoms and sidewalls to depths of approximately 2 ft (0.6 m). The primary contaminants of concern (COCs) are Cs-137, cobalt (Co)-60, and chromium (Cr). Concentrations of Cs-137 range from 2.9 to 39,400 pCi/g, and of Co-60 range from 0.2 to 27,100 pCi/g. Concentrations of chromium in the sediments ranged from 0 to 222 mg/kg. Data indicate that both chromium and radionuclides were strongly adsorbed into the surficial sediments and that soil contamination generally did not extend beyond a depth of 2 ft (0.6 m) below the base of each cell.

In 1993, the Warm Waste Pond was replaced by a lined evaporation pond. An interim remedial action was subsequently conducted to provide immediate risk reduction by removing approximately 4 ft (1.2 m) of sediment from the sidewall and 3 ft (0.9 m) of sediment from the base of the 1964 cell and placing of these excavated materials into the 1952 cell. Previously stockpiled materials from cleanup of Warm Waste Pond windblown contamination was also placed in the 1952 cell. The 1964 cell was then backfilled with approximately 10 ft (3 m) of clean soil, and the 1952 cell was covered with a 1.0-ft (0.31-m) layer of clean fill and then revegetated. The balance of the stockpiled material was distributed on the sidewalls of the 1957 cell as shielding. The 1957 cell sidewall sediment was then scraped in to the base of the 1957 cell followed by disposal of materials from a demolished contaminated wooden structure. The 1957 cell was then covered with a 0.5-ft (0.15-m) layer of clean fill. The 1957 cell was not capped because appropriate fill material was being identified and evaluated. In 1995 and 1996, material from OU 10-06 removal actions was also placed in the 1957 cell, including soil contaminated with Cs-137 from the Argonne National Laboratory stockpile, soil contamianted with Cs-137 from the Boiling Water Reactor Experiment, soil contaiminated with Cs-137 from the Experimental Breeder Reactor, soil contaminated with several radionuclides including strontium (Sr)-90, europium (Eu)-152, americium (Am)-241, Cs-137, Eu-154, and Co-60 from the TRA North Storage Area, soil contaminated with Cs-137 and Sr-90 from Test Area North Area B, and soil contaminated with Cs-137 and Sr-90 from the Technical Support Facility.

0.5 ft (0.15 m) of clean fill was placed over these materials. This soil was analyzed for polychlorinated biphenyls (PCBs): however, none were detected. The maximum detection

limit of the data
set was 0.220 ppm. The agencies have determined that these soils need not be managed as PCB-

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contaminated soil since the residual PCB levels are below the Office of Solid Waste and Emergency Response directive guidance level of 25 ppm at Superfund Sites.

Additionally, recent investigations have determined that RCRA-listed waste may have been present in the TRA Warm Waste System when discharges from the warm waste system to the pond occurred. Soil placed in the warm waste pond from Test Area North may be contaminated with RCRA-listed waste. Information regarding releases of RCRA-listed waste can be found in the "RCRA-listed Waste Determination Report for the INEEL Test Reactor Area, October 30, 1997," which has been placed in the Administrative Record. Pages 3-21 through 3-23 of the OU 2-13 comprehensive RI/FS report provide more detailed information on the COC concentrations and volumes of soil consolidated in the OU 2-10 Warm Waste Pond.

5.2.1.2 Chemical Waste Pond (TRA-06). The Chemical Waste Pond was excavated and put into operation in 1962 as an unlined infiltration pond designed to receive chemical waste from a demineralization plant at the TRA. The pond currently receives effluent containing mineral salts, with average discharge to the pond being 15 gal (57 L) per minute. In addition, until 1982, solid and liquid wastes were disposed directly into the pond from a support structure constructed for waste disposal. This disposal included corrosives and other waste. A tank containing battery acid from the vehicle storage facility at the Central Facilities Area was drained into the Chemical Waste Pond in 1992. Possible disposals into the pond, including pesticides, solvents, PCBs, methylene chloride, and biocides, are suspected, but not documented. However, the Track 1 document for this site indicates that these reports are unsubstantiated. Samples collected from the pond in 1990 (Figure 5-2) were analyzed for metals known to be associated with the demineralization process (i.e., silver, arsenic, barium, cadmium,

chromium, copper, mercury, nickel, selenium, and zinc), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PCBs. The sample results indicate that only barium and mercury exceed background levels presented in the OU 10-06 soil background document. The Chemical Waste Pond is identified in the FFA/CO as a land disposal unit. Application materials for a wastewater land application permit were submitted to the State of Idaho for review in late January 1997.

Maximum total concentrations of the metals were 3,830 mg/kg for barium and 133 mg/kg for mercury in an area where standing water occurs within the pond. The two metals have the highest concentrations in surface sediments, with concentrations decreasing with depth to background concentrations from 10 to 16 ft (3 to 5 m) below the surface. In the 1990 sampling event, PCBs were detected in 20 surface samples, with a maximum concentration of 0.33 mg/kg; they were not detected in subsurface samples. Volatile organic compounds and SVOC concentrations were either undetectable or below regulatory concern.

The most recent release of hazardous materials occurred in May and June 1995, when approximately 287,100 gal (1,068,788 L) of liquid used to neutralize and flush out-of-service acid and caustic tanks were disposed to the pond. After disposal it was determined that the liquids contained 0.3 ppm of mercury. which exceeds the toxicity characteristic leaching procedure (TCLP) limit of 0.2 ppm for D009 mercury hazardous waste. The total mass of mercury contained in the Chemical Pond from all past disposal operations is estimated to be approximately 8.0E+07 mg. The mercury contribution from the 1995 release is relatively small and is not expected to increase human health or ecological risk at the site.

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5.2.1.3 Cold Waste Pond (TRA-08). The Cold Waste Pond has been continually managed as a disposal site for nonradiologically contaminated wastewater since its construction in

1982. The pond consists of two cells, which are used for cold waste disposal, primarily from cooling tower effluent and from air conditioning units, secondary system drains, floor drains, and other nonradioactive drains throughout TRA. Historically, only one of the two cells is used at a time, and flow of wastewater is alternated from one cell to another on an annual basis. Wastewater that is discharged into the Cold Waste Pond percolates through the soil to form the perched water zones beneath TRA. Effluent routed to the pond has been monitored for metals, organic compounds, and radionuclides since 1986. Soil samples were collected from the bottom of the two cells in 1990 (Figure 5-3) and analyzed for gamma-emitting radioisotopes, TCLP metals, and VOCs. Radionuclides, including Co-60, Cs-134, Cs-137, and Eu-154, were detected at concentrations slightly above INEEL background levels in several samples. These low levels of radionuclides were found in samples collected from the pond berms and are thought to be the result of windblown soil contamination from the Warm Waste Pond rather than from effluents discharged to the Cold Waste Pond. Low levels of VOCs (carbon tetrachloride, tetrachloroethylene, tetrahydrofuran. 1,1,1-trichloroethane, and xylene) and metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, and silver) were also detected in the pond sediments.

In addition, in May 1996, sediment samples were collected from the Cold Waste Pond. Radionuclides, including Co-60, Cs-137, and Am-241, were detected at background or slightly above background concentrations. The results of this sampling effort can be found in the Administrative Record under the OU 2-13 Comprehensive RI/FS. Currently, a wastewater land application permit was submitted to the State of Idaho for review and approval in late January 1997.

5.2.1.4 Sewage Leach Pond (TRA-13). The Sewage Leach Pond is located outside the TRA facility fence and consists of two cells where effluent was discharged from sanitary sewer drains throughout TRA. The first cell (southern) was constructed in 1950 and the second (northern) in 1965. The system was routinely monitored by the Environmental Monitoring Unit beginning in 1986. Process knowledge; Indicates that effluent is limited to sewage. However, low-level gamma-emitting radionuclides were detected in the bottom of the 1950 cell, and alpha and gamma-emitting radionuclides were detected in a sludge pit located south of the Sewage Treatment Plant. The source of the contamination has been attributed to windblown sediments from the Warm Waste Pond. After a preliminary investigation, DOE-ID recommended that the bottom of the pond be backfilled when it was removed from

service.

IDHW and EPA concurred. Construction of a new sewage treatment facility, including a lined evaporation pond, was completed in December 1995, and the former Sewage Leach Pond and Sewage Treatment Plant were removed from service.

5.2.2 Subsurface Release Sites

Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. Therefore, soils at those sites associated with releases from the warm waste system or hot waste system will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action.

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5.2.2.1 Soil Surrounding Hot Waste Tanks at Building TRA-613 (TRA-15). The TRA-15 site is the location of underground Tanks 1 and 2 that leaked radiologically contaminated and possibly hazardous waste to surrounding soil. Four underground tanks are located at this site. Leaks from Tank 1 were determined to be the source of subsurface contamination identified in the 1993-1994 time frame. Four borings were drilled from the surface to basalt to depths of 30 to 31 ft (~9.5 m), as shown in Figure 5-4. Samples collected from these borings show soil is contaminated with Sr-90 and Cs-137 at or below a depth of 20 ft (6 m). Surface spills and leaks were also reported, but a surface soil contamination assessment conducted in 1994 showed that only low levels of Cs-137 to a maximum of 8.3 pCi/g were detected. However, surface samples collected in 1993 from borehole No. 3 showed Cs-137 concentrations as high as 33 pCi/gm.

Lead was detected in all the samples and ranged from 4.9 to 225 mg/kg. Chromium was detected from 4.45 to 31 mg/kg, and arsenic was detected from 2.1 to 10 mg/kg. Sampling results

indicate that volatile and semivolatile constituents were not detected at the site.

5.2.2.2 Soil Surrounding Tanks 1 and 2 at Building TRA-630 (TRA-19). The TRA-19 site (Figure 5-5) consists of subsurface soil contamination suspected of resulting from leaks from the radiologically contaminated waste drain line that originates at the Gamma Facility Building (TRA-641) or from possible releases from four underground catch tanks associated with the MTR. The original four catch tanks from the MTR were contained in a concrete vault. The tanks and vault were removed and replaced with new ones in 1985 and 1986. The original tanks were found to be intact upon removal and although the outside surface appeared to be degrading, the fiberglass liners had not been breached. Therefore, no releases from the tanks were suspected. Several spills inside the vault, however, had been reported as a result of pipe-cutting operations during tank removal, from reconnecting pipelines to the new, tanks, and from a damaged waste drain line from Building TRA-641, but nothing was released to the soil that remained after the tank upgrade. Recently it has been determined that hazardous waste has been and are being contained in the hot waste catch tanks near the TRA-19 release site. This raises the concern regarding whether releases associated with the hot waste system (i.e., TRA-19, TRA-15, and the Brass Cap Site) were appropriately characterized given the probability of nonradionuclide hazardous constituents having been released and only radionuclide sampling analysis performed. To address this issue, the agencies agreed that TRA-15 could serve as a corollary for release sites associated with the Hot Waste System because more complete characterization was performed at TRA-15 (radionuclides, metals, volatile, and semivolatile organic compounds). However, the data collected would not be sufficient to fully support a hazardous waste determination at TRA-15, TRA-19, and Brass Cap Area given the present knowledge of other listed hazardous wastes that were not sampled/analyzed as part of the general investigation at TRA-15. Therefore, a hazardous waste determination will need to be completed when excavation and disposal occur and the soil managed accordingly.

Limited sampling conducted at TRA-19, information from field screening data collected during tank removal, and information from Health Physics Technician logs indicate that COCs in soil resulting from pipeline leaks are likely to include Co-60, Cs-134, Cs-137, and Sr-90. The contamination is suspected to be the result of a leak from the radiologically contaminated waste drain line that originates at the Gamma

Facility Building (TRA-641) rather than the TRA-730 tanks or tank vault. Because the line is located at a depth of 8 ft (2.4 m), the contamination is suspected to extend below this depth. It should be noted that the Gamma Facility Building is no longer in use and is scheduled to undergo decontamination and decommissioning.

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5.2.2.3 Brass Cap Area. The Brass Cap Area is located in the center of TRA, near building TRA-630, and is southeast of site TRA-19 (see Figure 5-5). The contamination at this site is attributed to leaking warm waste lines. Following discovery of the contamination, the leaking waste line was repaired and contaminated soil associated with waste line repairs was removed. During removal of the contaminated soil, water collected in the bottom of the excavation. Actions included removing the soil and concrete in the area, identifying the leak, and repairing a pipeline elbow, The highest radiation levels were present directly above the elbow in the wasteline. Following the repair, the excavation was backfilled with clean soil and then resurfaced with concrete. The source of the water was determined to be a leaking warm waste line, located 5 ft (1.5 m) south and 5 to 6 ft (1.5 to 1.8 m) below the level of the excavation. The extent of migration of the radiological contamination under the concrete surface was characterized by boring six 8-inch-diameter holes through the concrete, followed by measurements using field screening instruments (intrinsic Germanium detector, multichannel analyzer, and tungsten collimator).

The extent of contamination in the excavation was determined by driving a hollow-pointed pipe into the ground at the bottom of the excavation and measuring the radiation inside the pipe.

This survey indicated that the soil was contaminated to a depth of approximately 10 ft (3 m). Soil sample results from the excavation indicated that the radionuclide contaminants consist primarily of Cs-137 and Cs-134, with lesser amounts of Sr-90 and Co-60. Contaminant estimates at the Brass Cap Area are based on radiation measurements rather than direct soil sampling results. It is not known whether chemical contaminants exist at this site. Following the soil removal and leak repair, the excavation was backfilled with clean soil and resurfaced with new concrete. A brass marker (hence, the name Brass Cap Area) was placed in the concrete to designate the area of subsurface contamination.

5.2.3 Windblown Surficial Contamination Site

5.2.3.1 Sewage Leach Pond Berms and Soil Contamination Area. The soil contamination area (Figure 5-6) is a fence-enclosed radiation control area on the north and south sides of the Sewage Leach Pond. The fenced area is approximately 475 x 480 ft (145 x 147 m). Radiological contamination on the south side of the southern berm (Figure 5-7) is attributed to Warm Waste Pond sediments. However, radiological contamination on the north side of the southern berm may have resulted from windblown Sewage Leach Pond sediments and/or the Warm Waste Pond windblown sediments.

A sampling investigation was conducted in the summer of 1994 to characterize the radionuclide contamination in surface soil northeast and southwest of the Warm Waste Pond. Fifty samples were collected along transects, which included the area adjacent to the Sewage Leach Pond. The most frequently detected radionuclides were Cs-137, Co-60, and Sr-90. Interim action at Warm Waste Pond in 1993 included excavation and consolidation of the contaminated pond sediments, which were then covered with clean soil, thus eliminating the suspected source of the windblown surface soil contamination. During this interim action, a front-end loader was used to remove contaminated surface soil with instrument reading of over 100 counts per minute. No verification samples, however, were collected to confirm the effectiveness of this contamination removal activity at that time.

In 1995, additional sampling was conducted to characterize the surface soil contamination near the Sewage Leach Pond; this sampling confirmed a reduction in contamination. Surface soil samples were randomly collected from 18 locations on the southern berm and from 18 locations in the remainder of the soil contamination area. Cesium-137 was detected in all samples collected on the southern

berm and is the
COC that causes an unacceptable risk. Other isotopes detected in berm samples were Co-60, Ag-108m.

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and Am-241. Also detected were the metals silver, barium, beryllium, cadmium, chromium, copper,
mercury, nickel, lead, and zinc. The SVOCs pyrene, fluoranthene, phthalates, chrysene,
benzo(b)fluoranthene, and 4-chloroanaline were also present. All metals were detected at or below
background concentrations. All SVOCs were nondetectable.

Samples from the remainder of the area had the same radionuclide contaminants, but at lower levels
than found in the berm samples. The primary COCs are Co-60 and Cs-137. Levels of contamination,
however, are below the preliminary remediation goal concentrations for radionuclides.

5.2.4 Snake River Plain Aquifer and Deep Perched Water System

Infiltration of water from the pond system at TRA has caused contaminant migration to the SRPA. A
chromium plume with concentrations currently above maximum contaminant levels (100 µg/L) extends
both south and southwest of TRA. A tritium-contaminated plume with concentrations currently above
maximum contaminant level (MCLs) also exists, extending both south and southwest of TRA. Semiannual
monitoring of these plumes continues. Computer modeling was conducted to determine the predicted
contaminant level in the future. Through radioactive decay (tritium), natural attenuation, and dispersion
processes, contaminant levels in the SRPA are expected to be reduced to less than MCLs (100 µg/L)
between the years 2004 and 2016. In order to evaluate the possibility of overlapping groundwater
contaminant plumes with other areas, contaminant source terms from the TRA modeling effort are

included in the OU 3-13 groundwater modeling effort at the Idaho Chemical Processing Plant.

The perched water zones underlying TRA are contaminated from infiltration of wastewaters from the system of ponds. An Investigation of the two perched zones (shallow and deep) was conducted. The ROD for the TRA Perched Water System, OU 2-12, was issued in December 1992. It was determined in the ROD that no remedial action was necessary to ensure protection of human health and the environment. That decision was based on the results of human health and ecological risk assessments (ERAs), which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected or future use of the SRPA beneath the deep perched water system at TRA. One of the assumptions for the no-remedial-action decision was that groundwater monitoring would be conducted to verify that contaminant concentration trends follow those predicted by a groundwater computer model. It was further stated that a statutory review, of this decision would be conducted by the agencies within 3 years to ensure that adequate protection of human health and the environment continues to be provided.

A technical memorandum was prepared in August 1996 that presents the 3 years of post-ROD monitoring data and provides an evaluation of hydrologic and groundwater contaminant conditions for the TRA deep perched water system and the underlying aquifer (refer to Section 5.2.5.12 for more information regarding the results of the 3-year post-ROD monitoring). The agencies agree that the remedy selected for OU 2-12 continues to provide adequate protection of human health and the environment. Specific recommendations in the OU 2-12 3-year review include continued sampling at SRPA wells TRA-06 and TRA-08, replacement of positive displacement pumps in wells TRA-06 and -08 by submersible pumps, and sampling on a semiannual basis for both deep perched water system and SRPA wells. The SRPA wells will be sampled for total dissolved chromium and tritium semiannually and cadmium, Co-60, and Sr-90 annually; deep perched water system wells will be sampled for total dissolved chromium, tritium, cadmium, Co-60, and Sr-90 semiannually. The OU 2-12 ROD is a final ROD and stand-alone document

A required monitoring plan will be developed following signature of this ROD. Monitoring performed in accordance with the OU 2-12 ROD will be integrated into the OU 2-13 post-ROD groundwater monitoring plan. The Warm Waste Pond and the Sewage Leach Pond have also been replaced by lined ponds, resulting in the elimination of a previous large source of contaminated effluent impacting the perched water zones. The impact of this source reduction will continue to be monitored.

5.2.5 No Action Sites

The agencies agree that no action will be taken under CERCLA at the sites discussed in the following sections. For those sites for which no action is being taken based on land use assumptions, those assumptions will be reviewed as part of the 5-year review.

5.2.5.1 Rubble Piles. Ten sites consisting of uncontaminated rubble plies were examined in the initial review of the TRA site. Because they contain no hazardous substances that would pose an unacceptable risk, they were given a No Action status in the FFA/CO and were not considered further in the RVFS. Miscellaneous asbestos tiles were discovered and cleaned up from the rubble piles in 1996.

5.2.5.2 Paint Shop Ditch (OU 2-01). The Paint Shop Ditch is an open ditch that was used for disposal of paint-shop waste until 1982. The site has been characterized; concentrations of contaminants are below risk-based levels of concern. A determination of No Further Action for the site was approved by the agencies in December 1991.

5.2.5.3 Inactive Fuel Tank Sites (OU 2-02). This OU 2-02 site includes five underground storage tanks that contained petroleum products. All five of the tanks have been removed from the ground; the initial site characterizations found that either no, or minimal, contamination remained at the sites. The sites were all recommended and approved for No Further Action by the agencies in 1992 and 1993.

5.2.5.4 Miscellaneous (OU2-03). This OU includes six miscellaneous sites where sources of contamination no longer exist. All sites in this OU received No Further Action determinations from the agencies in 1993. Following are summaries of those sites.

TRA-01 is a burial site containing excavated soil from a 1983 sulfuric acid spill. The acid in the soil was immediately neutralized at the spill site before excavation and burial. Bounding calculations show

that the calcite content of the soil would be sufficient to neutralize more than 10 times the estimated release volume. As no source exists at the site, no further action is appropriate.

TRA-11 is a french drain connected to the overflow vent of a 1,000-gal (3,875-L) sulfuric acid tank. No documented overflows or evidence of spills is associated with the site. Risk-based calculations demonstrate that the threshold quantity of acid necessary to generate an unacceptable risk would have been appropriately documented. As no source likely exists at the site, no further action is appropriate.

TRA-12 is a site where, in 1983, an estimated 110 gal (416 L) of No. 5 fuel oil overflowed from a 2000,000-gal (75,708-L) aboveground tank. Two independent eyewitnesses report that the flow never reached the ground (because of the high viscosity of the oil), and no ground staining was observed. Bounding calculations show that VOCs would not be present even if the spill volume was increased by a factor of ten. As no source exists at the site, no further action is appropriate.

TRA-20 is the site of a 15,000-gal (56,781-L) aboveground concrete tank used for processing sodium chloride solution, sodium hydroxide, and sulfuric acid. Before using the sodium hydroxide and sulfuric acid in the tank, it was lined with epoxy. The tank lining was found to be intact during a 1992 inspection. Bounding calculations show that the calcite present in 10 yd 3 of soil would be sufficient to neutralize at least 315 gal (1,192 L) of the acid. Risk-based calculations indicate that the threshold quantity of sulfuric acid [315 gal (1,192 L)] is greater than the amount likely to have been spilled. No further action is appropriate.

TRA-40 is the site of a 45-ft (13.7-m) concrete-lined trench containing piping for demineralizer solutions. A portion of the trench was unlined prior to 1989. Releases before 1984 would have involved nonhazardous substances. Subsequently, the system transferred sulfuric acid and sodium hydroxide. There are no documented releases from the site, and an inspection performed in 1992 indicated that the system was in a well maintained condition. Had a leak occurred, approximately equal volumes of acid and base would have been released. As no source exists at the site, no further action is appropriate.

TRA-614 is a site consisting of an earthen berm where small quantities of oil may

have been disposed. There is no documentation or evidence of oil disposal at the site. The site is currently beneath Building TRA-628. With excavation of the berm, there is no known source. No further action is appropriate.

Based on these results, no further action is appropriate for all OU 2-03 sites.

5.2.5.5 Petroleum and PCB Spill Sites and North Storage Area, Including the Soil Contamination Area (OU 2-04). Sites recommended for No Further Action include seven sites of mainly petroleum products, including three with PCB-contaminated areas. The other four sites include diesel fuel contamination in a perched water well, contamination beneath an old loading dock, and two areas of fuel oil contamination. Also included in OU 2-04 is the North Storage Area, including the North Storage Area Soil Contamination Area where localized areas of radionuclide-contaminated soils exist. The agencies recommend no further action because potential concentration of contaminants and associated risks are below levels that would justify cleanup action or further investigation.

TRA-653 is the site of a PCB transformer spill. After excavation of 8 yd 3 of contaminated soil and backfilling with clean soil in 1990, the highest PCB concentration was found to be 16 ppm under 4 ft (1.2 m) of clean soil. The maximum surface concentration was 2 ppm located in a 2 x 8 ft (0.6 x 2.4 m) area that was not excavated. The use of a conservative computer screening model demonstrated that the concentration of PCB is below that necessary to pose a risk to groundwater. Although the concentration of PCB for the soil investion pathway is above the 1 in 1,000,000 concentration of 0.08 ppm for carcinogenic risk, it is below the 25 ppm cleanup level established under the Toxic Substances Control Act (TSCA) for restricted industrial areas. No further action is appropriate.

TRA-619 is the site of a PCB transformer spill. Approximately 10 to 12 yd 3 of soil were removed from around the transformer. The site was backfilled with approximately 2 ft (0.6 m) of clean soil. The highest PCB concentration of 22 ppm is below the 2 ft (0.6 m) of contaminated soil and the concrete pad, which was left in place. Although the concentration of PCB for the soil ingestion pathway is above the 1 in 1,000,000 concentration of 0.08 ppm for carcinogenic risk, it is well below the 25 ppm cleanup level established under TSCA for restricted industrial areas, and is under at least 2 ft (0.6 m) of clean soil. No

further action is appropriate for this site. Note that this site description was inadvertently left out of the list of No Action site descriptions in the Proposed Plan.

TRA-626 is the site of a PCB transformer spill. Approximately 36 yd 3 of soil and concrete were excavated from the site, followed by backfilling with clean soil. The highest PCB concentration is 24 ppm under 4 ft (1.2 m) of clean soil. Computer model results demonstrate that the concentration of PCB is below that necessary to pose a risk to groundwater. Although the concentration of PCB for the soil ingestion pathway is above the 1 in 1,000,000 concentration of 0.08 ppm for carcinogenic risk, it is below the 25 ppm cleanup level established under TSCA for restricted industrial areas, and is under 4 ft (1.2 m) of clean soil. No further action is appropriate.

PW-13 is a monitoring well site where diesel fuel was discovered at a depth of 65 to 75 ft (20 to 23 m) during drilling operations. After approximately 20 gal (76 L) of diesel fuel, the borehole was observed for several days without additional influx of fuel being noted. The well was subsequently completed at a depth of 90 ft (27 m). The well has been sampled four times (July 1993, October 1993, January 1994, and April 1994) and analyzed for total petroleum hydrocarbons. The well was sampled and analyzed twice for benzene, toluene, ethyibenzene, and xylene. All analyses were reported as nondetects, with the exception of ethylbenzene, which was detected in samples at concentrations ranging from nondetect (April 1994) to a high of 5.41 ppb (July 1993). These levels are well below the allowable drinking water MCL of 700 ppb.

TRA-09 is the site of a former loading dock used to store petroleum products and solvents where, as a result of transfer operations, small quantities of this material may have been spilled. Bounding calculations performed demonstrated that the hazardous constituents from small incidental spills would have volatilized in the 8 years since the dock was removed. Soil staining observed in 1985 when the dock was removed is no longer-visible, qualitatively indicating natural degradation of the spill constituents.

TRA-670 is the site of surficial oil staining at the former location of two 500-gal (1,893-L) aboveground waste oil storage tanks. Anecdotal information indicates that the tanks had been overfilled on at least one occasion and that small incidental spills would occur during routine

transfer operations. The tanks and stained soil were removed from the site in 1987, and the area was backfilled with clean soil. It is unlikely that sufficient contamination remains at this location to pose an unacceptable risk.

TRA-627 is the site of oil-stained soils at an oil transfer pump house. The pump house was used to transfer No. 5 fuel oil from trucks to storage tanks. Incidental spills occurred during the transfer as lines were connected and disconnected. Whenever these spills occurred, however, it was standard practice to use a sand absorbent on the spill. The sand was then put into a "sand box" before disposal at the Central Facilities Area landfill. The only hazardous constituents of No. 5 fuel oil are low levels of polycyclic aromatic hvdrocarbons. The high viscosity of No. 5 fuel oil would have prevented significant infiltration prior to removal of the spills.

The North Storage Area, including, North Storage Area Soil Contamination Area located north of the North Storage Area fence, contained localized radionuclide-containinated soil. This soil contamination area was removed in the summers of 1995 and 1996 as part of an INEEL-wide cleanup of radioactively contaminated surface soil. Confirmation of samples show that removal of this contamination was effective. No further cleanup action is necessary, and the No Action option is appropriate.

5.2.5.6 Hot Waste Tanks (OU 2-05). This OU contains two tank sites (TRA-16 and TRA-603/005) used for hot waste disposal. Site TRA-16 was an underground hot waste storage tank. The contents of the tank were sampled in April 1993 and found to be an ignitable waste contaminated with low levels of radionuclides, primarily uranium isotopes. The tank contents were removed, and the tank was excavated in August 1993. Note that no leaks were detected and the tank was intact upon inspection when it was removed. The risk evaluation of the site found no unacceptable risk from exposure through any complete pathway. At the TRA 603/605 tank, there had been no evidence of leaks. It is unlikely that a source of contamination remains at the site. The process water pipe loop is constructed of 0.25-in. (0.64-cm) stainless steel and is unlikely to have lost sufficient integrity to allow leakage. In addition, any leaks would be collected in a sump within the building where the portion of the loop being used for

storage is located.

There have been no reports of leaks. It is unlikely that there is a source of contamination at this site. The agencies concurred in 1994 that no further action is necessary for these two tank sites.

5.2.5.7 Rubble Sites (OU 2-06). This OU 2-06 site consists of three separate rubble piles, which were generated as a result of previous construction activities at the TRA, These piles are located outside the existing fenced perimeter and were used intermittently from 1952 through 1971. No source of hazardous waste contamination exists at any of the three sites; therefore, no complete pathways were identified. After a limited investigation, the agencies concurred in October 1993 that no further action is necessary at these three sites. Historical data, including photographs, information from operations Personnel, and field screening data obtained during site visits provided the basis for this evaluation.

5.2.5.8 Cooling Tower Sites (OU 2-07). This OU consists of areas surrounding the cooling tower basins and cooling, towers associated with the ETR, MTR, and ATR. The sites were suspected of being contaminated with hexavalent chromium. However, the majority of chromium detected in the soil had been reduced to the less toxic trivalent state and is in the elemental state. Risk evaluations conducted for current occupational and future residential scenarios indicated that the potential risk for all pathways and all scenarios does not exceed 1 chance in 1,000,000. Based on these results, DOE-ID recommended, and the EPA and IDHW concurred, that no further action is appropriate.

5.2.5.9 Materials Test Reactor Canal (OU 2-08). For approximately 8 years, the canal, installed in 1952, leaked significant quantities of water contaminated with radionuclides. During an investigation in 1994, historical data (including operating procedures), monitoring data, and information from site personnel acre collected and evaluated. Potential contaminants in the subsurface are available for release only to the groundwater pathway, as the base of the canal is 14 to 32 ft (4 to 10 m) below ground level.

The groundwater pathway was evaluated using a conservative computer screening model. The results of the modeling indicate that the COCs (cadinium, beryllium, cesium, and cobalt) are relatively immobile, based on their respective computed travel times to the underlying aquifer. In addition, the potential for contaminant migration from moisture infiltration is limited by the fact that the major portion

of the canal is located below the MTR building and the portion that extends beyond the building is under pavement. Based on this information, the risk to human health and the environment to exposure by contaminants in the canal is considered low. DOE-ID recommended, and EPA and IDHW concurred, that no further action is appropriate for this site.

5.2.5.10 Sewage Treatment Plant (OU 2-09). Because there is no evidence of a release of a hazardous material, this site was determined to require no further action.

5.2.5.11 Retention Basin, Injection Well, Cold Waste Sump and Pit (OU 2-11). The warm waste retention basin is a large underground concrete basin. The retention basin received the waste routed to the Warm Waste Pond. It was originally designed to hold radioactive wastewater long enough for short-lived radionuclides to decay. The disposal well sampling pit, and sump system located south of the retention basin, were used for the disposal of uncontaminated cooling tower effluent water between 1964 and 1982. The site was evaluated in 1992, and it was determined that the well (TRA-05) sump and sampling pit do not pose an unacceptable risk. Radiological and chemical soil contamination was identified surrounding the warm waste retention basin from releases associated with the basin, piping, and sumps. The results of the OU 2-13 comprehensive baseline risk assessment indicate that the risks associated with the site are within allowable levels. The recommendation from the agencies for these sites is that no further action is appropriate.

5.2.5.12 Perched Water (OU 2-12). This OU comprises the perched water zones underlying the TRA. These zones are a result of water from the Cold Waste Pond, Warm Waste Pond, Chemical Waste Pond, and Sewage Leach Pond infiltrating the ground and perching on low permeability layers (i.e., silts and clays) in the underlying basalt. The investigation of the shallow and deep perched water zones was completed in 1992, and a ROD was signed in December 1992, recommending long-term monitoring and evaluation of monitoring results. After 3 years of post-ROD monitoring, chromium and tritium concentrations in two of the SRPA monitoring wells remain above drinking, water standards. However, insufficient data have been collected to determine the statistical sionificance of these results. Overall, good

agreement between actual and expected concentrations for other contaminants exists on the basis of the 3 years of study since the OU 2-12 ROD was signed. The Deep Perched Water System wells show that removing the Warm Waste Pond from service has reduced contaminant concentrations with time. In general, all monitoring wells show a decreasing contaminant concentration trend, with the exception of one well with chromium (USGS-53) and one well with tritium (USGS-58) that shows an increasing trend with time. The extent of detectable contaminant plumes originating at TRA appears to be less than 5 km, based on United States Geological Survey (USGS) monitoring of the public rest stop well on U.S. Highway 20. Continued monitoring of the SRPA and the perched water below the TRA is recommended.

5.2.5.13 New Sites (OU 2-13). Hot Tree Site-The Hot Tree Site is located in the center of TRA. Screening of the branches of a spruce tree indicated it was contaminated with gamma-emitting radionuclides. The tree was removed, boxed, and disposed in May 1994. Subsequent to the removal of the tree, ten shallow soil boring samples were collected for field screening. The samples were collected approximately 2 ft (0.6 m) below land surface in the immediate area surrounding the former free location, and the tree's root system was surveyed. In addition, three surface soil samples were collected and submitted for analysis. The highest radiologically contaminated areas were located west of the Hot Tree Site, suggesting that a nearby abandoned warm waste line was the contamination source. Adjacent trees were surface screened in August 1994. The surface screening of adjacent trees did not indicate contamination. Surface radiation surveys of the Hot Tree Site indicated a radiation dose rate of 30 to 40 µrem/hr at waist height (i.e., TRA background levels). This suggests that the contamination was confined to the Hot Tree Site.

The warm waste line, which is the suspectd contamination source, is located approximately 10 ft (3 m) west and 6 ft (1.8 m) below land surface of the removed tree. The waste transferred through this line was low-pressure, demineralized acidic water. The acidic condition of the waste could have contributed to the deterioration of the line, which could lead to potential releases. The line was cut and clapped in 1983, so is is not suspected to be a potential source of continuting relases.

Because only Cs-137 was detected in two 1994 surface soil samples, it is the only COPC. Based on the Hot Tree Site, sampling information by TRA facility personnel, and process knowledge of the warm waste line, only gamma-emitting radionuclides Cs-137 and Co-60, and the beta-emitting radionuclide Sr-90, were identified as COPCs at the Hot Tree Site.

Additional sampling was conducted to better characterize the subsurface contamination profile. The results of this sampling effort were evaluated in the baseline risk assessment. The baseline risk assessment showed that an unacceptable risk does not exist at this site because of low contaminant concentrations in the soil. No further action is necessary for this site.

Engineering Test Reactor Stack-The Engineering Test Reactor Stack is located outside and east of the TRA perimeter fence and west of the Warm Waste Pond. The site was suspected to have PCB contamination because tar-containing PCBs were used to coat the inside of the stack. This tar coating had deteriorated since 1957, when the stack was put in operation, and started to leak out the north access door at the base of the stack. Because of this process knowledge, no other COPCs are associated with this site. In addition, samples collected by the facility indicated low levels of PCBs in the soil immediately adjacent to the concrete pad where the stack was located.

Three soil/concrete samples and one duplicate were collected from the soil at the base of the stack. Analysis of the samples indicates that very low levels of PCB contamination are present at this site. The maximum concentration was 2.3 ppm of the Aroclor-1260 PCB in one sample. The TSCA requires cleanup of PCB-contaminated soils at an industrial site if the PCB concentration is 25 ppm or higher. Because the maximum concentration detected was 2.3 ppm, cleanup is not required. No further action is necessary.

French Drain Associated with TRA-653 (TRA-41)-The French Drain is located in the south central portion of TRA. The French Drain comprises an 8-in. (20-cm) conduit extending from ground surface to approximately 2 ft (0.6 in) below land surface. This French Drain is still in place and operational. It is reported to the State of Idaho on the active injection well inventory. Process knowledge indicates that VOCs and SVOCs are the only COCs. Sampling was conducted at the French Drain in August 1993 during, a Site-wide assessment of shallow injection wells. The material

sampled was a sludge with a black tar-like appearance. The analytical data indicated that this new site had probably been contaminated by the TRA-653 mechanical shop operations. The wastes suspected are solvents, fuel residues, and oily wastes. The composite sample result was sufficient to characterize the sludge material.

A TRA faciltiy maintenance action was completed in 1995 to remove sludge inside the drain. Approximately two 55-gal (208-L) drums of material were removed from the drain during the maintenance action. Confirmation sampling was conducted following removal of the sludge to verify total contamination removal. This material was characterized in August 1995 and was determined to be nonhazardous. Following this determination, the drums were dispositioned at the Central Facilities Area landfill. The results of the baseline risk assessment indicate that an unacceptable risk is not posed by this site. No further action is recommended.

Diesel Unloading Pit (TRA-42)-The diesel unloading pit is located in the northeast corner of the Test Reactor Area. The unloading pit for No. 2 diesel consists of a 4-in. (10-cm) flow line encased in an approximately 3- x 3- x 8-ft (1- x 1- x 2.4-m) concrete vault. The connection has been used since the late 1950s. Over the years, the unloading operations have resulted in minor releases into the bottom of the pit.

When the pit was cleaned, it was discovered that the pit had an unlined soil and sand floor, not a concrete floor as expected. Any diesel spills may have penetrated the surface soil of the pit surrounding the connection.

No additional field characterization was conducted. A conservative estimate of the volume of diesel fuel that may have been spilled at the site indicates that the volume is insufficient to migrate to groundwater using the computer model. In addition, the computer model indicated that the potential residual concentration of benzene that might be leached into the groundwater is insufficient to pose a risk for groundwater consumption. This site was eliminated from further evaluation on the basis that a source of contamination is no longer present that would pose an unacceptable risk. No further action is necessary.

6. SUMMARY OF SITE RISKS

6.1 Human Health Risk Evaluation

The human health risk assessment consists of two broad phases of analysis: (1) a site and contaminant screening that identified COPCs at retained sites, and (2) an exposure route analysis for each COPC. The exposure route analysis includes an exposure assessment, a toxicity assessment, and a risk characterization discussion. The OU 2-13 baseline risk assessment includes an evaluation of human health risks associated with exposure to contaminants through soil ingestion, fugitive dust inhalation, volatile inhalation, external radiation exposure, groundwater ingestion, ingestion of homegrown produce, dermal absorption of groundwater, and inhalation of water vapors because of indoor water use.

6.1.1 Contaminant Identification

Historical sampling data were used to identify contaminants present in surface soils at the WAG 2 sites. The list of contaminants was screened based on comparison with background concentrations determined for the INEEL, detection frequency of less than 5% and no evidence that the contaminant was released at the site, and whether the contaminant is routinely considered to be an essential nutrient, Because substances that are essential nutrients can be toxic at high concentrations, this screening step applied only at sites where essential nutrient concentrations are less than 10 times the background concentration.

In addition, an evaluation of groundwater concentrations was conducted to ensure that contaminants that have been detected above MCLs or risk-based concentrations were not eliminated from evaluation.

6.1.2 Exposure Assessment

The human health exposure assessment quantifies the receptor intake of COCs for select pathways. The assessment consists of estimating the magnitude, frequency, duration, and exposure

route of chemicals to humans.

6.1.2.1 Exposure Scenarios. Only those exposure pathways deemed to be complete, or where a plausible route of exposure can be demonstrated from the site to an individual, were quantitatively evaluated in the risk assessment. The populations at risk because of the exposure from waste at the TRA were identified hv considering both the current and future land use scenarios.

The residential scenarios model a person living on the site 350 days a year for 30 years, beginning in 2097 (100 years from 1997), and 2997 (1,000 years from 1997). The 100-year residential scenario was selected for analysis because the INEEL institutional control is currently expected to last for at least 100 years. The 1,000-year residential scenario was evaluated because 1,000 years is a sufficient period of time to allow for decay of the short half-life radionuclides at WAG 2. For purposes of the baseline risk assessment, the assumption was made that future residents will construct 10-ft basements beneath their homes, and so could he exposed to contaminants down to that depth.

The occupation scenarios model nonintrusive daily industrial use without restrictions. The two occupational scenarios that were analyzed include a current occupational scenario that lasts for 25 years from the present and a future occupational scneario that starts in 30 years and lasts for 25 years.

6.1.2.2 Quantification of Exposure. The following exposure pathways were considered applicable to the evaluation of human exposure to contaminants at the TRA sites: ingestion of soil, inhalation of fugitive dust, inhalation of volatiles, external radiation exposure, groundwater ingestion (residential scenano only), ingestion of homegrown produce (residential scenario only), and inhalation of volatiles from indoor use of groundwater (residential use only). Dermal absorption risks and hazard quotients for organic contaminants contained in WAG 2 soils were calculated at all of the retained release sites evaluated in the baseline risk assessment. It was determined that dermal exposure did not contribute significantly to risk based on these calculations and combined with the knowledge that the predominant contaminants of concern at TRA (i.e., radionuclides) are not dermally absorbed to any great extent.

Adult exposures were evaluated for all scenarios and pathways (external exposure, inhalation of dust, and ingestion of soil, groundwater, and foods); child exposures (0 to 6 years old) were considered separately only for the soils ingestion pathways in the residential scenarios. Children were included because children ingest more soil than adults, significantly increasing their exposure rate.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reasonable maximum exposure at a site. Use of this approach makes underestimation of the actual cancer risk highly unlikely. The exposure parameters used in the risk assessment were:

- All pathways

- Exposure frequency, residential	350 days/yr
- Exposure frequency, occupational, current	250 days/yr
- Exposure duration, occupational, current	25 yr

- External exposure pathway

- Exposure time, residential	24 hr/day
- Exposure time, occupational	8 hr/day
- Exposure duration, residential	30 yr

- Soil ingestion pathway

- Soil ingestion rate, residential, adult	100 mg/day
- Soil ingestion rate, residential, child	200 mg/day
- Soil ingestion rate, occupational	50 mg/day
- Exposure duration, residential, adult	24 yr
- Exposure duration, residential, child	6 yr

- Dust inhalation pathway

- Inhalation rate	20 m 3 of air/day
- Exposure duration, residential	30 yr

- Groundwater ingenstion pathways

- Groundwater ingestion rate, residential	2 L/day
- Expsoure duration, residential	30 yr

The contaminant exposure point concentrations evaluated in the Baseline Risk Assessment were developed from site-specific sampling information. Ninety-five percent upper confidence level (UCL)

(95% UCL) of the mean concentrations were calculated from these sampling data, and either the 95% UCL or maximum detected concentration at a given site was used as the exposure point

concentration in the site's risk calculations. This analysis method was also designed to produce reasonable maximum exposure estimates for the WAG.

6.1.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at the TRA. A toxicity value is the namerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values (slope factors and reference doses) for the sites were obtained from EPA's Integrated Risk Information System (IRIS) database and EPA's Health Effects Assessment Summary Tables: Annual FY-93, ECAO-CIN-909, 1993.

6.1.4 Human Health Risk Characterization

Excess lifetime cancer risks are estimated by multiplying the intake level, developed using the exposure assumptions, by the slope factor. These risks are probabilities that are generally expressed in either scientific notation (1 x 10-6) or exponential notation (1E-06). An excess lifetime cancer risk of 1E-06 indicates that, a plausible upper bound, an individual has a one in one million chance of developing cancer over a lifetime as a result of site-related exposure to a carcinogen under the specific exposure conditions at a site. Excess cancer risks estimated below 1E-06 typically indicate that no further action is appropriate. Risks estimated in the range of 1E-04 to 1E-06 indicate that further investigation or remediation may be needed, and risks estimated above the 1E-04 typically indicate that further action is appropriate. However, the upper boundary of the risk range is not a discrete line at 1E-04, although EPA generally uses 1E-04 in making risk management decisions. A specific risk estimate around 1E-04 may be considered acceptable if justified based on site-specific conditions.

Tables 6-1 and 6-2 summarize the results of the human health evaluation with respect to the evaluated exposure routes. Table 6-1 indicates which release sites evaluated in the baseline risk assessment have predicted risks in excess of 1E-04 during the occupational 0-year or 30-year time periods, or the residential 100-year or 1,000-year time periods. Risk results are time dependent because of radioactive decay without physical source depletion. The results from the 30-year residential time period are not included because TRA is not expected to be released for residential development any sooner than 100 years in the future. Finally, Table 6-3 indicates the three sites (Chemical Waste

Pond, Cold Waste
Pond, and Sewage Leach Pond) with a predicted hazard index greater than one. As shown in these tables,
the exposure routes that could produce unacceptable risks and hazard indexes are external radiation
exposure, ingestion of soil, ingestion of homegrown produce, and inhalation of fugitive dust. Table 6-4
provides a summary of sites that pose an unacceptable risk to ecological receptors.

The contaminants with the greatest potential for causing adverse human health effects at WAG 2
(i.e., risks greater than 1E-04 or hazard index greater than 1.0) include four radionuclides and four metals.
In general, radionuclide contamination in shallow soils represents the greatest health risk identified at the
WAG. The contaminants with calculated risks greater than 1E-06 and/or calculated hazard indexes greater
than 1.0 are considered to be COCs for WAG 2. These are shown in Table 6-5. Tables 6-6 and 6-7 list
sites determined to present risks greater than 1E-04 or a hazard index greater than 1, respectively, for one
or more exposure scenarios.

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a. Co-located facilities that are currently in use and/or near areas of industrial activity.

b. At TRA-02, the metals are antimony, lead, selenium, silver, thallium and tin. The organic compound is benzo(b)fluoranthene.

c. At TRA-03, the metal is mercury and the radionuclides are americium-241, curium-244, plutonium-238, plutonium-239/240, and strontium-90.

d. At TRA-04/05, the metals are arsenic, copper, lead, mercury, selenium, and thallium; the organic compound is acrylonitrile.

e. At TRA-06, the metals are antimony, arsenic, barium, lead, mercury, selenium, silver, strontium, thallium, and tin.

f. At TRA-08, the metals are arsenic, barium, cadmium, copper, lead, mercury, selenium, and silver.

g. At TRA-13, the metals are copper, lead, mercury, selenium, silver, and zinc.

h. At TRA-15, the metals are arsenic, fluoride, and mercury.

i. At TRA-16, the metal is mercury.

j. At TRA-19 and the Brass Cap Area, the internal and external radionuclides are cesium-134 and cesium-137.

k. At TRA-36, the metal is selenium. (Cadmium and zinc also had hazard quotients >1: however, these contaminants would pose risk at background levels and are not considered a problem at this site.)

l. At TRA-38, the metals are antimony, arsenic, lead, mercury, selenium, and thallium.

Table 6-5. WAG 2 contaminants of concern.

Exposure Scenario	Radionuclides	Metals	Organic Contaminants	Other
Occupational	Ag-108m, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Sr-90	Arsenic	None	PCBs
Residential	Ag-108m, Am-241, Cs-134, Cs-137, Co-60, Pu-238, Pu-239, Sr-90,	Arsenic, beryllium, chromium, mercury	Acrylonitrile	PCBs

Th-228, U-238

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Additional exposure routes that have calculated 100-year future residential risks within or above the National Contingency Plan (NCP) target risk range (one in ten thousand to one in one million excess cancer risk) at WAG 2 are ingestion of soil, ingestion of homegrown produce, and ingestion of groundwater. Estimated risks for ingestion of soil are within or above the target risk range at the TRA-619, TRA-626, TRA-653 PCB Spill Sites, the TRA-15 soil surrounding the Hot Waste Storage Tanks at TRA-613, the TRA-19 soil surrounding the Rad Tanks at TRA-630, the TRA-08 Cold Waste Pond, the TRA-03 Warm Waste Pond 1952 and 1957 cells, the TRA-04/05 soil between 0 and 10 ft below

land surface surrounding the Retention Basin, the TRA-06 Chemical Waste Pond, the Brass Cap Area, and the Experimental Test Reactor Stack. Estimated risks for ingestion of homegrown produce are within or above the target risk range at the TRA-619, TRA-626, TRA-653 PCB Spill Sites, the TRA-15 soil surrounding the Hot Waste Storage Tanks at TRA-613, the TRA-19 soil surrounding the Rad Tanks at TRA-630, the TRA-08 Cold Waste Pond, the TRA-03 Warm Waste Pond 1952 and 1957 cells, the TRA-04/05 soil between 0 and 10 ft below land surface surrounding the Retention Basin, the TRA-06 Chemical Waste Pond, the Brass Cap Area, and the Experimental Test Reactor Stack. Estimated risk for external radiation exposure is within or above the target risk range at the North Storage Area, the TRA-15 soil surrounding Hot Waste Storage Tanks at TRA-6l3, the TRA-19 soil surrounding Rad Tank at TRA-630, the TRA-08 Cold Waste Pond, the TRA-04/05 soil between 0 and 10 ft below land surface surrounding the Retention Basin and the Cold Waste Sampling Pit and Sump, SLP-Berm and Soil Contamination Area, the Brass Cap Area, and the Hot Tree Site, in addition to the Sewage Leach Pond and the Warm Waste Pond 1952 and 1957 cells.

Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks to the environment occurred. Therefore, if excavation occurs, soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action.

6.1.5 Human Health Risk Uncertainty

Many of the parameter uncertainty values used to calculate risks in the WAG 2 Baseline Risk Assessment and Ecological Risk Assessment (ERA) are uncertain. For example, limitations in site sampling produce some uncertainty associated with the extent of contamination at most of the WAG 2 sites. Limitations in the characterization of the WAG 2 physical environment produce some uncertainty associated with fate and transport properties of WAG 2 contaminants. To offset these uncertainties, parameter values were selected for use in the Baseline Risk Assessment and ERA so that the assessment's results would present an upper bound, and yet reasonable, estimate of WAG 2 risks. Assumptions and supporting rationale, along with potential impacts on the uncertainty, are included in Table 6-8.

6.2 Ecological Evaluation

The ecological assessment of the TRA is a qualitative evaluation of the potential effects of the sites on plants and animals other than people and domesticated species. A quantitative ecological assessment is planned in conjunction with the INEEL-wide comprehensive RI/FS scheduled for 1998. This INEEL-wide ecological assessment will provide an indication of the affect of INEEL releases in the ecology at a population level. There are no critical or sensitive habitats on or near TRA. Based on the present contaminant and ecological information and the qualitative eco-evaluation performed for this ROD, the remedies selected to address human health risks will serve to reduce the ecological risk posed at seven sites where both human health and potential ecological risk have been identified. The need for remedial action will be reconsidered at these sites as well as the remaining five sites if the INEEL-wide ecological risk assessment suggests that these conclusions are not well founded. However, it is unlikely that the INEEL-wide comprehensive RI/FS ecological assessment will identify the need for any additional actions at these sites.

Table 6-4 summarizes the results of the ERA evaluation for those sites that have potential to pose an unacceptable risk to ecological receptors.

6.2.1 Species of Concern

The only federally listed endangered species known to frequent the INEEL is the peregrin falcon. The status of the bald eagle in the lower 48 United States was changed from endangered to threatened in July 1995. Several other species observed on the INEEL are the focus of varying levels of concern by either federal or state agencies. Animal and avian species include the ferruginous hawk, the northern goshawk, the sharp-tailed grouse, the loggerhead shrike, the Townsend's big-eared bat, the pygmy rabbit, the gyrfalcon, the bored owl, the flammulated owl, the Swainson's hawk, the merlin, and the burrowing owl. Plant species classified as sensitive include Lemhi milkvetch, plains milkvetch, wing-seed evening primrose, nipple cactus, and oxytheca.

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6.2.2 Exposure Assessment

Three primary media were identified to have the potential for posing risk to WAG 2 ecological components: contaminated surface soil, contaminated subsurface soil, and contaminated surface water. Ingestion of contaminated groundwater was not considered because groundwater is not accessible to ecological receptors. For plants, the uptake of contaminants through root systems was considered.

The amount of exposure is directly related to the amount of time spent and the fraction of diet taken on the sites. Therefore exposures are greatest for permanent ecological residents, particularly plants and small burrowing animals. The small size of the sites of concern at WAG 2 is expected to minimize the exposures received by migratory species, which include most avian and large mammal species that inhabit the INEEL.

Table 6-4 summarizes the results of the ERA evaluation for those sites that pose an unacceptable risk to ecological receptors.

6.2.3 Ecological Risk Evaluation

Of the sites and COPCs assessed, two sites were eliminated as posing no potential risk to ecological receptors (TRA-39 and the ETR Stack). In addition, TRA-34, TRA-619, TRA-626, and TRA-653 were determined to be highly unlikely to pose risk to ecological receptors and, therefore, were eliminated from consideration. The PCB sites (TRA-619, 626, and 653) exceeded the target value for only one functional group (avian insectivores). Given the size of these sites, it is highly unlikely that the member of this group (swallows) would have an exposure that would result in adverse effects. The sites were therefore eliminated. For site TRA-39, no contaminant exceeded the target value; therefore, this site was eliminated from further consideration. The results of the assessment indicate risk at the remaining 12 sites as follows: from internal and external exposure to radionuclides at the Brass Cap Area and TRA-19 soil surrounding Rad Tanks 1 and 2 at TRA-630; from internal exposure to radionuclides at TRA-03 Warm Waste Pond, as well as from a metal at TRA-03; and from both metals and organic compounds at the following

sites:
TRA-02 TRA Paint Shop Ditch, TRA-04/05 Warm Waste Retention Basin and Sampling Pit, TRA-06 Chemical Waste Pond, TRA-08 Cold Waste Pond, TRA-13 Sewage Leach Ponds, TRA-15 Hot Waste Tanks at TRA-613, TRA-16 Inactive Radioactive Contaminated Tank at TRA-614, TRA-36 ETR Cooling Tower Basin, and TRA-38 ATR Cooling Tower. These sites are all associated with ongoing TRA facility operations. For a complete description of the ecological risk assessment process, please refer to the WAG 2 Comprehensive Remedial Investigation/Feasibility Study Report located in the administrative record. The TRA-02 Paint Shop Ditch, TRA-04/05 Warm Waste Retention Basin and Sampling Pit. TRA-16 Inactive Radioactive Contaminated Tank at TRA-614, TRA-36 ETR Cooling Tower Basin, and TRA-38 ATR Cooling Tower sites pose only a potential ecological risk.

A basic assumption of the ERA is that, under a future-use scenario, the contamination is present at an abandoned site that will not be institutionally controlled. In actuality, co-located facilities are currently in use, and institutional controls will remain in place until they are decommissioned. Because these sites are at an industrial facility that is currently in use, they most likely do not contain desirable or valuable habitat. The absence of habitat, the existence of facility activities, and institutional controls will minimize the exposure of ecological receptors.

The ERA determined that risks to ecological receptors may exist at 12 sites at WAG 2. Four sites (TRA-03, TRA-06, TRA-08, and TRA-13) are outside the TRA facility fence. Human health risks exceeding allowable levels exist at these sites, and some level of remediation ranging from institutional controls to active remediation will be required. Any remedial alternative that reduces human health risks would be expected to also reduce ecological risks. The remaining sites are inside the facility fence, where ongoing facility operations result in limited ecological exposures, as discussed previously. The relatively small size of these sites, including TRA-02, -16, and -38, would also likely result in little or no ecological risk. The results of these studies can be found in the Environmental Science and Research Foundation 1996 Annual Technical Report, located in Idaho Falls, Idaho.

Recent D&D activities during the summer of 1996 at the TRA-645 building discovered radioactive barn swallow nests. Barn swallows are common at most facilities on the INEEL and are know to nest near many wastewater ponds found on the site. In a study conducted in 1976 through 1979, barn swallows

nesting at the TRA were found to build nests with radionuclide-contaminated materials and to accumulate radionuclides internally by ingesting arthropods from radioactive leach ponds. The results of this study indicate that no obvious direct effects to the barn swallows or their clutches were found. Recent studies conducted in 1995 showed that average radionuclide concentrations in adult barn swallows are about 54 to 314 times lower than those observed in the 1976 study.

6.2.4 Ecological Risk Uncertainty

Uncertainty is inherent in the risk process. Principal sources of uncertainty lie within the development of an exposure assessment. Uncertainties inherent in the exposure assessment are associated with estimation of receptor ingestion rates, selection of acceptable HQs, estimation of site usage, and estimation of plant uptake factors and bioaccumulation factors. Additional uncertainties are associated with the depiction of site characteristics, the determination of the nature and extent of contamination, and the derivation of Threshold Limit Values. All of these uncertainties likely influence risk.

Overall, it is important to reiterate that it was anticipated that the conservative nature of the ERA at the WAG level would result in many sites and contaminants being indicative of potentially unacceptable risk to ecological receptors. This is due to the exposure calculation, using a very conservative approach and is also compounded by the methods used to determine extent of contamination and characterize exposure concentarions at each release site.

Because of these considerations, the relative small size of the sites, and the conservatism of the ecological risk assessment, no significant ecological impact is anticipated from these sites. The need for remedial action at sites posing a potentially unacceptable ecological risk will be reconsidered if the INEEL-wide ecological risk assessment suggests that these conclusions are not well founded.

6.3 Groundwater Fate and Transport

WAG 2 includes three potential sources of groundwater contamination: contamination contained in perched water bodies beneath TRA, contamination injected into the aquifer by the TRA-05 disposal well, and contamination that could leach from surface and near-surface soil. From 1964 until 1972, the TRA-05, disposal well was used to dispose of the secondary reactor cooling water. This disposal well injected directly into the SRPA and did not contribute contaminants to the Perched Water System. After 1972,

hexavalent chromium was no longer used as a rust inhibitor in the cooling systems and was no longer

discharged to the disposal well or to the ponds. Use of the disposal well ceased in 1982. Groundwater contamination produced by perched water system infiltration and disposal well injection was evaluated as part of the OU 2-12 perched water system RI, while contamination that could leach into the SRPA from surface and near surface soil was evaluated using the computer code GWSCREEN in the baseline risk assessment.

As discussed in the OU 2-12 perched water system RI, the principal groundwater COCs at WAG 2 are chromium and tritium (H-3). The Third Annual Technical Memorandum states that the MCLs for chromium and H-3 have been exceeded in various wells throughout the OU 2-12 monitoring. Specifically, the MCL for chromium is 100 µg/L, and the MCL for H-3 is 20 pCi/mL. To date, the monitoring indicates the following about the TRA wells: (a) the long-term concentration trend (1988-present) is decreasing for both contaminants in USGS-55, USGS-56, and USGS-65; (b) the short-term, post-ROD concentration pattern (1993-present) is variable in USGS-55, increasing in USGS-56, and near stable in USGS-65; (c) the concentration trend for chromium is increasing in USGS-53 but decreasing in USGS-64; and (d) the concentration trend for H-3 is decreasing in USGS-53. In addition, there are insufficient TRA-7 data to make contaminant trend determinations.

As discussed in the OU 2-12 ROD, H-3 is expected to fall below MCLs by the year 2004, and chromium is expected to fall below MCLs by the year 2016. So neither contaminant is expected to produce unacceptable risks from groundwater ingestion at WAG 2 if residential development occurs at TRA in 100 years. The radiologically contaminated wastewater source to the Warm Waste Pond has been removed. The groundwater modeling performed for the OU 2-12 RI/FS predicted that the H-3 contamination in the SRPA beneath TRA will naturally be reduced to concentrations that are less than MCLs through radioactive decay and downgradient transport, and that most of the chromium contamination will be reduced via dilution and dispersion.

The groundwater contamination below the TRA commingles with groundwater contamination below the Idaho Chemical Processing Plant (ICPP). The groundwater contamination below the ICPP is being evaluated as part of the OU 3-13 Comprehensive RI/FS. Because of the commingling nature of

the plumes below the TRA and ICPP, the chromium and H-3 contamination in the SRPA beneath TRA is being evaluated in the draft OU 3-13 RI/baseline risk assessment. To accomplish this evaluation, the GWSCREEN fluxes derived in the OU 2-13 TRA Groundwater Flow and Contaminant Transport Model were provided for input into the OU 3-13 flow and transport model. The flow and transport model being used for the OU 3-13 baseline risk assessment is TETRAD, a proprietary three dimensional code. The primary time frame of interest for the modeling is 100 years in the future. During this time frame, concentration contours and peak concentrations in the aquifer are calculated for both H-3 and chromium. In addition, the model simulates transport of each contaminant until its peak concentration falls below a concentration equal to the 1E-06 risk concentration or the contaminant's MCL, whichever is lower.

The only other contaminant that is predicted to produce groundwater risks greater than 1E-06 at WAG 2 is arsenic. No remedial action is recommended to lower arsenic groundwater risk because the risk is less than the risk level of 1E-04 that has been agreed to by the agencies as the basis for groundwater remedial action objectives (RAOs), and the predicted concentrations of arsenic are less than the MCL.

6.4 Basis for Response

Eight sites within TRA have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These sites include four disposal ponds [Warm Waste Pond (TRA-03), Chemical Waste Pond (TRA-06), Cold Waste Pond (TRA-08), and the Sewage Leach Pond (TRA-13)], three subsurface contaminant release sites [Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15), Tanks 1 and 2 at Building 630 (TRA-19), and the Brass Cap Area], and one area of surficial windblown contamination (Sewage Leach Pond Berms and Soil Contamination Area). The response actions selected in this ROD are designed to reduce the potential threats to human health and the environment to acceptable levels.

The ERA for WAG 2 determined that potential risks to ecological receptors exist at 12 sites. Four of these sites (the Warm Waste Pond, Chemical Waste Pond, Cold Waste Pond, and the Sewage Lagoons) are outside the TRA facility fence. Human health risks exceeding allowable levels exist at these sites, and some level of remediation will be required. The TRA-02 Paint Shop Ditch, TRA-04/05 Warm

Waste Retention Basin and Sampling Pit, TRA-16 Inactive Radioactive Contaminated Tank at TRA-614, TRA-36 ETR Cooling Tower Basin, and TRA-38 ATR Cooling Tower sites pose only a potential ecological risks. The need for remedial action at sites posing a potentially unacceptable ecological risk will be reconsidered if the INEEL-wide ecological risk assessment suggests that these conclusions are not well founded. Any remedial alternative that reduces human healtn risks would be expected to also reduce ecological risks. The remaining sites are inside the facility fence, where ongoing facility operations result in limited ecological exposure. The relatively small size of these sites would also likely result in little or no ecological risk. The need for remedial action will be considered if the INEEL-wide ecological risk assessment suggests that these conclusions are not well founded.

7. DESCRIPTION OF ALTERNATIVES

7.1 Remedial Action Objectives

Remedial action objectives for TRA (OU 2-13) were developed in accordance with the NCP and CERCLA RI/FS guidance. The RAOs were defined through discussions among agencies (IDHW, EPA, and DOE). The RAOs are based on the results of the human health risk assessment and are specific to the COCs and exposure pathways developed for OU 2-13. They are as follows:

For protection of human health

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) to current and future workers and future residents.

- Inhibit ingestion of radionuclide and nonradionuclide COCs by all affected exposure routes (including soil and groundwater ingestion, and ingestion of homegrown produce) that would result in a total excess cancer risk of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) or a hazard index greater than 1 to current and future workers and future residents.

- Inhibit degradation of any low-level soil repository covers (e.g., Warm Waste Pond 1952 and 1957 cell covers) that would result in exposure to buried wastes or migration of contaminants to the surface that would pose a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) or a hazard index greater than 1 to current and future

workers and future residents.

For protection of the environment

- Inhibit adverse effects to resident populations of flora and fauna, as determined by the ecological risk evaluation, from soil, surface water, or air containing COCs.

- Inhibit adverse effects to sites where COCs remain in place below ground surface that could result in exposure to COCs or migration of COCs to the surface.

To meet these objectives, preliminary remediation goals (PRGs) were established. These goals are quantitative cleanup levels based primarily on ARARs and risk-based doses. The PRGs are used in remedial action planning and assessment of effectiveness of remedial alternatives. Final remediation goals are based on the results of the baseline risk assessment and evaluation of expected exposures and risks for selected alternatives.

The 1 chance in 10,000 risk (1E-04) or hazard index of 1, whichever is more restrictive for a given contaminant, is the primary basis for determining PRGs for the OU 2-13 sites of concern. The basis for using the upper end of the 1E-04 to 1E-06 is justified based on the remoteness of the site, conservatism of the risk assessments, the absence of current residents, and modeling 100 years in the future for future residents, and as consistent with exposure levels established to be acceptable by EPA for radionuclides. Preliminary remediation goals for individual COCs were defined by calculating soil concentrations that would result in excess cancer risks equal to 1E-04 or hazard indexes equal to 1 for the 100-year future residential exposure scenario due to exposure to all of a site's COCs. For example, if a given site contained only one COC, the PRG basis for the COC was risk equal to 1E-04 and hazard index equal to 1. But if the site contained two COCs, the PRG basis was risk equal to 1E-04 divided by 2 (or 5E-05) and a hazard index equal to 1/2. The primary COCs for WAG 2 are radionuclides. Table 7-1 presents the final remediation goals that have been established for the eight sites of concern in OU 2-13. Remedial actions will ensure that risk is mitigated to the point that exposure would not exceed these levels. On the basis of these remediation goals, areas and volumes of contaminated media that would require some form of remedial action were identified. These estimated areas, depths, and volumes are presented in

Table 7-2.

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the FS identified alternatives that (a) achieve the stated RAOs, (b) provide overall protection of human health and the environment, (c) meet ARARs, and (d) are cost effective. These alternatives, used individually or in combination, can satisfy the RAOs through reduction of contaminant levels, volume or toxicity, or by isolation of contaminants from potential exposure and migration pathways. For OU 2-13 (TRA) sites, soil is the only medium of concern targeted for remediation. Five alternative categories were identified to meet the RAOs for contaminated soil at OU 2-13 sites.

1. No Action (with monitoring)

2. Limited Action

3. Containment and Institutional Controls

4. Excavation, Treatment, and Disposal

5. Excavation and Disposal.

Estimated present worth costs for the remedial alternatives for all sites are shown in Table 9-2 in Section 9. Post-closure costs were estimated for the full duration of the 100-year period of monitoring.

7.2.1 Alternative 1: No Action (With Monitoring)

The NCP [40 CFR 300.430(e)(6)] requires consideration of a No Action alternative to serve as a baseline for evaluation of other remedial alternatives. The No Action (with monitoring) alternative does not involve active remedial actions but environmental monitoring may be warranted if contamination were left in place under this alternative. Monitoring would enable identification of potential contaminant migration within environmental media (air, groundwater, and soil) or other changes in site conditions that may warrant future remedial actions. No land-use restriction, controls, or active remedial measures are implemented at the site. If warranted, monitoring is an institutional action assumed to remain in effect for at least 100 years. For the sites in this ROD, environmental monitoring would consist of radiological surveys in appropriate areas and groundwater monitoring. Air monitoring will be performed as part of the air monitoring program. It is anticipated that monitoring will be conducted at least

annually, but the efficiency will be determined during the remedial design as well as the appropriate areas.

Table 7-1. Final remediation goals for OU 2-13 sites of concern.

Site	Contaminant of Concern	Final Remediation Goals (mg/kg for nonradionuclides pCi/gm for radionuclides) a,b,c
Warm Waste Pond (TRA-03)	Ag-108m	0.39
	Cs-137	7.78
	Eu-152	99.9
Chemical Waste Pond (TRA-06)	Ba	926
	Mn	146
	Hg	0.47
	Zn	43.3
Cold Waste Pond (TRA-08)	As	18.3
	Cs-137	11.7
Sewage Leach Pond (TRA-13)	Hg	0.94
	Zn	86.6
	Ag-108m	0.58
	Cs-137	11.7
Soil surrounding hot waste tanks at Building 613 (TRA-15)	Cs-137	23.3
Soil surrounding Tanks 1 and 2 at Building 630 (TRA-19)	Cs-137	23.3
Brass Cap Area	Cs-137	23.3
Sewage Leach Pond Berm and Soil Contamination Area	Cs-137	23.3

a. Final remediation goals are soil concentrations of COCs that would result in a cumulative excess cancer risk of 1 in 10,000 or a hazard index greater than 1 for the 100-year residential exposure scenario. These may vary during the actual cleanup in recognition of natural background levels as established in Rood, 1995, and in recognition that cleanup to within the acceptable risk range could be achieved with a different mix of the COCs than was assumed in establishing these final remediation goal (FRG) values.

b. See Section 7.1 for a discussion of the risk basis for these FRGs. These FRGs may be met via installation of a cover to ensure that these levels are not exceeded through an available exposure pathway.

c. This table was generated during RI/FS process.

Table 7-2. Estimated area and volume of contaminated media requiring remedial action.

Site	Surface Area (ft 2)	Depth of Contamination (ft)	Soil Volume a (ft 3)
Disposal Pond Sites			
Warm Waste Pond (TRA-03)	5.88E+04	1.23E+01	7.23E+05
Chemical Waste Pond (TRA-06)	2.90E+04	5.00E-01	1.45E+04
Cold Waste Pond (TRA-08)	1.58E+05	5.00E-01	7.92E+04
Sewage Leach Pond (TRA-13)	3.25E+04	6.00E+00	1.95E+05
Subsurface Release Sites			
Hot Waste Tanks at Building 613 (TRA-15)	6.24E+02	3.83E+01	2.39E+04
Tanks 1 and 2 at Building 630 (TRA-19)	6.00E+01	1.00E+01	6.00E+02
Brass Cap Area	2.83E+02	1.00E+01	2.83E+03
Windblown Surficial Contamination Site			
Sewage Leach Pond Berm and Soil Contamination Area (outside fence)	2.26E+05	5.00E-01	1.13E+05

a Estimated soil volume for remediation = 6.24E+03 ft 2 based on 10-ft excavation depth.

While the No Action alternative does not involve any construction or operational activities that would result in disturbances to the surfaces of the OU 2-13 sites, IDAPA 16.01.01.650 could nonetheless apply to any sites that were a source of fugitive dust and is, therefore, considered an ARAR that would not be met. If metals and semivolative organic compounds were present in fugitive dust, then IDAPA 16.01.01.585-586 are ARARs that would not be met. 40 CFR 122.26 would similarly apply, and would not be met. IDAPA 16.01.11.200 would be met by ongoing groundwater monitoring. The No Action alternative would not meet DOE orders because health risks to current workers and potential future residents exceed allowable ranges. The estimated cost for implementing the No Action (with monitoring) alternative is relatively low when compared to the other alternatives and ranges from $2.2M at the Brass

Cap site to $3.2M at the Warm Waste Pond.

7.2.2 Alternative 2: Limited Action

A Limited Action alternative was developed primarily for those sites posing an unacceptable risk to current and future workers and for which the radionuclide contamination will decay to acceptable levels within the next 100 years. However, this alternative may be implemented in conjunction with a contingent remedial alternative for those sites determined to pose an unacceptable risk and where access is physically limited thereby inhibiting full implementation of the contingent remedy at this time. This alternative essentially continues management practices and institutional controls currently in place at OU 2-13 disposal pond, surficial contaminated soil, and buried contaminated soil sites. Current management practices and institutional controls are in place as a result of Department of Energy responsibilities and authorities for maintaining security, control, and safety at DOE facilities. These responsibilities and authorities have their basis in the Atomic Energy Act of 1954. For DOE facilities, Federal Regulation 10 CFR 835 implements the Radiation Protection Guidance to Federal Agencies for Occupational Workers, recommended by the EPA and issued by the President on January 20, 1987. The requirements of this regulation include standards for control of occupational radiation exposure, control of access to radiological areas, personnel training, and record keeping.

In addition, the regulations specify limits for maintaining occupational radiation exposure as low as reasonably achievable (ALARA), and requires that DOE activities be conducted in compliance with a documented radiation protection program approved by DOE. At INEEL, the requirements of 10 CFR 835 are primarily implemented through DOE Order 5400.5. Regulations for the protection and security of DOE facilities are included in 10 CFR 860, which prohibits unauthorized entry. This regulation is implemented through DOE Order 5632.1C. At the INEEL, the requirements of this order are primarily implemented through DOE's Management and Operating Safeguards and Security manuals. The manuals and associated control procedures define the programs and requirements for protecting INEEL property personnel, and sensitive information. The manuals include defining the processes for protecting controlled property from theft, intentional acts of destruction and misuse, access controls for

employees and offsite visitors to the INEEL, and procedures for conducting investigations or security incidents.

A description of the areas where access will be restricted, the specific controls (e.g., fences, signs) that will be used to ensure that access will be restricted, the types of activities that will be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls will be placed in the "INEEL Comprehensive Facility and Land Use Plan" maintained by the Office of Program Execution. DOE shall also provide the Bureau of Land Management the detailed description of controls identified above. This information will be submitted to the EPA and IDHW once it has been placed in the INEEL Comprehensive Facility and Land Use Plan.

DOE-ID will submit a written evaluation of the effectiveness of the institutional controls at the TRA as part of every 5-year review. This report, at a minimum, will include a description of a walk-through of the areas subject to institutional controls conducted at the time of each 5-year review.

Short-term effectiveness of this alternative is considered high, as this alternative is already implemented at the sites. Radiation control area fences and signs are maintained. No specialized equipment, personnel, or services are required to continue to implement the Limited Action alternative. Implementation of this alternative would have no physical effect or habitat alteration on the environment beyond what is already there.

The estimated costs for implementing the Limited Action alternative are described in Sections 8 and 9 of this ROD.

7.2.3 Alternatives 3a and 3b: Containment Alternatives and Institutional Controls

The two containment alternatives consist of the isolation of contaminated soil from potential receptors (for the period of time that unacceptable cumulative exposure risks will be present) through the use of a protective cover followed by institutional controls, including long-term environmental monitoring, [as described above for the No Action (with monitoring) alternative] cover integrity monitoring and maintenance, access restrictions, and surface water diversion. Institutional controls are assumed to remain in effect for at least 100 years. These alternatives were considered for the Waste Disposal Ponds and Subsurface Release Sites at TRA.

Alternative 3a consists of an engineered cover originally developed by the Uranium Mill Tailings Remedial Action program for stabilization of abandoned uranium mill tailings. This design, based on recent biointrusion research studies at the INEEL, was recently constructed at the INEEL stationary Low-Power Reactor-I burial ground site (Figure 7-1). This cover

- Requires minimal maintenance
- Inhibits inadvertent human intrusion
- Minimizes plant and animal intrusion
- Inhibits contaminant migration.

The cover design consists of four lavers of natural geologic materials, with the uppermost layer consisting of rock riprap to inhibit intrusion and minimize erosion, a second layer of gravel overlying a third laver of riprap or cobbles, and a fourth layer consisting of gravel. Deviation from this sequence of materials and respective material thicknesses is not anticipated; however, the engineered cover design may be refined during the remedial design phase.

Alternative 3b consists of a native soil cover. This cover consists of a 10-ft (3-m) single layer of lower permeability soil obtained on the INEEL, applied in lifts and compacted to 95% of optimum moisture and density (see Figure 7-1). The surface would be completed to promote runoff and may be vegetated with a crested wheatgrass mixture that does not require supplemental water or nutrients once established, or a gravel much/rock armor material to be determined during remedial design. Specific design elements for the native soil cover will be developed during the remedial design phase.

Each capping technology is designed to prevent direct radiation exposures, resist erosion because of wind and surface water runoff, and resist biointrusion that may penetrate the contamination zone or facilitate erosion. The primary differences between capping technologies are the length of time these functions can be maintained and the effectiveness of the biointrusion and erosion control components of the designs. The design life of the capping technologies specified for the containment alternatives will depend on the construction materials specified, number and thickness of layers required, and sequence of those layers. The long-term effectiveness and permanence required at the Warm Waste Pond and the

Sewage Leach Pond is at least the decay time required to reduce external exposure risks to acceptable levels. The engineered barrier design is likely to provide a higher level of protection against biointrusion. Thick soil will eliminate intrusion into waste by most INEEL species, but not all plants and invertebrates. Root intrusion into contaminated soils could result in mobilization of radionuclides to environmental

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receptors. The engineered barrier is also likely to provide more effective control of wind erosion. Vegetated surfaces are erosion resistant, but fire and other natural and human activities, including grazing, could reduce or eliminate vegetation and allows wind erosion to occur.

Environmental impacts resulting from the excavation and construction activities would be minimal. Materials would be excavated, transported, and placed entirely within previously disturbed areas. Installation of surface water diversion controls at the OU 2-13 disposal pond sites might result in alteration of the nearby terrain. However, the overall impact of these activities is not considered irreparable and would be unnoticeable in the long run. The remoteness of the site would prevent any impact to the surrounding communities during construction activities. No environmentally sensitive areas such as archaeological or historical sites, wetlands, or critical habitat exist in the vicinity of the OU 2-13 sites, because all are in previously disturbed areas.

Cost associated with the cover alternatives at each site are detailed in Sections 8 and 9 of this ROD.

7.2.4 Alternative 4: Excavation, Treatment, and Disposal

Standard treatment technologies have not been shown to be effective for the radionuclide-contaminated soils at INEEL. Based on previous INEEL studies, no technology or combination of technologies has been demonstrated to be able to achieve significant volume reduction of radionuclide-contaminated TRA soils and sediments, primarily because of the binding of cesium in both surface microfissures of large-grained soil fractions, and in the silicate lattices of clay materials of fine grained fractions.

Technologies evaluated include physical separation using screening, flotation, attrition scrubbing, monitor and gate systems, soil washing, chemical stabilization, and thermal treatment using plasma torch. Therefore, this alternative was identified as being potentially applicable only to the sediments of the Chemical Waste Pond (TRA-06) that are contaminated with mercury. Under this alternative, those sediments with mercury concentrations exceeding 260 ppm would be excavated and treated with a mercury retort process. These sediments would be heated, volatilizing mercury as a vapor. The vapor would be subsequently cooled, and the liquid mercury would be recovered for recycling and disposal. Equipment would include a feed conveyor, heating units, heat exchangers, condensers, and air pollution control equipment, including a baghouse and granular activated carbon absorbers. This alternative would achieve long-term effectiveness because of the expected reduction in contaminant mobility, volume, and toxicity of the treated sediments.

Implementation of the mercury retort process is dependent on mercury contamination being present at concentrations exceeding 260 ppm and whether the mercury is in an elemental or ionized state. During the remedial design phase, further consideration may also be given to other potentially appropriate treatment process options identified in the OU 2-13 comprehensive RI/FS such as stabilization of mercury-contaminated soils. The determination as to whether this treatment technology is appropriate or not will be dependent upon post-ROD sampling of the Chemical Waste Pond. The goals of the post-ROD sampling will be to determine the nature and extent of contamination at the Chemical Waste Pond, although it is anticipated that mercury will be the primary focus of the sampling effort. The costs associated with excavation, treatment, and disposal are estimated in Section 8 and 9 of the ROD.

7.2.5 Alternative 5: Excavation and Disposal

This alternative involves complete removal of material contaminated at unacceptable concentration levels from a human health perspective, to levels of intrusion (maximum of 10 ft) or to the maximum depth at which contaminant concentrations exceed preliminary remediation goals, whichever is less. This would be followed by offsite transportation and disposal at a disposal facility licensed to receive low-level radioactively contaminated soils. Verification samples would be collected to ensure that the final

remediation goals were met.

The license for a disposal facility will specify the radionuclide activity levels that can be accepted.

Transportation would involve a combination of onsite trucking to a railhead and offsite rail transportation to the disposal facility.

This alternative provides long-term effectiveness because the contamination would be removed from the site. Long-term monitoring would no longer be required, assuming removal of contaminated soils achieve acceptable levels. Costs of excavation and disposal, which are high compared to other alternatives considered, can be found in greater detail in Sections 8 and 9 of this ROD.

7.3 Summary of Comparative Analysis of Alternatives

The five alternatives discussed in Section 7.2 were evaluated using the nine evaluation criteria as specified by CERCLA:

1. Overall protection of human health and the environment-addresses whether a remedy provides adequate protection of human health and the environment, and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs-addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

3. Long-term effectiveness and permanence-refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume through treatment-addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the COCs, including how treatment is used to address the principal risks posed by the site.

5. Short-term effectiveness-addresses any adverse impacts on human health and the environment that may be posed during the construction and implementation period, and the period of time needed to achieve cleanup goals.

6. Implementability-addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost-includes estimated capital and operation costs, expressed as net present-worth costs.

8. State acceptance-reflects aspects of the preferred alternative and other alternatives that the state favors or objects to, and any specific comments regarding state ARARs or the proposed use of waivers.

9. Community acceptance-summarizes the public's general response to the alternatives described in the Proposed Plan and in the RI/FS, based on public comments received.

Table 7-3 presents the results of the comparative analysis of the five alternatives using a ranking based on an alternative's ability to meet the nine evaluation criteria. Table 7-4 provides a ranking of alternatives for each on the basis of the comparative analysis. The following sections describe how each alternative either does or does not meet the criteria.

Each of the five alternatives subjected to the detailed analysis was evaluated against the nine evaluation criteria identified under CERCLA. The criteria are subdivided into three categories: (1) threshold criteria that mandate overall protection of human health and the environment and compliance with ARARs; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction in toxicity, mobility or volume through treatment, and cost; and (3) modifying criteria that measure the acceptability of alternatives to state agencies and the community. The following sections summarize the evaluation of the five alternatives against the nine evaluation criteria.

7.3.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment, and compliance with ARARs. The selected remedial action must meet the threshold criteria. Although the No Action alternative does not meet the threshold criteria, this alternative was used in the detailed analysis as a baseline against which the other alternatives were compared, as directed by EPA guidance.

7.3.1.1 Overall Protection of Human Health and the Environment. This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or

controlled through
treatment, engineering controls, or institutional controls.

Alternative 1 (No Action With Monitoring) would not satisfy the criterion of overall protection of human health and the environment because access to the site and contact with the waste are not prevented.

Alternative 2 (Limited Action) would be effective for protecting human health and the environment.

Institutional controls, including access restrictions, are regarded as reliable for at least 100 years following site closure. With the exception of mercury at the Chemical Waste Pond, COCs were determined to degrade to risk levels less than 1E-04 within 100 years. Therefore, no long-term human health risks will exist after that time. Institutional controls at the Chemical Waste Pond would have to be maintained permanently as the COC, mercury, does not degrade.

Regarding both the engineered barrier (Alternative 3a), and the native soil cover (Alternative 3b), each containment alternative involves the use of institutional controls (radiation surveys, cap integrity monitoring, and access restrictions) and surface water diversion controls. Surface water diversion controls will be maintained at least until the 100-year institutional control period expires. Alternative 3a (engineered barrier) is expected to be highly protective of human health and the environment for at least

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the length of time an unacceptable risk is posed at the OU 2-13 buried soil and disposal sites. The engineered cover ensures long-term protection because it uses natural construction materials approximately 4 ft thick. Functional requirements of this cover would include inhibiting human and biotic intrusion, as well as meeting other RAOs. The thickness of this barrier would be more than sufficient to shield against penetrating radiation above background levels. Furthermore, this barrier would be designed to inhibit inadvertent human intrusion, and resist erosion from wind and surface water runoff. This barrier would also inhibit biotic intrusion, thereby controlling exposure pathways to environmental receptors. The native soil cover (Alternative 3b) is designed for long-term isolation of waste with minimal maintenance requirements. The cover surface would provide erosion control, and the cover soil thickness would inhibit biointrusion into contaminated soil, However, the potential would exist for deep-rooting vegetation or burrowing invertebrates to mobilize radionuclides into the environment.

Alternative 4 (excavation, treatment, and disposal) involves excavation of mercury-contaminated soils and pond sediments at the Chemical Waste Pond, treatment in a mercury retort, and return of clean soils to the disposal pond. For the purposes of this evaluation, it is assumed that all pond sediments would fail the TCLP and require treatment. This alternative provides highly effective, long-term protection of human health and the environment. The removal of all mercury-contaminated soils from the Chemical Waste Pond would eliminate potential long-term human health and environmental concerns associated with future exposure of mercury migration from the pond. Recycling and/or reuse by an approved and permitted industrial facility is assumed to ensure complete elimination of risks to human health and the environment at this site.

Finally, excavation and disposal (alternative 5) provides highly effective, long-term protection of human health and the environment. The removal of all contaminated soil from OU 2-13 sites of concern would eliminate potential long-term human health and environmental concerns associated with future exposure of contaminant migration from uncontrolled radioactive waste disposal sites. This alternative is also environmentally protective during implementation, based on the contamination mitigation activities that would be used to prevent contaminant migration during excavation activities. However,

short-term protection of human health is less effective because workers would receive direct exposure to contaminated soil and debris during excavation.

7.3.1.2 Compliance with Applicable or Relevant and Appropriate Requirements. While the No Action alternative does not involve any construction or operational activities that would result in disturbance to the surfaces of the OU 2-13 sites, most ARARs and To Be Considered (TBC) requirements for the eight sites identified as having unacceptable risks or adverse noncarcinogenic health effects would not be met under this alternative. Table 7-3 shows which ARARs would not be met under this alternative. Most ARARs and TBCs would be met under the Limited Action alternative, with the exception of Idaho Fugitive Dust Emission (IDAPA 16.01.01.650 et seq) requirements and Storm Water Discharge regulations (40 CFR 122.26). While the Limited Action alternative does not involve any construction or operational activities that would result in disturbances to the surfaces of the OU 2-13 sites. IDAPA 16.01.01.650 could nonetheless apply to the existing Warm Waste Pond cells if they were a source of fugitive dust and is, therefore, considered an ARAR that would not be met. The ARARs pertaining to current workers are met through administrative controls in place at TRA; these controls would remain in effect durinig the institutional period (at least 100 years). If metals and SVOCs were present in fugitive dust, then IDAPA 16.01.01.585-586 are ARARs that would not be met.

All ARARs and TBCs would be met under the containment alternatives (Alternatives 3a and 3b). Containment actions, including the use of institutional controls, would reduce the external exposure risk associated with contaminated soil left in place at disposal ponds and subsurface release sites. Alternative 4 involves excavation, treatment, and disposal at the Chemical Waste Pond (TRA-06) only. This alternative satisfies all ARARs and TBCs, provided proper engineering controls (i.e., dust suppression and retort emissions control) are followed during excavation and treatment. Excavation and disposal (Alternative 5) would comply with all ARARs and TBCs. Compliance with the emissions control ARARs would be ensured by performing excavation using water sprays and other techniques for dust suppression, as needed.

Recent investigations have determined that RCRA-listed waste may have been present in the TRA

warm and hot waste systems when leaks from the systems to the environment occurred. Therefore, soils at those sites associated with releases from the warm and hot waste systems will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action.

7.3.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the remedial alternatives and weigh major tradeoffs among alternatives. The balancing criteria are used in refining the election of the candidate alternatives for the site. The balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

7.3.2.1 Long-Term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternative 1 (No Action With Monitoring) provides the least possible level of long-term effectiveness and permanence because unacceptable risks would remain at the sites. The long-term effectiveness and permanence of the Limited Action Alternative (Alternative 2) is considered high as long as administrative and institutional controls are in place to prevent human exposure to contaminated surface soil. Alternatives 3a and 3b (containment alternatives and institutional controls) involve the installation of either an engineered barrier or a native soil cover. Cap integrity monitoring and survey programs would be implemented annually for the first 5 years following completion of the cap, and additional monitoring requirements would be evaluated during subsequent 5-year reviews. Therefore, the long-term effectiveness and permanence requirements are met by these alternatives. Each capping technology is designed to resist erosion because of wind and surface water runoff and to resist biointrusion into the contaminated soil. The design of the engineered cover provides greater permanence and lower maintenance. The native soil cover would be more susceptible to erosion and biointrusion and would require more maintenance and monitoring than the engineered cover. Based on direct exposure reduction requirernents, the Warm Waste Pond 1952 and 1957 cells would require long-term effectiveness and permanence for a period of at least 270 years. Both containment designs would meet this requirement.

Alternative 4 (excavation, treatment, and disposal) at the Chemical Waste Pond has a high potential for achieving long-term effectiveness and permanence because soil contaminated greater than TCLP levels is completely removed, treated, and used as clean backfill in the excavation. Alternative 5 (excavation and disposal) has the highest potential for achieving long-term effectiveness and permanence because

contaminated soil is completely removed from the site. This would reduce or eliminate the need for long-term monitoring and maintenance and would likely eliminate the need for other institutional controls such as fencing and deed restrictions.

7.3.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment. This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal elements. Treatment to reduce the toxicity of radionuclides is presently not feasible. Therefore, none of the remedial alternatives, with the exception of excavation, treatment, and disposal of mercury contaminated soil at the Chemical Waste Pond, involves the use of treatment to reduce the toxicity, mobility, or volume of contaminated materials. At the Chemical Waste Pond, it is expected that treatment would reduce the toxicity, mobility, and volume to acceptable levels, if treatment were deemed necessary.

7.3.2.3 Short-Term Effectiveness. Short-term effectiveness addresses the time needed to implement remediation methods to reduce any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

The short-term effectiveness for any remedial action taken at the TRA would be enhanced to the maximum extent practicable through adherence to strict health and safety protocols for worker protection and use of engineering controls to prevent potential contaminant migration. However, the alternative that provides the least amount of disturbance to contaminated materials ranks the highest in terms of short-term effectiveness. As such, Alternative 1 (No Action With Monitoring) provides the highest degree of short term effectiveness because no additional onsite activities are required. The Limited Action (Alternative 2) alternative is already implemented at TRA through radiation control and fences, signs, and

radiation monitoring; as a result, short-term effectiveness is considered high. No specialized equipment, personnel, or services are required to continue this alternative. Natural decay of radionuclides over time would reduce the environmental and human health risk. Short-term effectiveness criteria for the containment alternatives (Alternatives 3a and 3b) are met because exposure to construction workers during installation of the cover would be minimized. Inhalation and ingestion risks would be minimized by the use of appropriate protective equipment, engineering controls, and adherence to health and safety protocol, including the DOE as-low-as-reasonably-achievable approach to radiation protection.

Risks from transportation would be low because of the likelihood of obtaining construction materials from local sources. Environmental impacts during construction activities would be minimal. The activities would occur within previously disturbed areas. The remoteness of the TRA site would prevent any impact to surrounding communities during construction activities. Short-term effectiveness of Alternative 4 (excavation, treatment, and disposal) at the Chemical Waste Pond is considered relatively high provided administrative and engineering controls are properly conducted. Equipment-operator exposures would be minimized to the extent practicable. Environmental impacts for this alternative are minimal and are similar to those for the excavation and disposal alternative. The RAOs would be achieved by this alternative once excavation, treatment, and disposal of treated soil is complete. Alternative 5 (excavation and disposal) offers the least short-term effectiveness because of direct contact with contaminated materials during excavation and transportation of the disposal facility. However, radiation controls and monitoring would be implemented to mitigate these risks.

Equipment-operator exposures would be minimized to the extent practicable through shielding, use of supplied air, air filters, and other engineering controls (i.e., dust suppression). In addition, exposure could be reduced through reduction in the amount of time spent at the site by any one worker. Some environmental disturbance is likely to occur in the area surrounding the excavation and haulage route. However, these impacts would be temporary and restoration of disturbed areas would occur following completion of construction activities. The RAOs would be achieved by this alternative once

excavation
and disposal are complete.

7.3.2.4 Implementability. The implementability criterion has the following three factors
requiring evaluation: (1) technical feasibility, (2) administrative feasibility, and (3) the availability of
services and materials. Technical feasibility requires an evaluation of the ability to construct and operate
the technology, the reliability of the technology, the ease of undertaking additional remedial action (if
necessary), and monitoring considerations. The ability to coordinate actions with other agencies is one
factor for evaluating administrative feasibility, and the agencies have demonstrated this ability throughout
the project to date. Other administrative activities that would be readily implementable include planning,
use of administrative controls, and personnel training. In terms of services and materials, an evaluation of
the following availability factors is required: necessary equipment and personnel, prospective technologies,
and cover materials.

Alternative 1 (No Action With Monitoring) is the simplest remedial action to implement from a
technical perspective because environmental monitoring is all that may be required. If required,
monitoring would be performed until future reviews of the remedial action indicate that such activities are
no longer necessary. Environmental monitoring services and equipment are readily available. However,
Alternative 1 is administratively unacceptable because of the potential risks to human health and the
environment posed by the TRA sites of concern. Implementability for Alternative 2 (Limited Action) is
high because most administrative and institutional controls are already in place and access to contaminants
is currently restricted. The containment alternatives (Alternatives 3a and 3b) are readily implementable
based on local sources of materials, conventional construction equipment and methods, and easily
implemented institutional controls, including long-term monitonng, cap integrity monitoring, access
restrictions and surface water runoff control. Long-term activities following cover construction would
include radiation surveys, annual review of cover integrity, institutional controls for 5 years, and
subsequent 5-year reviews. Containment activities have been successfully implemented in other areas of
the INEEL. At the Chemical Waste Pond, Alternative 4 (excavation, treatment, and disposal) is readily
implementable.

Treatment of mercury-contaminated soils has been previously demonstrated to be

effective at the INEEL and at identified industrial facilities willing to take recovered mercury. Alternative 5 (excavation and disposal) would be moderately difficult to implement because of the complexity of the retrieval system with respect to safety considerations and containment requirements. Significant effort would be required to perform environmental assessments, safety analyses, and equipment modifications (for operator safety), as well as system testing and demonstration. Although the equipment and technology are available to perform the activities specified in this alternative, increased risks to workers during excavation result in lower implementability relative to other alternatives.

7.3.2.5 Cost. In evaluating project costs, an estimation of the direct and indirect costs in present worth dollars is required. Present worth costs are estimated assuming variable annual inflation factors for the first 10 years, and a constant 5% annual inflation rate after that. A constant 5% discount rate is assumed. Direct costs include the estimated dollars for equipment, construction, and operation activities to conduct a remedial action. Indirect costs include the estimated dollars for activities that support the remedial action (such as construction management, project management, and management reserve). In accordance with the RI/FS study guidance, the costs presented in Table 9-2 are estimates (-30 to +50%). Actual costs will vary based on the final design and detailed cost itemization.

The costs associated with Alternative 1 (No Action With Monitoring) involve only radiation surveys. Post-closure costs were estimated for the full duration of the 100-year period of monitoring. The costs associated with Alternative 2 (Limited Action) involve only radiation surveys and maintaining existing fences, such as the one located at the Sewage Leach Pond Soil Contamination Area. For Alternatives 3a (engineered barrier) and 3b (native soil cover) the cost estimate is based on constructing the engineered and native soil cover, installing surface water diversion controls, using monitoring equipment, conducting analyses, and post-closure maintenance and monitoring. Costs for the native soil cover are lower than for the engineered cover because of the simple design. At the Chemical Waste Pond, costs associated with excavation, treatment, and disposal are considered moderate. The estimated cost for Alternative 5 (excavation and disposal) is relatively high. The implementation requirements significantly increase the

cost associated with this alternative. No post-closure monitoring or care is required because the contaminants will be removed.

7.4 Modifying Criteria

The modifying criteria, state and community acceptance, are used in the final evaluation of remedial alternatives. For both of these criteria, the factors include the elements of the alternatives that are supported, the factors of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

7.4.1 State Acceptance

The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs, with the selected remedial alternatives for the sites contained in this ROD and is signatory to the ROD with DOE and EPA.

7.4.2 Community Acceptance

Community participation in the remedy selection process includes participation in the public meetings held in March 1997 and review of the Proposed Plan during the public comment period of March 10, 1997 through May 9, 1997. Community acceptance is summarized in the Responsiveness summary presented as Appendix A of this document. The Reponsiveness Summary includes comments received either verbally or in writing from the public, and the agencies' responses to these comments.

A total of about twenty people not associated with the project attended the Proposed Plan public meetings. Overall, twenty citizens provided formal comments; of these, six citizens provided verbal comments, and fourteen provided written comments. All comments received on the proposed plan were considered during the development of this ROD.

As can be seen in the Responsiveness Summary, the ROD was substantively modified and improved in response to comments made by the public. Comments were often incorporated directly or were

modified and included in the decision. In other cases, the modifications were made to the document to add greater explanation as to why a comment could not be incorporated.

In addition to their direct impact on the decision and the document, public comments triggered focused review of the sections highlighted by each commentor. The DOE, EPA, and the State review of these sections and the document as a whole resulted in further modifications and improvements to the decision. The agencies appreciate the public's participation in this process and acknowledge the value of public comment.

8. SELECTED REMEDY

The results of investigations at OU 2-13, WAG 2, TRA, at INEEL indicate that eight sites exceed a 1 in 10,000 risk or greater than 1.0 hazard index (indicates adverse noncarcenogenic health effects) to human health and/or the environment and thus pose an unacceptable risks; 47 sites do not exceed a 1 in 10,000 risk and therefore require no action. Please note that there are no unacceptable cumulative effects from the eight sites, and the remedial actions being recommended address individual risks as well as preventing cumulative risks to a future residential receptor at WAG 2. Based on consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE-ID, EPA, and IDHW have selected the following alternatives for the sites contained in this ROD (Table 8-1).

Table 7-3 provides a summary of how the selected remedy for each ranks relative to one another. This comparative analysis provides a measure of the relative performance of alternatives against each evaluation criterion. The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative.

8.1 Description of Selected Remedy

The selected remedies for each are described in the following sections.

8.1.1 Warm Waste Pond (TRA-03)

The selected remedy for the Warm Waste Pond 1952 and 1957 cells is Alternative 3a (containment with an engineered cover and institutional controls). This alternative was found to provide the greatest level of protectiveness to human health and the environment and had substantially lower

costs than the excavation and disposal alternative. Implementation of the engineered cover is slightly more difficult than the native soil cover alternative, but the engineered cover provides greater permanence and requires less maintenance. Because contaminants are being left in place, institutional controls will be required to remain for the length of time that the contaminants pose an unacceptable risk to human health or the environment (at least 100 years). These institutional controls are to include soil cover integrity monitoring and maintenance, surface water diversions, access restrictions, and long-term environmental monitoring Institutional controls are assumed to remain in effect for at least 100 years. Five-year reviews will be used to ensure that the remedy remains protective and appropriate. Before placement of the final cover, the 1957 cell may be filled to grade with CERCLA-contaminated soils from surrounding INEEL sites. As approved by the agencies, all soils used to fill the Warm Waste Pond to grade will have to be consistent with what has been placed to date in the 1957 cell in terms of contaminant type and concentration.

This alternative will reduce human exposure by preventing direct contact with and exposure to contaminants and will inhibit or eliminate potential intrusion of contaminated soils by both human and ecological receptors (i.e., burrowing mammals and deep-rooted vegetation). Under this alternative, groundwater monitoring will be continued to ensure that groundwater concentrations do not increase to unacceptable levels and that modeling predictions remain valid.

For the 1964 cell, where previous interim remedial action has already been completed, a basalt riprap or cobble gravel layer will be placed on top of the current native soil surface to inhibit intrusion or future excavation at the and to increase the permanence of the remedy.

Table 8-1. Selective remedial alternatives for sites of concern in OU 2-13.

	Selected Remedy
Warm Waste Pond (TRA-03) 1952 and 1957 cells	Containment with an engineered cover and institutional controls
Warm Waste Pond 1964 cell	Final basalt riprap or cobble gravel layer on existing native soil cover and institutional controls

Chemical Waste Pond (TRA-06)	Native soil cover and institutional controls, with possible excavation, treatment, and disposal
Cold Waste Pond (TRA-08)	Excavation and disposal
Sewage Leach Pond (TRA-13)	Containment with a native soil cover and institutional controls
Soil Surrounding Hot Waste Tanks at Building TRA-613 (TRA-15)	Limited Action for at least 100 years
Soil Surrounding Tanks 1 and 2 at Building TRA-630 (TRA-19)	Limited Action with implementation of a contingent excavation and disposal option
Brass Cap Area	Limited Action with implementation of a contingent excavation and disposal option
Sewage Leach Pond Berms and Soil Contamination Area	Limited Action for at least 100 years; berms will be placed in the floor of the Sewage Leach Pond

Performance standards will be implemented to ensure that the engineered cover provides protection against direct exposure to the contaminated waste. These standards are described in Section 8.2.

Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm waste system when discharges from the warm waste system to the pond occurred. In addition, soil placed in the Warm Waste Pond from Test Area North (TAN) during the OU 10-06 removal action may have been contaminated with RCRA-listed waste. Therefore, the Warm Waste Pond soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action. Any final determination to be made in regard to management of these soils will be pursued within time frames capable of supporting the schedule to be established in the RD/RA Scope of Work.

The soil from TAN placed in the TRA Warm Waste Pond during the OU 10-06 removal action may have been contaminated with low levels of PCBs. This soil was analyzed for PCBs; however,

none were detected. The maximum detection limit of the data set was 0.220 ppm. The agencies have determined that these soils need not be managed as PCB-contaminated soil since the residual PCB levels are below the OSWER directive guidance level of 25 ppm at superfund sites.

In summary, the containment remedy for the Warm Waste Pond is protective of human health and the environment, complies with ARARs, provides short- and long-term effectiveness, is readily

and is cost effective. The engineered cover design has been shown to be effective at other sites contaminated with radionuclides. Institutional controls will be implemented as described in Section 7.2.2.

8.1.2 Chemical Waste Pond (TRA-06)

The selected remedy for the Chemical Waste Pond is Containment with a Native Soil Cover and Institutional Controls with Possible Excavation, Treatment, and Disposal. The need for excavation, treatment and disposal will be determined on the basis of additional sampling to be performed during the remedial design phase. The agencies have concurred that excavating and disposing of contaminated sediments in the bottom of the pond before filling the pond to grade or constructing a native soil cover will meet the cleanup goals for the Chemical Waste Pond. However, it is not clear which is most cost effective. Cost effectiveness is dependent on the amount of soil that would need to be excavated and the requirements for its management as well as the design of the cover. If only small amounts of contaminated soil would need to be excavated and disposed, and the level of mercury in that soil is below levels that would require treatment, then excavation and disposal would likely be more cost effective. This is because the disposal cost would be low, the pond could be filled to grade with minimal backfill specifications, and long-term monitoring and maintenance needs would be eliminated. If larger amounts of soils would need to be excavated and disposed to meet cleanup goals, and the levels of mercury in the soil would require treatment by stabilization or retorting to meet hazardous waste regulations, then the soil cover would be the more cost-effective remedy. However, if the contamination is left in place, the cover would require more strict specifications to enhance runoff and reduce erosion. In order to make the final determination, further sampling and analysis needs to be completed in the pond to define the amount of soils that would require excavation and how the soil

would have to be managed (i.e., soils contaminated with mercury above 260 mg/kg must be treated by retorting the soil if excavated and thereby generated as hazardous waste). Therefore, the specific design of the remedy selected in this ROD, native soil cover with possible excavation and disposal after sampling, will be dependent upon the results of a sampling and analysis effort as a first step after signature of the ROD but before the final design is completed.

If contaminants are left in place, the final cover design will consist of a sloped surface with a 1-ft peak similar to that depicted in Figure 7-1. Environmental monitoring and institutional controls would be maintained for at least 100 years. Institutional controls and access restrictions as described in Section 7.3.2 will be required. Five-year reviews will be used to evaluate the effectiveness and appropriateness of this alternative.

Performance standards will be implemented to ensure that the native-soil cover provides protection against direct exposure to the contaminated wastes. These standards are described in Section 8.2.

8.1.3 Cold Waste Pond (TRA-08)

The selected alternative for the Cold Waste Pond is Alternative 5, Excavation and Disposal. Costs for this alternative were lower due to the estimated amount of contaminated sediment requiring removal [0 to 6 in. (0 to 15 cm)] versus the amount of fill materials that would be required under the two containment options (Alternatives 3a and 3b). It is anticipated that a hot spot removal will be performed on the basis of field measurements and laboratory data collected. This alternative provides the highest degree of long-term, effectiveness and permanence. Only sediments with contaminant concentrations exceeding risk-based cleanup goals will be excavated and appropriately disposed.

Performance standards will be implemented to ensure that the excavation and disposal of contaminated soil provide protection against direct exposure to the contaminated wastes. These standards are described in Section 8.2.

8.1.4 Sewage Leach Pond (TRA-13)

The selected alternative for the Sewage Leach Pond is Alternative 3b (containment with a native soil

cover and institutional controls, as described above). Institutional controls will be required to remain for the length of time that the contaminants pose an unacceptable risk to human health or the environment (at least 100 years). Before the barrier is constructed, the pond will initially be backfilled with soils from the contaminated berms, then filled with clean soil to grade. This will ensure that any contamination from the berms is placed in the bottom of the pond. The final cover design will consist of a sloped surface with a 1-ft peak. The cover surface would be completed with a gravel mulch and vegetated with crested wheatgrass. The slope surface would be used to divert surface water runoff and to promote evapotranspiration. This alternative would effectively reduce risks to human health and the environment at relatively low implementation costs compared to excavation and disposal. The native soil cover effectively reduces the potential for human and environmental exposure to contaminants but requires long-term monitoring and maintenance to ensure that migration of contaminants to receptor pathways does not occur. This alternative was compared and selected based on remedy selection criteria as described in Section 7.3. Five-year reviews will be used to evaluate the effectiveness and appropriateness of this alternative.

Performance standards will be implemented to ensure that the native-soil cover provides protection against direct exposure to the contaminated wastes. These standards are described in Section 9.2.

8.1.5 Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15)

The selected alternative for the soil surrounding Hot Waste Tanks at Building 613 is Alternative 2, Limited Action, because risk estimates are only slightly above criteria for current and future workers. Existing administrative and institutional controls will continue to be used to be protective of occupational scenarios. These controls would be maintained for a period of 100 years. Performance standards will be implemented to ensure protection against direct exposure to the contaminated wastes while the site is under institutional control. At the end of 100 years, no other action will be required because radioactive decay of contaminants will have occurred to levels that no longer represent an unacceptable risk to human health and the environment.

8.1.6 Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19)

The selected alternative for the Soil Surrounding Tanks 1 and 2 at Building 630 is Alternative 2 (Limited Action), with the contingency that if controls established under the Limited

Action are not maintained then an Excavation and Disposal option would be implemented. Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. If soil is excavated for disposal, a hazardous waste determination will be required. Therefore, the TRA-19 soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of excavation and disposal. Excavation would occur to a maximum depth of potential intrusion [10 ft (3 m) or the maximum depth at which contaminant concentrations exceed PRGs, whichever is less]. The excavated soil will be transported to an approved disposal facility. This alternative was selected on the basis of long-term effectiveness, permanence, and costs that are roughly equivalent to those for Alternative 3a, containment with an engineered cover.

This alternative is selected because the contamination associated with these two sites is located under the ground surface in and around active radioactive waste piping and tank systems and buildings where access is physically limited. Therefore, excavation or containment alternatives are not fully implementable at this time, because it cannot be ensured that adequate contamination could be removed to eliminate the need for the controls that would be in place under the Limited Action alternative. If during 5-year reviews it is determined that the controls established under the Limited Action alternative are not maintainable or do not continue to be protective, the contingency of Excavation and Disposal would be implemented. Selection of the Limited Action alternative in this ROD would require that existing controls such as access restrictions and worker protection programs be maintained to prevent exposure above acceptable levels to workers or future inhabitants.

The identification of Limited Action as the preferred alternative, with an Excavation and Disposal option contingency, is based on the 100-year industrial land use assumption for TRA. The validity of this assumption will be evaluated during the 5-year review process. However, the maximum duration of time for which this assumption may be considered valid is up to 100 years from now.

Performance standards will be implemented to ensure protection against direct exposure to the contaminated wastes while the site is under institutional control. When excavation and

disposal take place at some point in the future, the performance standards described in Section 8.2 will be implemented to ensure that excavating and disposal activities provide protection against direct exposure to the contaminated wastes.

8.1.7 Brass Cap Area

As with TRA-19, the selected alternative is Limited Action, with the contingency that, if controls established under the Limited Action are not maintained then an Excavation and Disposal option would be implemented. This alternative provides long-term effectiveness, permanence, and reasonable costs when compared with the other remedies evaluated.

This consists of radioactively contaminated soil located below the ground surface inside the security fence at TRA. The source of contamination is attributed to a leaking warm waste line; however, it is acknowledged that possible releases from a nearby hot waste line may have occurred and that this contamination may not be readily distinguishable from any warm waste line releases. Some contaminated soil and concrete were excavated and removed during repair of the leaking line. The excavation was backfilled with clean soil, and the concrete surface was replaced. Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. If soil is excavated for disposal, a hazardous waste determination will be required. Therefore, the Brass Cap Area soils will be managed in a manner consistent with the hazardous waste determination to be performed at the time of excavation and disposal.

The identification of Limited Action as the preferred alternative, with an Excavation and Disposal option contingency, is based on the 100-year industrial land use assumption for TRA. The validity of this assumption will be evaluated during the 5-year review process. However, the minimal duration of time for which this assumption may be considered valid is up to 100 years from now.

Performance standards will be implemented to ensure protection against direct exposure to the contaminated wastes while the is under institutional control. When excavation and disposal take place at some point in the future, the performance standards described in Section 8.2 will be implemented to ensure that excavating and disposal activity provides protection against direct exposure to the

contaminated wastes.

8.1.8 Sewage Leach Pond Berm and Soil Contamination Area

The selected remedy for the Sewage Leach Pond Berms and Soil Contamination Area is Alternative 2 (Limited Action), consisting of existing administrative and institutional controls. As previously described in Section 8.1.4 for the Sewage Leach Pond (TRA-13), the contaminated berms will be placed in the bottom of the pond before completion of the final clean, native soil cover. The remaining low-level radionuclide-contaminated soils will be left in place, and exposure to these contaminants will be minimized through the use of fences, signs, and monitoring (i.e., field measurement surveys). Institutional controls will be maintained for a period of at least 100 years. This will be protective of occupational scenarios while achieving acceptable risks within 100 years because of natural radioactive decay. A CERCLA 5-year review will be conducted to ensure that the administrative controls are being properly maintained and that the predicted decrease in contaminant concentrations does occur.

8.1.9 No Action Site

The No Action alternative was reaffirmed or selected as the appropriate alternative for the 47 sites at TRA listed below. This alternative was chosen because there are no known or suspected contaminant releases, contaminants exceeding acceptable levels, or previous cleanups resulting in unacceptable risks to human health and the environment. For this reason, long-term environmental monitoring is not warranted for these sites. It should be noted that the eliminated No Action sites do not pose a risk in combination.

Operable Unit--None

- TRA-10 TRA MRT Construction Excavation Pile
- TRA-23 TRA ETR Excavation Rubble Pile
- TRA-24 TRA Guardhouse Construction Rubble Pile
- TRA-25 TRA Sewer Paint Settling Pond Rubble Pile
- TRA-26 TRA Rubble by USGS Observation Well
- TRA-27 TRA North Storage Area Rubble Pile
- TRA-28 TRA North (Landfill) Rubble
- TRA-29 TRA ATR Construction Pile
- TRA-32 TRA West Road Rubble Pile
- TRA-33 TRA West Staging Area/Drainage Ditch Rubble

Operable Unit 2-01

- TRA-02 TRA Paint Shop Ditch

Operable Und 2-02

- TRA-14 TRA Inactive Gasoline Tank at TRA-605

- TRA-17 TRA Inactive Gasoline Tank at TRA-616
- TRA-18 TRA Inactive Gasoline Tank at TRA-619
- TRA-21 TRA Inactive Tank, North Side of MTR-643
- TRA-22 TRA Inactive Diesel Fuel Tank at ETR-648

Operable Unit 2-03

- None TRA-614 Oil Storage North
- TRA-01 TRA Acid Spill Disposal Pit
- TRA-11 TRA French Drain at TRA-645
- TRA-12 TRA Fuel Oil Tank Spill (TRA-727B)
- TRA-20 TRA Brine Tank (TRA-731) at TRA-631
- TRA-40 TRA Tunnel French Drain (TRA-731)

Operable Unit 2-04

- None TRA PCB Spill at TRA-619
- None TRA PCB Spill at TRA-626
- None TRA-627 #5 Oil Spill
- None TRA PCB Spill at TRA-653
- None TRA-670 Petroleum Product Spill
- None TRA PW 13 Diesel Fuel Contamination
- TRA-09 TRA Spills at TRA Loading Dock (TRA-722)
- TRA-34 TRA North Storage Area

Operable Unit 2-05

- None TRA-603/605 Tank
- TRA-16 TRA Inactive Radionuclide Contaminated Tank at TRA-614

Operable Unit 2-06

- TRA-30 TRA Beta Building Rubble
- TRA-31 TRA West Rubble
- TRA-35 TRA Rubble East of West Road near Beta Building Rubble Pile

Operable Unit 2-07

- None TRA-653 Chromium-Contaminated Soil

Operable Unit 2-08

- TRA-37 TRA MTR Canal in basement of TRA-603

Operable Unit 2-09

- TRA-07 TRA Sewage Treatment Plant (TRA-024) and Sludge Pit (TRA-07)

Operable Unit 2-10

- TRA-03B TRA Warm Waste Pond (Sediments)

Operable Unit 2-11

- TRA-03A TRA Warm Waste Leach Pond (TRA-758)
- TRA-04 TRA Warm Waste Retention Basin (TRA-712)
- TRA-05 TRA Waste Disposal Well, Sampling Pit (764) and Sump (703)

Operable Unit 2-12

- None Perched Water RI/FS

Operable Unit 2-13

- TRA-41 French Drain
- TRA-42 Diesel Unloading Pit
- None Hot Tree
- None ETR Stack Area

The agencies concur with the No Action alternative selected for the above-listed sites.

For those sites for which no action is being taken based on land use assumptions, those assumptions will be reviewed as part of the 5-year review. In addition, legacy waste that has been generated as a result of previous sampling activities at WAG 2 (i.e., investigation-derived waste) will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to achieve remediation goals consistent with remedies established for sites under this ROD.

8.2 Remediation Goals

The purpose of this response action is to inhibit potential exposure for human and environmental receptors and to minimize the spread of contamination. For the majority of disposal pond sites, this will be accomplished by constructing long-term covers (caps) and restricting access to the sites. For the subsurface release sites, this will be primarily accomplished by eventual excavation and disposal of the contaminated soils. For the remaining sites, this will be accomplished through institutional controls.

8.2.1 Containment System Performance Standards

Performance standards will be implemented to ensure that the cover systems provide protection against direct exposure to the waste at the sites with native-soil covers or engineered covers. The performance standards identified for the containment alternative include:

- Installation of covers that are designed to remain in existence for the length of time an unacceptable risk is posed, in order to discourage any individual from inadvertently intruding into the burned waste or from contacting the waste.

- Application of maintenance and surface monitoring programs for the containment systems capable of providing early warning of releases of radionuclides and non-radionuclide contaminants of concern from the disposal sites before they leave the site boundary

- Institution of restrictions limiting land use for at least 100 years

- Implementation of surface water controls to direct surface water away from the disposed waste

- Elimination, to the extent practicable, of the need for ongoing active maintenance of the disposal sites following closure so that only surveillance, monitoring, or minor custodial care are required

- Placement of adequate cover to inhibit erosion by natural processes for the specified design lives of the covers

- Incorporation of features to inhibit biotic intrusion into the Warm Waste Pond 1952 and 1957 cells.

The inspection and maintenance of the cover system will be conducted concurrent with the radiological survey program. Implementation of the maintenance and survey programs will ensure protection of human health and the environment from any unacceptable risks. These programs will be implemented annually for the first 5 years following completion of the caps. The necessity for continued monitoring will then be reevaluated and defined as determined appropriate by the agencies during subsequent 5-year reviews.

8.2.2 Excavation and Disposal Performance Standards

Performance standards will be implemented to ensure that excavation and disposal activities will result in protection against direct exposure to the contaminants during excavation and after disposal. The performance standards identified for this alternative include:

- Physically removing the source of contamination so that the pathway by which a future receptor may be exposed is broken. This will be determined by confirmation soil sampling to ensure that the cleanup meets or exceeds preliminary remediation goals.

8.2.3 Limited Action Performance Standards

Performance standards will be implemented to ensure that institutional controls will result in protection against direct exposure to the contaminants for a period of at least 100 years (corresponding to the point in time at which the contaminants have decayed to below levels of concern). The performance standards identified for this alternative include:

- Installation, where necessary, and maintenance of physical barriers to restrict unauthorized access. This may include fences, ground surface cover, and/or posted warning signs.

- An evaluation of existing management and administrative controls to ensure that protection against direct exposure to contaminants is effective. This evaluation will be performed as part of the remedial design.

- Implementation of additional administrative controls as determined necessary by the evaluation described in bullet 2 of this subsection.

8.2.4 Treatment Performance Standards

Performance standards will be implemented to ensure that treatment of contaminated soil at the Chemical Waste Pond, if necessary, will achieve acceptable levels. The performance standards identified for treatment include:

- Treatment of contaminated soil to at least 0.2 mg/L TCLP for mercury.

8.3 Estimated Cost Details for the Selected Remedy

A summary of the costs for each of the remedial action alternatives evaluated is presented in

Table 9-2. Tables 8-2 through 8-7 provide detailed breakdowns of the estimated costs for the selected remedies.

Table 8-2. Warm Waste Pond engineered barrier detailed cost estimate.

Cost Elements	Estimated Costs ($)
Management and Documentation Costs	
FFA/CO Management and Oversight	375,000
LMITCO Project Management and Title III Inspection	188,356
Construction Project Management (Parsons)	
Remedial Design/Remedial Action Statement of Work and Remedial Design/Remedial Action Work Plan	313,926
	22,000
Subtotal	899,282
Remedial Design	
Title Design Construction Document Package	178,400
Remedial design documentation	60,000
Pre-final Inspection Report	8,000
Subtotal	246,400
Construction Subcontract	
Mobilize/demobilize cap subcontractor	20,000
Construction of cap	688,939
Surface water control	16,000
Access restriction fencing	80,000
Contractor overhead and profit	241,482
Procurement and General and Administrative	

376,711

Subtotal
1,423,132

Post-closure Costs

Post-closure management
3,125,000
Annual Operations and Management reports
250,000
WAG 5-year review
500,000
Remedial action report
17,000
Warm Waste Pond 100-year long-term total costs
2,120,000

Subtotal
5,512,000

Total in 1997 dollars a
8,580,814
Total in net present value dollars
6,843,216

a. Costs shown are in 1997 dollars and net present value dollars. $8,580,814 in 1997 dollars is equal to
$6,843,216 net present value dollars (net present value takes the 1997 dollar amount and assumes variable annual
inflation factors for the first 10 years, and a constant 5% annual inflation rate after that for a total of 100 years. A
constant 5% discount rate is then assumed which results in the net present value amount).

Table 8-3. Chemical Waste Pond detailed cost estimate.

Estimated Costs
Cost Elements
($)

Management and Documentation Costs

FFA/CO Management and Oversight
375,000
LMITCO Project Management and Title III Inspection
23,166
Construction Project Management (Parsons)
38,610
Remedial Design/Remedial Action Statement of Work and Remedial
22,000
Design/Remedial Action Work Plan

Subtotal
458,776

Remedial Design

Title Design Construction Document Package
65,600
Remedial design documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
133,600

Construction Subcontract (Native Soil cover)

Mobilize/demobilize cap subcontractor
10,000
Construction of cap
59,000
Surface water control
5,000
Access restriction fencing
25,000
Contractor overhead and profit
29,700
Procurement and General and Administrative
46,332

Subtotal
175,032

Construction Subcontract (excavate, treat, dispose)

Excavate and haul to on treatment
26,850
On treatment
859,200
Transport concentrated waste off
3,200
Transport clean soils back to Chemical Pond
4,136
Mobilize/demobilize
10,000

Subtotal
903,386

Post-closure Costs (if contamination left in place)

Post-closure management
3,125,000

Annual Operations and Management reports
250,000
WAG 5-year review
500,000
Remedial action report
17,000
Chemical Waste Pond long-term maintenance costs
822,000

Subtotal
4,714,000

Total in 1997 dollars (Native Soil Cover only)
5,481,408
Total in net present value dollars
3,904,959

Table 8-4. Cold Waste Pond excavate and dispose detailed cost estimate.

Estimated Costs
Cost Elements
($)

Management and Documentation Costs

FFA/CO Management and Oversight
375,000
LMITCO Project Management and Title III Inspection
28,548
Construction Project Management (Parsons)
47,580
Remedial Design/Remedial Action Statement of Work and Remedial
22,000
Design/Remedial Action Work Plan
Packaging, Shipping, Transportation Plan
25,000

Subtotal
498,128

Remedial Design

Title Design Construction Document Package
44,600
Remedial design documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
112,600

Construction Subcontract

Excavate and haul costs
112,000
Disposal costs
896,000
Mobilize/demobilize cap subcontractor
10,000
Contractor overhead and profit
36,600
Procurement and General and Administrative
57,096

Subtotal
1,111,696

Post-closure Costs

Remedial action report
17,000

Subtotal
17,000

Total in 1997 dollars
1,739,424
Total in net present value dollars
1,592,818

Table 8-5. Sewage Leach Pond native soil cover detailed cost estimate.

Estimated Costs
Cost Elements
($)

Management and Documentation Costs

FFA/CO Management and Oversight
375,000
LMITCO Project Management and Title III Inspection
28,080
Construction Project Management (Parsons)
46,800
Remedial Design/Remedial Action Statement of Work and Remedial
22,000
Remedial Design/Remedial Action Work Plan

Subtotal
471,880

Remedial Design

Title Design Construction Document Package
65,600
Remedial design documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
133,600

Construction Subcontract

Mobilize/demobilize cap subcontractor
20,000
Construction of cap
70,000
Surface water control
5,000
Access restriction fencing
25,000
Contractor overhead and profit
36,000
Procurement and G&A
56,160

Subtotal
212,160

Post-closure Costs

Post-closure management
3,125,000
Annual Operations and Management reports
250,000
WAG 5-year review
500,000
Remedial action report
17,000
Sewage Leach Pond long-term maintenance costs
934,000

Subtotal
4,826,000

Total in 1997 dollars
5,643,640
Total in net present value dollars
4,028,832

Table 8-6. TRA-15, TRA-19, Brass Cap Area limited action detailed cost estimate.

Cost Elements	Estimated Costs ($)
Management and Documentation Costs	
FFA/CO Management and Oversight	125,000
LMITCO Project Management and Title III Inspection	983
Construction Project Management (Parsons)	1,638
Remedial Design/Remedial Action Statement of Work and Remedial Design/Remedial Action Work Plan	22,000
Subtotal	149,621
Remedial Design	
Title Design Construction Document Package	18,800
Remedial design documentation	60,000
Pre-final Inspection Report	8,000
Subtotal	86,800
Inspection and Maintenance Costs	
Access restriction fencing	35,000
Surface water diversion	700
Subcontractor overhead and profit	1,260
Procurement and General and Administrative fees	1,966
Subtotal	7,426
Post-closure Costs	
Post-closure management	3,093,750
Annual Operation, and Management reports	

147,500
Remedial Action Report
17,000
WAG 5-year review
500,000
Long-term maintenance Costs
570,000

Subtotal
4,428,250
Total in 1997 dollars
4,672,099
Total in net present value dollars
2,312,337

Table 8-7. Sewage Leach Pond Berm and Soil Contamination Area limited action detailed cost estimate.

Estimated Costs
Cost Elements
($)

Management and Documentation Costs

FFA/CO Management and Oversight
125,000
LMITCO Project and Title III Inspection
28,080
Construction Project Management (Parsons)
46,800
Remedial Design/Remedial Action Statement of Work and Remedial
22,000
Design/Remedial Action Work Plan

Subtotal
221,880

Remedial Design

Title Design Construction Document Package
18,800
Remedial Design Documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
86,800

Inspection and Maintenance Costs

Access restriction fencing
100,000
Surface water diversion
20,000
Subcontractor overhead and profit
36,000
Procurement and General and Administrative fees
56,160

Subtotal
212,160

Post-closure Costs

Post-closure management
3,093,750
Annual Operations and Management reports
247,500
Remedial action report
17,000
WAG 5-year review
500,000
Long-term maintenance costs
570,000

Subtotal
4,428,250

Total in 1997 dollars
4,949,090
Total in net present value dollars
3,497,155

Table 8-8. Brass Cap Area excavation and disposal contingent remedy detailed cost estimate.

Estimated Costs
Cost Elements
($)

Management and Documentation Costs

FFA/CO Management and Oversight
375,000
LMITCO Project Management and Title III Inspection
6,578
Construction Project Management (Parsons)
10,963
Remedial Design/Remedial Action Statement of Work and Remedial
47,000
Design/Remedial Action Work Plan

Subtotal
439,541

Remedial Design

Title Design Construction Document Package
44,600
Remedial Design Documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
112,600

Construction Subcontract

Excavate and haul
5,250
Transport and disposal costs
42,000
Refill borrowed and reseeding
5,420
Mobilize/demobilize
10,000
Contractor overhead and profit
6,201
Procurement and General and Administrative
9,674

Subtotal
78,545

Post-closure Costs

Remedial action report
17,000

Subtotal
17,000

Total in 1997 dollars
647,686
Total in net present value dollars
598,512

Table 8-9. TRA-19 excavation and disposal contingent remedy detailed cost estimate.

Estimated Costs
Cost Elements

($)

Management and Documentation Costs

FFA/CO Management and Oversight
375,000
LMITCO Project Management and Title III Inspection
3,801
Construction Project Management (Parsons)
6,334
Remedial Design/Remedial Action Statement of Work and Remedial
47,000
Design/Remedial Action Work Plan

Subtotal
439,541

Remedial Design

Title Design Construction Document Package
44,600
Remedial Design Documentation
60,000
Pre-final Inspection Report
8,000

Subtotal
112,600

Construction Subcontract

Excavate and haul
1,150
Transport and disposal costs
9,200
Refill borrowed and reseeding
5,092
Mobilize/demobilize
10,000
Contractor overhead and profit
4,873
Procurement and General and Administrative
2,601

Subtotal
37,916

Post-closure Costs

Remedial action report
17,000

Subtotal
17,000

Total in 1997 dollars
599,651
Total in net present value dollars
549,110

9. STATUTORY DETERMINATION

The selected remedy for each site meets the statutory requirements of CERCLA Section 121, the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. All remedies meet the threshold criteria established in the NCP (i.e., protection of human health and the environment and compliance with ARARs). CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable, and, that the implemented action be cost effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.
For many of the sites contaminated with radionuclides, effective treatment technologies are currently unavailable; therefore, the preference for permanent solutions cannot be met except through natural radioactive decay processes over time. For those sites where contaminated soils and sediments will be left in place at levels associated with a risk greater than 1E-04 and a hazard index greater than 1.0, a review will be conducted within 5 years and at least every 5 years thereafter, until determined by the agencies to be no longer necessary to ensure that the remedy continues to provide adequate protection of human health and the environment.

9.1 Protection of Human Health and the Environment

As described in Section 8, the selected remedy for each site satisfies the criterion of overall protection of human health and the environment.

9.1.1 Alternative 1: No Action

No remedial action is necessary to ensure continued protection of human health and the environment at the 47 sites identified in Section 8.9. Because no unacceptable risks to human health and the environment were identified, or those risks were mitigated during previous cleanups, the No Action alternative has been selected and environmental monitoring is not warranted.

9.1.2 Alternative 2: Limited Action

Protection of human health is achieved by this alternative through existing administrative and institutional controls that reduce the potential for exposure to site contaminants. The use of routine maintenance, access restriction, long-term environmental monitoring, and surface water diversion are included in this remedy. Protection of environmental receptors is not ensured under this alternative. However, for TRA-15 19, Brass Cap Area, and Sewage Leach Pond Soil Contamination Area, for which this remedy was selected, no unacceptable risks to environmental receptors have been identified.

9.1.3 Alternatives 3a and 3b: Containment with Engineered Cover or Native Soil Cover

The containment cover alternatives prevent direct contact with contaminants by all potential receptors, reduce radiation external exposure through shielding, and reduce the likelihood of biointrusion (engineered cover only).

9.1.4 Alternative 4: Excavation, Treatment, and Disposal

This alternative provides maximum protection of human health and the environment by the reduction of toxicity, mobility. and volume of mercury-contaminated sediments through excavation and treatment. Following treatment, contaminated sediments would be disposed and would, therefore, no longer pose a risk to human and environmental receptors at OU 2-13.

9.1.5 Alternative 5: Excavation and Disposal

The excavation and disposal alternative provides the best protection of human health and the environment by removing contaminants that pose an unacceptable risk and placing them in a licensed disposal facility designed to protect human health and the environment.

9.2 Compliance with ARARs

In general, sites identified during the OU 2-13 RI/FS as needing remedial action are the result of releases to the environment that had little known potential to contain RCRA hazardous waste or PCBs. The exception is the Chemical Waste Pond, which was known to have received corrosive hazardous waste, and, more recently, wastewaters containing levels of mercury above the TCLP level. Recent evaluations have determined that small quantities of RCRA-listed solvents and PCBs may also be associated with some sites. RCRA-listed solvents may have been disposed to the warm wastewater and hot wastewater systems at TRA, resulting from the use of small quantities of solvents in TRA laboratories, which may

have
released small quantities of the solvent to drains that are connected to these systems. Trichloroethylene
(TCE), a RCRA-listed solvent, and PCBs are associated with soil from TAN, which was placed in the
57 cell of the Warm Waste Pond during an OU 10-06 removal action.

Of the eight sites needing remedial action under this ROD, four are associated with the warm
wastewater system, hot wastewater system. and/or OU 10-06 removal actions. The sites include the hot
waste tanks (TRA-15), the hot waste catch tanks (TRA-19), the Brass Cap Area, and the Warm Waste
Pond. Therefore, soils at these sites associated with releases from the warm waste system, hot waste
system, and/or 10-06 removal actions will be managed in it manner consistent with the hazardous waste
determination to be performed at the time of the remedial action. Any final determination to be made in
regard to management of the warm Waste Pond soils will be pursued within time frames capable of
supporting the schedule to be established in the RD/RA SOW.

Soil from the Test Area North placed in the Warm Waste Pond during the OU 10-06 removal action
may have been contaminated with very low of PCBs. This soil was analyzed for PCBs, however,
none were detected. The maximum detection limit of the data set was 0.220 ppm. The agencies have
determined that these soils need not be managed as PCB-contaminated soil since the residual PCB levels
are below the office of solid waste and emergency response directive guidance level of 25 ppm at
Superfund Sites. The data supporting this decision can be found in the OU 2-13 Administrative Record as
attachments to agency comment responses to the OU 2-13 Draft ROD.

The selected remedies will be designed to comply with all chemical-specific, action-specific, and
location-specific federal and state ARARs, as described in Section 7.3 and presented in Table 9-1.

Table 9-1. Summary of ARARs met by selected alternatives for OU 2-13 sites of concern.

(1) Warm Waste Pond-Contaminant with an engineered barrier

Chemical-Specific ARARs

40 CFR 61.92	NESHAPS for Radionuclides from DOE Facilities	Applicable
40 CFR 61.93	Emission Monitoring	Applicable
40 CFR 61.94(a)	Emission Compliance	Applicable
IDAPA 16.01.01...585 and .586	Toxic Substances	Applicable

Action-Specific ARARs

It is anticipated that the requirements of 40 CFR 264.310(a)(1) and (5) could be met for the 1964 cell demonstrating that contaminant migration to the aquifer does not pose an unacceptable risk.

40 CFR 264.309(a),and (b) Surveying and Recordkeeping R & A
40 CFR 264.310(a)(1)(2)(3)(4)(5) Closure and post-closure care R & A
40 CFR 264.310(b)(1)(5)(6) Closure and post-closure care R & A

Location-Specific ARARs

(2a) Chemical Waste Pond-Contaminant with native soil barrier

Chemical-Specific ARARs

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable
40 CFR 61.93 Emission Monitoring Applicable
40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585, and .586 Toxic Substances Applicable

Table 9-1 (continued).

Action-Specific ARARs

It is anticipated that the requirements of 40 CFR 264.310 (a)(1) and 5 could be met for the Chemical Waste Pond by demonstrating that contaminant migration to the aquifer does not pose an unacceptable risk.

40 CFR 26.309(a) and (b) Surveying and Recordkeeping R & A
40 CFR 264.340(a)(1)(2)(3)(4)(5) Closure and Post Closure R & A
40 CFR 264.310(b)(1)(5)(6) Closure and Post Closure R & A

2(b) Chemical Waste Pond-excavation and off-site disposal

Chemical-Specific ARARs

40 CFR 61.92 NESHAPS Radionuclide

Emissions from DOE Facilities Applicable

40 CFR 61.93 Emission Monitoring Applicable

40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01.585 - .586 Toxic Substances Applicable

(Note: Waste excavated from the Chemical Waste Pond will be managed in accordance with the outcome of the hazardous waste determination).

(3) Cold Waste Pond-Excavate and dispose onsite

Chemical-Specific ARARs

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable

40 CFR 61.93 Emission Monitoring Applicable

40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585, and .586 Toxic Substances Applicable

Table 9-1. (continued).

Action-Specific ARARs

40 CFR 262.11 Hazardous Waste Determination Applicable

Note: Waste excavated from the Cold Waste Pond will be managed in accordance with the outcome of the hazardous waste determination.

(4) Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19)-Institutional control with excavate and disposal contingency

Chemical-Specific ARARS

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable

40 CFR 61.93 Emission Monitoring Applicable

40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585, and .586 Toxic Substances

Applicable

Action-Specific ARARs

40 CFR 262.11 Hazardous Waste Determination Applicable

Note: Waste excavated from TRA-19 will be managed in accordance with the outcome of the hazardous waste determination.

(5) Brass Cap Area-Institutional control with excavate and disposal contingency

Chemical-Specific ARARs

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable
40 CFR 61.93 Emission Monitoring Applicable
40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585, and .586 Toxic Substances Applicable

Action-Specific ARARs

40 CFR 262.11 Hazardous Waste Determination Applicable

Table 9-1. (continued).

Action-Specific ARARs

40 CFR 262.11 Hazardous Waste Determination Applicable

(Note: Waste excavated from the Brass Cap Area will be managed in accordance with the hazardous waste determination)

(6) Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15)-Institutional Control

Action-Specific ARARs

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable
40 CFR 61.93 Emission Monitoring Applicable
40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585, and .586 Toxic Substances Applicable

Action-Specific ARARs

(8) Sewage Leach Pond-Native Soil Cover

Chemical-Specific ARARs

40 CFR 61.92 NESHAPS for Radionuclides from DOE Facilities Applicable
40 CFR 61.93 Emission Monitoring Applicable
40 CFR 61.94(a) Emission Compliance Applicable

IDAPA 16.01.01...585 and .586 Toxic Substances Applicable

Table 9-1. (continued).

(9) Additional ARARs for all Actions at all Sites

Action-Specific ARARs

40 CFR 262.11 Hazardous Waste Determination Applicable
IDAPA 16.01.05.005-.011 Idaho Hazardous Waste Regulations, which Applicable reference Federal regulations.

40 CFR 268.7, .9, .40, .45, and .48 Land Disposal Restrictions Applicable
40 CFR 122.26 Stormwater Discharge Requirements Applicable
IDAPA 16.01.01.651 Rules for Control of Fugitive Dust Applicable

Chemical-Specific ARARs

IDAPA 16.01.01.500.02 Operation of and Air Emissions from Portable Equipment Applicable
IDAPA 16.01.02.299(5)(a)(b) Idaho Groundwater Quality Standards Applicable
IDAPA 16.01.11.200 Idaho Groundwater Quality Rule R&A

(10) To Be Considered

DOE Order 5400.3 Hazardous and Mixed Waste Program

DOE Order 5820.2A, Chapter III Low-Level Radioactive Waste Management
DOE Order 5400.5 Radiation Protection Std.

Chemical-specific ARARs are usually health- or risk-based numerical substantive requirements of the values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amounts or concentrations of a chemical that may be found in, or discharged to, the ambient environment.

Action-specific ARARs are usually technology- or activity-based requirements for actions taken at a site. Action-specific ARARs generally do not guide the development of remedial action alternatives, but they indicate how the selected remedy must be implemented.

A number of statutes have requirements related to activities occurring in particular locations. For instance, waste management activities in flood plains are restricted under RCRA. Location-specific ARARs are regulatory requirements placed on activities in specific locations that must be met by a given remedial action, These location-specific ARARs are used in conjunction with chemical and action-specific ARARs to ensure that remedial actions are protective of human health and the environment.

The following information provides a general discussion describing why a requirement is either applicable or relevant and appropriate at each of the sites of concern.

Warm Waste Pond-National Emissions Standards for Hazardous Air Pollutants (NESHAPS) for radionuclide emissions from DOE facilities is applicable to this activity because radionuclides may be suspended during soil movement and consolidation. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public), then the need for additional measures will be evaluated and implemented as appropriate.

The requirements of 40 CFR 264.309 and 264.310, included in Table 9-1, are relevant and appropriate because of recent information that shows RCRA-listed constituents were likely disposed to the Warm Waste Pond. The requirements of 40 CFR 264.310(a)(1) and (5) may be met by demonstrating that no unacceptable risk is present via the groundwater pathway. It is anticipated that such a determination could be made for the 1964 cell, but is not anticipated for the 1952 or 1957 cells.

Idaho rules for toxic air emissions are applicable because they address releases or

emissions of
radionuclides to the atmosphere, such as may occur during soil movement and consolidation.

Chemical Waste Pond-NESHAPS for radionuclide emissions from DOE facilities is applicable to this activity because radionuclides may be suspended during soil movement and consolidation. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports.
It radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the
public), then the need for additional measures will be evaluated and implemented as appropriate.

Idaho rules for toxic air emissions are applicable because they address mercury and radionuclides
emissions to the atmosphere, such as may occur during soil movement and consolidation.

The Chemical Waste Pond is a land disposal unit. The agencies deem this risk-based CERCLA remedial action to be functionally equivalent to RCRA corrective action requirements to eliminate
unacceptable risk. Administrative RCRA closure requirements will occur separately from the ROD after
the remedial action is completed. However, the requirements of 40 CFR 264.309 and 264.310, as listed in
Table 9-1, would be appropriate performance standards and, therefore, can be considered relevant and

appropriate for this action. If excavation and disposal were to occur, waste would be managed in accordance with the outcome of a hazardous waste determination conducted at the time of the remedial
action (e.g., treatment of contaminated soil to at least 0.2 mg/L TCLP for mercury).

Cold Waste Pond-NESHAPS for radionuclide emissions from DOE facilities are applicable to this
activity because radionuclides may be suspended during soil movement and consolidation. The radiation
dose to the public will be estimated and included in the annual INEEL calculations and reports. If
radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the
public), then the need for additional measures will be evaluated and implemented as appropriate.

Requirements for hazardous waste determinations and for management of hazardous waste are applicable during excavation and disposal. While unlikely, sediments may exhibit a characteristic of a
hazardous waste. If so, sediments must be managed and disposed as hazardous waste.

Idaho rules for toxic air emissions are applicable because they address radionuclide emissions to the
atmosphere, such as may occur during soil movement and consolidation.

Soil Surrounding Tanks 1 and 2 at Building 639 (TRA-19)-NESHAPS for radionuclide emissions from DOE facilities are applicable to this activity because radionuclides may be suspended

during soil movement and consolidation. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public), then the need for additional measures will be evaluated and implemented as appropriate.

Requirements for hazardous waste determinations and for management of hazardous waste are applicable during excavation and disposal. When contaminated soil is eventually excavated, then requirements for hazardous waste management and disposal are applicable, because the soil may contain RCRA-listed hazardous waste from warm and/or hot waste system leaks. If so, sediments must be managed and disposed as hazardous waste.

Idaho rules for toxic air emissions are applicable because they address radionuclide emissions to the atmosphere, such as may occur during, soil movement and consolidation.

Brass Cap Area-NESHAPS for radionuclide emissions from DOE facilities are applicable to this activity because radionuclides may be suspended during soil movement and consolidation. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public) then the need for additional measures will be evaluated and implemented as appropriate.

Requirements for hazardous waste determinations and for management of hazardous waste are applicable during excavation and disposal. When contaminated soil is eventually excavated, then requirements for hazardous waste management and disposal are applicable, because the soil may contain RCRA-listed hazardous waste from warm and/or hot waste system leaks. If so, sediments must be managed and disposed as hazardous waste.

Idaho rules for toxic air emissions are applicable because they address radionuclide emissions to the atmosphere, such as may occur during soil movement and consolidation.

Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15)-NESHAPS for radionuclide emissions from DOE facilities are applicable to this activity because radionuclides may be suspended. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public), then the need for additional measures will be evaluated and implemented as appropriate.

Idaho rules for toxic air emissions are applicable because they address radionuclide emissions to the atmosphere, such as may occur during soil movement and consolidation.

Sewage Leach Pond Berm and Soil Contamination Area (SLP-SCA)-NESHAPS for radionuclide emissions from DOE facilities are applicable to this activity because radionuclides may be suspended during soil movement and consolidation. The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public), then the need for additional measures will be evaluated and implemented as appropriate.

Idaho rules for toxic air emissions are applicable because they address radionuclide emissions to the atmosphere, such as may occur during soil movement and consolidation.

9.2.1 Additional ARARs

A hazardous waste determination is required for all waste generated during remedial activities. All selected remedies at WAG 2 that result in generation of hazardous waste will be required to adhere to pertinent substantive RCRA requirements (e.g., LDR standards) during excavation, storage, transportation, treatment and disposal activities.

All selected remedies at WAG-2 that result in hazardous waste storage or soil movement or excavation will be required to apply requirements to prevent contamination of storm water runoff into waters of the United States.

Remedial actions taken at WAG 2 must protect groundwater and demonstrate that water quality specifications found in the Idaho Water Quality standards and under the Idaho Groundwater Quality Rule will be met or achieved.

Any remedial activities that may result in generation of fugitive dust are subject to Idaho requirements for preventing escape, suspension, or release of fugitive dust.

Remedial activities at WAG-2 may require various types of portable equipment. Portable equipment and air emissions from portable equipment must meet requirements specified in Idaho Air Quality regulations.

9.2.2 To Be Considered

DOE orders will be evaluated as To-Be-Considered, especially in the absence of applicable state or federal regulation. DOE Order 5400.3 requirements address programs for managing hazardous and mixed

DOE Order 5400.5 provides guidance on radiological environmental protection requirements

and
guidelines for cleanup of residual radioactive material and management of the resulting waste and residue
and release of property. This order shall be used in lieu of applicable state or federal groundwater
standards for radionuclides.

DOE Order 5820.2A provides guidance on disposal of low-level radioactive waste at DOE facilities.

9.3 Cost Effectiveness

Table 9-2 summarizes the estimated costs in net present value for the five alternatives at each site of
concern. These costs were estimated assuming annual inflation rate for the first 10 years and a constant
5% annual inflation rate after that. A constant 5% discount rate is assumed. Each remedial action selected
is cost effective because it provides overall effectiveness in meeting the remedial action objectives,
proportionate to its costs. When compared to other potential remedial actions, the selected remedies
provide the best balance between cost and effectiveness in protecting human health and the environment.
Please note that the WAG 2 comprehensive feasibility study eliminated the Limited Action alternative on
the basis of effectiveness for all sites, except the Sewage Leach Pond Berms and Soil Contamination Area
and Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15). Therefore, Limited Action costs are
presented only for these two sites in Table 9-2.

At the Warm Waste Pond, initial construction costs are higher than for the native soil cover.
However, the Engineered Cover provides greater protection for a longer period of time with less
maintenance required, thereby making this alternative more cost effective in the long run. The costs of
monitoring, access restrictions, and surface water diversion are nearly the same for the engineered barrier
and the native soil cover. Long-term air monitoring requirements are relatively low, assuming the air
monitoring would be performed as part of INEEL-wide programs.

At the Sewage Leach Pond, where a Native Soil Cover will be employed, the cost is based on
constructing the native soil cover, installing surface-water diversion controls, using monitoring equipment,
conducting analyses, and post-closure monitoring and maintenance for at least 100 years. It is expected
that a higher level of maintenance will be required for the native soil covers when compared to the
engineered barrier.

At the Chemical Waste Pond, if a Native Soil Cover will be constructed, the cost is based on

constructing the native soil cover, installing surface-water diversion controls, using monitoring equipment, conducting analyses, and post-closure monitoring and maintenance for at least 100 years. If excavation, treatment, and disposal are selected as part of this alternative, the cost is based on the excavation of mercury-contaminated soils below 260 ppm, treatment using a solidification process such as grouting or chemical stabilization, and disposal offsite at an approved hazardous waste landfill.

For the Excavation and Disposal alternative at the Cold Waste Pond, initial implementation costs are higher than the other alternatives considered. However, by removal of contaminants, the requirement for long term maintenance and monitoring is eliminated, making this alternative cost effective proportional to its effectiveness in protecting human health and the environment.

For the Sewage Leach Pond Soil Contamination Area, TRA-15, TRA-19, and the Brass Cap Area, the overall cost of the Limited Action remedy compared to effectiveness is low. The cost compared to

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effectiveness is further decreased for the TRA-19 and Brass Cap Area where eventual excavation and disposal costs will be incurred. However, institutional and administrative costs associated with the Limited Action alternative were based on the assumption that none of these measures are currently in place. On the contrary, administrative and institutional controls are currently in place because TRA facility operations are on-going. The added cost of invoking the Limited Action alternative recommended in this ROD is expected to be minimal. However, a post-ROD evaluation will be conducted to determine what additional administrative and institutional controls will be required as a result of this ROD.

9.4 Preference for Treatment as a Principal Element

For radionuclide-contaminated sites, effective treatment technologies that would satisfy this criterion do not currently exist. However, natural radioactive decay will result in the reduction of contaminant concentrations to acceptable levels within approximately 300 years. The EPA's preference for sites that pose relatively low long-term threats, or where treatment is impracticable (e.g., TRA radionuclide contamination) is engineering controls, such as containment.

In the case of mercury contamination at the Chemical Waste Pond, the preference for treatment as a principal element of the remedy will not be fulfilled if the selected remedy is only containment with a native soil cover. However, containment with a native soil cover is appropriately protective of human health and the environment. If excavation, treatment, and disposal are chosen as part of the selected remedy, then the preference for treatment as a principal element of the remedy will be fulfilled. The specific design of the remedy selected, native soil cover with possible excavation, treatment, and disposal after sampling, will depend upon the results of a sampling effort as a first step after the ROD and before the final design is completed.

10. DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD.

Refinements have been made to the selected remedy for the Chemical Waste Pond. The Proposed Plan recommended containment with native soil cover after excavation, treatment, and disposal of contaminated sediments. A number of possible options for the excavation and disposal part of the remedy discussed in the Proposed Plan were dependent on the levels of mercury found in the pond sediments.

The approach presented in the Proposed Plan can be simplified because the native soil cover alternative will meet cleanup objectives for the Chemical Waste Pond whether or not sediments are excavated and disposed prior to filling the pond to grade. However, it is not clear whether the native soil cover alternative is more cost effective with or without some excavation and disposal of contaminated sediments. Cost effectiveness is dependent on the amount of soil that would need to be excavated, the requirements for its management during and after excavation through disposal (e.g., RCRA requirements for treatment and disposal), and on the rigor of the cover design and the need for long-term monitoring and maintenance. If the amount of contaminated soil that would need to be excavated and the requirements for its management are relatively minor, then excavation and disposal followed by filling the pond to grade with clean backfill materials would likely be the most cost effective. This is because, with the majority of contamination removed, the pond could be filled to grade with minimal backfill specifications, and long-

term monitoring and maintenance would not be needed. If larger amounts of soils needed to be excavated and disposed and the levels of mercury in the soil required treatment prior to disposal, then it would likely be more cost effective to design a cover with more strict specifications and to implement long-term monitoring and maintenance of that cover. In order to make a final determination on the design of the native soil cover, further sampling and analysis need to be completed in the pond to define the amount of soil that would require excavation and how the soil would have to be managed and the associated cost.

Therefore, the specific design of the remedy selected in this ROD, native soil cover with possible excavation and disposal after sampling, will be dependent upon the results of a sampling and analysis effort as a first step after the ROD, but before the final design is completed. Figure 10-1 presents a flow chart of this logic.

Recent investigations have determined that RCRA-listed waste may have been present in the TRA warm and hot waste systems when leaks from the systems to the environment occurred. If soil is excavated for disposal, a hazardous waste determination will be required. Therefore, soils at those sites associated with releases from the warm waste system and hot waste system will be managed in a manner consistent with the hazardous waste determination to be performed at the time of the remedial action.

The primary elements of the preferred alternatives for the sites of concern at the TRA remained relatively unchanged. For this reason, the agencies determined that a new proposed plan and public comment period where unnecessary.

The Proposed Plan made the following statement in regards to no action sites: "The No Action status of these sites will be verified on an annual basis to determine whether the status has changed. The concern

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is that the continued operation of the Test Reactor Area may adversely impact these sites, and therefore, such status verification is necessary." This language has been changed in the ROD to be consistent with the NCP. The following language is incorporated in this ROD: "For those sites for which no action is

being taken based on land use assumptions, those assumptions will be reviewed as part of the 5-year review."

In addition, the following statement regarding future discoveries of contamination was made in the Proposed Plan. "The possibility exists that contaminated environmental media not identified by the INEL Federal Facility Agreement and Consent Order (FFA/CO) or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and/or decontamination and dismantlement activities at the Test Reactor Area. Future discoveries of radioactively and chemically contaminated environmental media will be evaluated as part of the CERCLA 5-year review process. The 5-year review process will ensure remedial actions and institutional controls are maintained. Five-year reviews will also ensure that any changes in the physical configuration of any Test Reactor facility or site where there is a suspicion of a release of hazardous substances (such as decontamination and dismantlement or facility renovation/modification) will be managed to achieve remediation goals consistent with remedies established for the sites in this proposed plan. Sufficient planning documentation for such actions will be submitted to the agencies before implementation to ensure this consistency."

This language has been changed in the ROD to be consistent with the NCP as follows: "The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dismantlement activities at TRA." "Upon discovery of a new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and appropriate response action taken in accordance with the FFA/CO."

The Proposed Plan described Alternative 1 as No Action (with monitoring) based on the presumption that contamination would be left in place under this alternative. However, any contamination remaining in place has been determined to not pose an unacceptable risk. Therefore, long-term environmental monitoring is not warranted for the 47 no action sites.

11. RESPONSIVENESS SUMMARY

The Responsiveness Summary is designed to provide the agencies with information about community preferences regarding the selected remedial alternatives and general concerns about the site. Secondly, it summarizes how public comments were evaluated and integrated into the decision-

making
process and records how the agencies responded to each of the comments. Appendix A provides a summary of community involvement in the CERCLA process for OU 2-13 and a summary of comments received and corresponding agency responses.

DOE/ID-106112
December 22,1997

Sources of Public Comment
Concerning the Proposed Plan for
Waste Area Group 2
at the Test Reactor Area

Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

A Summary of Comments Received
During the Public Comment Period

A-1. OVERVIEW

Operable Unit (OU) 2-13 is within Waste Area Group (WAG) 2 of the Test Reactor Area (TRA) at
the Idaho National Engineering and Environmental Laboratory (INEEL). The unit contains 55

identified
release sites contained within 13 operable units. Eight of these sites were determined during the
comprehensive remedial investigation/feasibility study (RI/FS) to have contamination that poses a potential
risk to human health and the environment and that requires remedial action to reduce or eliminate those
risks. For the eight sites that include four disposal ponds, three subsurface soil contamination areas, and
one area of windblown surficial soil contamination, remedial alternatives were evaluated, and preferred
alternatives were selected. In addition to the eight sites of concern at OU 2-13, there were 47 sites that
were determined to pose no unacceptable risk to human health or the environment and were identified by
the agencies as recommended "No Action" alternative sites. A Proposed Plan that summarized the results
of the RI/FS and presented the preferred remedial alternatives was released by the agencies for public
review on March 10, 1997. Public review of this document took place between March 10, 1997, and
April 9, 1997. An additional 30-day review period (to May 9, 1997) was requested and used by the
Shoshone-Bannock Tribes. Public meetings were held in Idaho Falls, Boise, and Moscow, Idaho, on
March 25, 26, and 27, 1997, respectively.

This Responsiveness Summary responds to both written and verbal comments received during the
public comment period and meetings. Generally, support for the selected alternatives for each site was
mixed.

A-2. BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with Comprehensive Environmental Response, Compensation, and Liability Act
(CERCLA) Sections 113(k)(2)(B)(I-v) and 117, a series of opportunities was available for public
information and participation in the remedial investigation and decision process for OU 2-13, WAG 2 of
the TRA from 1991 to the present. For the public, the activities included receiving fact sheets that briefly
discussed the status of investigations to date, INEEL Reporter articles and updates, a Proposed Plan, and
focus group interactions, including teleconference calls, briefings, presentations, and public meetings.

On March 10. 1997, the U.S. Department of Energy, Idaho Operations Office (DOE-ID) issued a
new release to more than 100 acerning the beginning of a 30-day public comment
period pertaining to the WAG 2 TRA Proposed Plan, which began March 10, 1997, and was extended to
May 9, 1997. In addition, a fact sheet was sent to approximately 6,700 people on the INEEL Community

Relations Plan mailing list. Both the news release and fact sheet gave notice to the public that WAG 2

TRA investigation documents would be available before the beginning of the comment period in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library, the INEEL Boise Office, and public libraries in Fort Hall, Pocatello, and Moscow, Idaho. Following the announcement of the public comment period, 6,700 copies of the Proposed Plan were mailed to the public for their review and comment. In addition, public meetings were held at Idaho Falls, Boise, and Moscow, Idaho, on March 25, 26, and 27, 1997, respectively. Written comment forms were available at the meetings, and a court recorder was present at each meeting to record transcripts of discussions and public comments. A total of about 20 people not associated with the project attended the public meetings. Overall, 20 citizens provided formal comments; of these, 6 citizens provided verbal comments and 14 provided written comments.

This Responsiveness Summary has been prepared as part of the Record of Decision (ROD). All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the ROD. Those comments are annotated to indicate which response in this Responsiveness Summary addresses each comment. The ROD presents the preferred alternative for each site of concern and the recommendation for No Action for the remaining sites. The preferred alternatives were selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan). The decisions presented in the ROD are based on information contained in the Administrative Record.

A-3. SUMMARY OF COMMENTS WITH RESPONSES

Comments and questions raised during the public comment period on the Proposed Plan for the WAG 2 Comprehensive RI/FS for OU 2-13 at TRA are summarized below. The public meetings were divided into an informal question-and-answer session and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginining of the meeting. The informal question-and-answer session was designed to provide immediate responses to the Public's questions and concerns. Several questions were answered during the informal period of the public meeting on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings., However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meetings are addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message using INEEL's toll-free

number.

Comments on the Remedial Investigation Process

1. Comment: One commentor expressed concern that the investigative process not only repeated work already performed but ignored prior research, and felt that we should use all the results, not just recent results. He also mentioned some concerns related to chromium and strontium-90 in the aquifer and noted the studies should be as technical as possible. (T-11, T-16, T-17, T-18)

Response: It is acknowledged that much of the groundwater investigative work is very similar to work that has been conducted by the U.S. Geological Survey (USGS) for many years. All past and present available sources of information, including USGS sources, have been used to evaluate the site risks and extent of contamination at TRA. Sources of information used to evaluate site-specific risks can be found in the technical site-specific summary reports (i.e.. Track 1 and Track 2 documents) for each site. Track 1 and Track 2 technical information can be found in the Administrative Record for WAG 2.

2. Comment: Even though one commentor thought that the investigations were thorough and that future monitoring would not be needed, another commentor brought up the "Hot Tree" incident and hopes that 20 or 30 plants across the site would be sampled. (W-11, W-30)

Response: The scope of site-wide ecological sampling is being established during the OU 10-04 Comprehensive RI/FS. Other trees in the vicinity of the Hot Tree Site were sampled and found not to be contaminated. In addition, the CERCLA risk assessment process evaluates plant uptake factors for exposure scenarios such as ingestion of homegrown produce at sites of concern. The results of these risk evaluations help guide the type of remedial activity that is necessary to protect human health and the environment.

There are several other entities that conduct ecological surveys across the site. They are the Radiological and Environmental Sciences Laboratory at the Central Facilities Area and the Environmental Research and Science Foundation in Idaho Falls. Copies of their survey reports can be made available to the public by calling 1-800-708-2680.

3. Comment: A commentor asked that audits and certification be conducted before remediation is approved, and that the applicability of ISO 14001, 4.4.4 be addressed. (W-1)

Response: The CERCLA remedial action process requires pre-final and final inspections at

completion of construction activities for long-term remedial actions or at completion of remediation for short-term remedial actions. The purpose of the inspection is to determine if all aspects of the plans and specifications have been implemented at the site and are performed with the U.S. Environmental Protection Agency's (EPA's) and State of Idaho's review, concurrence, and resolution of outstanding issues.

In response to issue and needs identified in a recent DOE-ID and Lockheed Martin Idaho Technologies Company (LMITCO) assessment, LMITCO is initiating efforts to develop a LMITCO Environmental Management System (EMS). The objective of the EMS is to reinforce accountability for compliance and provide the tools and systems to achieve compliance. The framework for the system is based on ISO 14001, the international EMS standard.

4. Comment: One commentor stated that the cover's performance cannot be evaluated until it is designed and demonstrated, all of which should take place before the ROD is signed, not after. (W-42)

Response: The CERCLA remedial action process provides that alternatives are generally analyzed as part of the RI/FS process. However, resources are not spent developing specific details and specifications until the remedY is actually selected in the ROD.

The general barrier desing anticipated for the Warm Waste Pond, for example, was implemented for the INEEL Stationary Low-Power Reactor (SL-1) closure cover. The long-term performance of this alternative is considered to be highly effective for preventing external exposure to contaminated surface soil. This basic desing will be evaluated and modified as needed during the post-ROD remedial design process. See Sections 7 through 11 of the Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering Laboratory (the OU 2-13 Comprehensive RI/FS) for additional supporting information.

5. Comment: One commentor noted that the Diesel Unloading Pit had an unlined soil and sand floor, rather than a concrete floor as expected. The commentor wanted to know when this was discovered and what other structures are constructed differently than expected. (W-28, W-29)

Response: The Diesel Unloading Pit is the only site of concern at TRA known to have been constructed differently than expected. All other sites were found to be consistent with current documented construction descriptions. If new information is discovered in the future regarding these sites, this information will be considered and acted upon in the CERCLA 5-year review process. If the new information demonstrates that the selected remedy is fundamentally no

longer valid to protect human health and the environment, then the CERCLA process provides that this decision would be revisited through a ROD amendment.

6. Comment: One commentor felt that, because the maximum concentration of contaminants detected was not reported simultaneously with the maximum contaminant levels (MCL-s), it showed a "trivialized characterization of the problem." (W-M9)

Response: It should be noted that MCLs only have meaning when compared to contaminant levels in drinking water or the aquifer. It would be misleading to list an MCL for soil because MCLs apply only to drinking water. Risk-based soil concentrations (which are analogous to MCLs for water) were thoroughly documented and listed in Appendix B of the OU 2-13 Comprehensive RI/FS.

7. Comment: A commentor felt that No Further Action for polychorinated biphenyls (PCBs) was insufficient because 24 ppm is 96% of the limit of 25 ppm. (W-25)

Response: While the PCB level is 96% of the 25-ppm limit, it is still below the limit. The 25-ppm limit for PCBs was established as part of the Toxic Substances Control Act (TSCA). The limit has been used as the basis of remediation at industrial PCB release sites located across the country. Because TRA is an industrial facility, 25 ppm is the standard to which cleanup would have taken place. Because the limit is protective of human health and the environment and none of the PCBs detected at the TRA release sites exceed the limit, no remediation of PCBs is necessary.

8. Comment: A commentor noted that remedial actions were being delayed because operations were ongoing. The commentor stated that the delays indicate that operations are more important than remediation, which the commentor held was unacceptable. (W-M32)

Response: The commentor is correct in stating, that remediation of two sites (the Brass Cap Site and TRA-19) is being postponed until active operations in the vicinity are ended. The postponement is due to these two sites current inaccessibility and the lack of assurance that adequate cleanup could be achieved to eliminate the need for controls. Because the contamination is in the subsurface, there is no exposure to workers as long as the institutional controls are maintained. However, if the sites posed an immediate, unacceptable risk, remediation would not be delayed in favor of operations.

Comments on the Remedial Investigation Process: Contaminants

9. Comment: Two commentors listed contaminants that they felt should have been included in the RI/FS: tritium, carbon-14, uranium-234, neptunium-237, iodine-129, plutonium-238/239/240, nickel, zinc, lead, copper, ammonium; cyanide: benzene, diesel oil, kerosene, xylene, nitrates, nitrites, sulfates, and phosphates. (T-MI, W-M20)

Response: All contaminants that were detected during sampling at the TRA release sites were included in the RI/FS. These sampling investigations were conducted in a systematic manner that begins with a complete listing of all contaminants suspected of being present or those that are detected. This list is then screened on a site-by-site basis to determine the presence or absence of the contaminant at each site. Once this is completed, risk calculations are made based on the concentrations found. Contaminants that pose no risk are screened out. To be considered a contaminant of concern, risk analysis must indicate a potential unacceptable level of risk posed by the given contaminant. The contaminants identified by the commentor were given consideration during the RI/FS and received detailed analysis in the RI/FS, but they may not have been identified as contaminants of concern in the Proposed Plan. Two of the contaminants listed by the commentor (diesel fuel and kerosene) are not examined as such but are measured by their constituent products (xylene, benzene, etc.).

10. Comment: One commentor noted a comment by the State during the perched water Investigation, OU 2-12, that the perched water zone may extend farther to the north than DOE recognized. In addition, he said that because the plume is connected to the Big Lost River flood zone, contaminants could be transported rapidly to the deep zone. (W-M14, W-M16, W-M17)

Response: These issues were evaluated during the previous OU 2-12 remedial investigation and resolved with the State. Flooding of the Big Lost River was modeled as part of that investigation. Analysis indicated that the Big Lost River has a very minor impact, if any, on the edge of the TRA perched water bodies compared to the volumen of water being discharged as a result of routine operations. The No Action (with monitoring) decision finding from the investigation and resulting Record of Decision is still valid.

Comments on Risk Assessment

11: Comment: One commentor questioned whether it is reasonable to assume that a receptor (resident) would actually be exposed to contaminants at the site, and where that reasonableness is

taken into consideration during the risk assessment process. (T-19, T-116)

Response: It can be difficult to predict resident exposures 100 years into the future with certainty, However, it is reasonable to expect that government control will be maintained for at least 100 years. At that point, it is assumed for purposes of a CERCLA baseline risk assessment that a resident could live at TRA. The residential scenario, whether likely or not, is evaluated in the risk assessment process based on guidance from the agencies, and this conservative assumption is intended to ensure that cleanup alternatives are protective.

12. Comment: One commentor wanted to know which risks (by pathway) are current (during the institutional control period) and which risks will only be present in the future (after the institutional control period). Therefore, is the present construction of an engineered cover justified, even though it will increase risk to the groundwater? (W-32, W-35, W-36)

Response: Table 1 of the Proposed Plan presents the calculated risks for workers and potential future residents at the TRA release sites. These risks were calculated assuming that no remedial actions would be taken at any of the TRA sites and that access controls to the sites would not be left in place. The results presented in Table 1 are the sum of risks calculated for workers and residents across all exposure pathways after an evaluation of contaminant ingestion, inhalation, and external radiation exposure. Details of these individual pathway risks can be found in Section 5 of the OU 2-13 Comprehensive RI/FS.

The plan for constructing an engineered barrier over the Warm Waste Pond was developed to ensure that the pond's contamination would not be spread by wind erosion, and workers or potential future residents at the site would not receive radiation exposures from the pond's contamination. In addition, the barrier was developed to inhibit future excavation or intrusion into the contamination.

It is true that the design will reduce evapotranspiration, which could result in more infiltration. In response to the commentor's concern about the increased hydraulic load to the aquifer as a result of an engineered cover. DOE re-ran the hydrologic models. The models increased the potential amount of flow into groundwater that would result from the engineered cover. Even considering the commentor's concern and a conservative doubling of infiltration, risk does not significantly increase and remains within acceptable risk levels.

13. Comment: One Commentor, noting the graph of probable cancer per 10,000 exposed individuals, stated during the public meeting that the rate of 1 in 10,000 is not determinable in this population and, therefore, should not be used as a goal or as a limit, since its attainment cannot be proven. (W-53)

Response: The 1 in 10,000 does not mean 1 person in 10,000 would contract cancer. It is a probability that any person exposed at those contaminant levels would contract cancer. As part of the Comprehensive RI/FS described in the OU 2-13 Proposed Plan, DOE worked closely with EPA and the State to ensure that risk assessment methods, including calculating risk probabilities, are in accordance with EPA guidance. These methods have been used to consistently evaluate risks associated with the TRA release sites and to identify the sites that have a potential for producing risks that exceed the CERCLA acceptable risk range.

Comments on Risk Assessment: Groundwater

14. Comment: A commentor cited the problem with cesium-137 levels in perched water: 176,000 times over the MCL, which will take 500 years to decay down to MCL levels, and will migrate into the aquifer, which is already considerably over drinking water standards. (T-M5, W-M12)

Response: The commentor's suggestion that cesium-137 levels in the perched water are 2,000,000 picocuries per liter (which is 176,000 times the MCL is incorrect. The highest level of cesium-137 detected was 9,920 picocuries per liter (80 times the MCL) in one shallow well at TRA in 1980. Cesium was last measured in this shallow well at 1,600 picocuries per liter (13 times the MCL).

Cesium-137 quickly absorbs to the soil or rock medium through which it passes. Therefore, it is not considered a threat to the aquifer because it will quickly become bound to subsurface material, where it will remain until it decays. This is demonstrated by the lack of cesium-137 migrating to the Snake River Plan Aquifer to date, including when discharge to the Warm Waste Pond was taking place at over 2 million gallons per year. Although it is acknowledged that Cs-137 levels in the shallow perched water are by no means trivial, models and historic monitoring indicate that cesium levels in shallow and deep perched water will not reach the aquifer at levels that could pose a risk. Therefore, this ROD does not alter the previous No Action with Monitoring decision for

OU 2-12.

15. Comment: One commentor felt that residents would never need to inhabit the site, so the residential scenario for risk assessment is not necessary. Conversely, another commentor wondered how we would protect the residential use of the site after institutional controls are lifted and felt that the No Action decision is risky. (W-13, T-M5)

Response: As stated in the response to Comment 11, the assumption that someone will someday move to TRA is a conservative assumption that was made for risk assessment purposes. People may never live at the site, but we can be reasonably assured that no resident would be adversely impacted by the existing contamination if a potential future resident at the site in 100 years can be protected.

The No Action decision was recommended for sites that do not pose unacceptable residential exposure risks. Where contaminant releases have occurred, the risks were calculated in a conservative manner, indicating it is unlikely that minor contamination left in place at the sites will one day cause adverse health impacts, to future residents. These decisions will be reevaluated to ensure that land use assumptions remain valid as part of the CERCLA 5-year review process.

16. Comment: A commentor thought that the Proposed Plan was inadequately reviewed regarding the effects of its preferred alternatives on the future groundwater pathway risk. (W-46)

Response: The OU 2-13 Comprehensive RI/FS Report and the Proposed Plan received numerous technical reviews, including, reviews internal to LMITCO followed by reviews by EPA and the State. Areas of review include risk assessment, environmental compliance, quality assurance, groundwater, and legal.

Comments on Risk Assessment: Groundwater Modeling

17. Comment: One commentor referred to findings that revealed the presence of lava tubes that move water rapidly through the aquifer and exit at Thousand Springs. The commentor stated that it is unjustified and unacceptable for DOE to contend that "there is no current use of the perched water or contaminated Snake River Aquifer in the vicinity of TRA." The commentor questioned the decision to consider the potential use of the area for only a 125-year period. (W-M23)

Response: Lava tubes have been identified in the Snake River Plain basalts, but they are localized characteristics of the area's basalt flows. There is no evidence to suggest the possible presence of intact, uncollapsed lava tubes that could transport groundwater over very large distances

beyond the INEEL to Thousand Springs.

DOE monitors drinking water wells at TRA to ensure that they are not producing contaminated water. If contaminated water were to be detected at one of these wells, measures would be taken to ensure that workers have clean drinking water. DOE also routinely monitors wells located off the INEEL in an attempt to detect groundwater contamination before it could reach water users downgradient of the site. Very little contamination has ever been detected in these off-site wells, and contaminant concentrations detected have been well below drinking water standards. Groundwater monitoring also is conducted independently by USGS and the State's INEEL Oversight Program.

All of the action decisions recommended in the Proposed Plan were based on risks that are expected within the next 100 years, but the OU 2-13 Comprehensive RI/FS evaluation was not limited to this time frame. The RI/FS includes analysis of a residential exposure scenario in 1,000 years, including computer modeling of groundwater. Remedial action objectives have been established to ensure that remediation will remain protective of human health and the environment until contaminant concentrations decrease to an acceptable level.

Comments on Risk Assessment: Ecology

18 Comment: Two commentors noted that the risk assessments consider occupational and residential scenarios but include very little biological monitoring. They felt that other scenarios, including Native American subsistence and recreation, should he considered. (T-M2, W-M26)

Response: In addition to the occupational and residential exposure scenarios, Native American subsistence and recreation scenarios were also considered but not evaluated individually. The residential scenario that is evaluated is the most conservative scenario (i.e., exposure to contaminants is greater, or more protective, under the residential scenario than under any other scenario). For this reason, the residential scenanio provides the highest degree of protection.

19. Comment: One commentor wanted to know why the Paint Shop Ditch, the Radioactive-Contaminated Tank at TRA-614, and the Advanced Test Reactor Cooling Tower are not included as sites with human health risks greater than allowable levels. (W-19)

Response: All of these sites were included in the WAG 2 Comprehensive RI/FS. They were each

evaluated in a manner that was consistent with the other sites in the RI/FS, and were found to have risks below the 1 chance in 10,000 threshold. Details on the risk assessment for the sites can be found in Section 5 of the OU 2-13 Comprehensive RI/FS.

Comments on Risk Assessment: Contaminants

20. Comment: Several commentors suggested that the actual values should be provided, rather than stating that concentrations are above MCLs or making unquantified statements. Also, one commentor wondered why tritium and chromium pose a health hazard even though they are below MCLs. (T-19, W-16, W-21, W-M25, W-54)

Response: The commentor's implication that a reader is better informed when actual contaminant concentrations (values) detected are used in the Proposed Plan is well taken. In the future, greater care will be given to providing actual concentrations (values) in the documents written for public review. A complete description of the WAG 2 contaminant sampling investigations, including the detected contaminant concentrations (the actual values) in groundwater, is available and can be found in Section 4.4 of the OU 2-13 Comprehensive RI/FS.

With regard to the last concern noted above, tritium and chromium are the only two contaminants that currently exceed MCLs in the groundwater beneath TRA. Groundwater modeling of these contaminants predicts that they will be below MCLs before the end of the 100-year INEEL institutional control period. As a result, no one is expected to be exposed to these contaminants at concentrations that could cause adverse health effects.

21. Comment: One commentor asked if arsenic concentrations are currently below detection limits, why will there be concentrations producing risks of 3 chances in 1,000,000 at approximately 1,000 years in the future? (W-18)

Response: Arsenic is naturally occurring in soils and groundwater at TRA. Groundwater modeling predicts that the arsenic could migrate from surface soils down to the aquifer within 1,000 years. This migration would be caused by arsenic dissolving, in rain and snowmelt moving through the unsaturated zone beneath TRA. The model predicts that the maximum risk from drinking, arsenic-contaminated groundwater would be 3 chances in 1,000,000, and that risk would occur in 1,000 years. The fact that arsenic emerges as a contaminant of potential concern demonstrates the conservative nature of the risk assessment process.

22. Comment: One commentor stated that DOE should not eliminate from consideration those isotopes with half-lives greater than 5 years, especially cesium. He wondered if DOE would

walk

away from sediments with high concentrations of cesium, and wanted to know which worst-case conditions were used for cesium to approach National Contingency Plan limits. (W-M22, W-M27, W-M30)

Response: The WAG 2 Comprehensive RI/FS did not eliminate any radionuclides from consideration based solely on radioactive half-life. All contaminants were evaluated for their potential to cause adverse impacts to human health and the environment, and contaminants that have the potential for producing adverse impacts were considered in the RI/FS. Cesium was one of the many contaminants that was retained for evaluation in the RI/FS, and its presence is the reason for many of the remedial action recommendations presented in the OU 2-13 Proposed Plan.

23. Comment: A commentor stated that the combined cancer risks for inhalation should be considered. Because risk from radionuclides is close to the National Contingency Plan limit, will the combined radionuclide and nonradionuclide risk be over the limit? (W-M24)

Response: The WAG 2 risk assessment considered the combined risks from multiple exposure routes, including inhalation and ingestion. For any site where the combined risks are over the acceptable limit, remedial action is being recommended. The "worst-case" conditions evaluated for soil ingestion assume that, in 100 years, a resident lives on the contaminated site for 30 years, 350 days per year, 24 hours per day, and ingests 100 milligrams of dirt per day,

24. Comment: One commentor contended that the sediment contains hazardous waste despite DOE's claims to the contrary. Also, even though DOE's tests show that the contaminants did not leach, how did perched water become highly contaminated if not through leaching? (W-M31)

Response: It is acknowledged that hazardous substances are contained in the sediments and soils at a number of release sites; hence, the need for investigation and cleanup. Hazardous wastes as defined by the Resource Conservation and Recoverv Act (RCRA) were not generally disposed of at TRA with few exceptions. New information does suggest that, during its more than 40 years of existence, the Warm Waste Pond received minute quantities of RCRA-listed hazardous wastes. More information can he found in Section 9 of the ROD.

Direct infiltration of water that was disposed of in the Warm Waste Pond is the primary source of

the past majority of contamination in the pond sediments and the TRA perched water. This water contained contaminants that vere produced operation at TRA, and the discharge carried the contaminants directly to the perched water bodies. Contaminants leaching from sediments are not a significant continuing source of contamination. All discharges to the unlined Warm Waste Pond were discontinued in 1993, and there is no more Contaminated water infiltrating to the perched water bodies from the Warm Waste Pond. Contaminated discharges from the TRA reactor that previously went to the Warm Waste Pond are now being sent to a lined disposal pond that does not allow water to infiltrate into the subsurface. All discharges to the disposal ponds will eventually cease, at which time the perched water bodies are expected to begin to dissipate.

Comments on Risk Assessment: Land Use

25. Comment: One person said that evaluation of risk at 100 years is not sufficient, it should be evaluated for 1,000 years or more. (T-M3)

Response: The assumption that in 100 years someone will actually build a home and live at TRA was made for the purpose of the comprehensive risk assessment. The evaluation was made because it is conservative. If the site can be remediated to be protective of human health and the environment in 100 years, it is anticipated to stay that way until contaminant concentrations decrease to acceptable levels and farther into the future. Additionally, this assumption is consistent with the Long-Term Land Use Future Scenarios for the Idaho National Engineering Laboratory.

All of the action decisions recommended in the Proposed Plan were based on risks that are expected within the next 100 years, but the WAG 2 Comprehensive RI/FS evaluation was not limited to this time frame. The RI/FS includes analysis of a residential exposure scenario in 1,000 years, including computer modeling of groundwater.

Comments on Alternatives

26. Comment: Several commentors said that efforts should be concentrated on the Chemical Waste Pond and the Warm Waste Pond to ensure that contaminants (especially mercury) are isolated and do not pollute the aquifer anymore. Also, a commentor suggested that the engineered cover needs to be demonstrated and reevaluated to see if it is really the best alternative for the long term as well as short term. (T-I2, T-I3, T-I10, W-33)

Response: The primary contaminant of concern at the Chemical Waste Pond is mercury.

Contaminants of concern at the Warm Waste Pond include cesium-137, cobalt-60, and chromium.
Computer modeling using GWSCREEN shows that these contaminants do not migrate readily to the aquifer. Annual average precipitation at the INEEL is approximately 10 cm per year. Infiltration rates as high as 23 cm per year have been modeled and have shown that residual contamination would not be expected to add to the cumulative risk in the aquifer. Essentially, the model tells us that more than two times the average annual precipitation could fall on sites of concern and the contaminants at the source still would not likely migrate to the aquifer.

The engineered cover is designed to isolate radioactive waste and to reduce surface exposures to background levels. This barrier design was implemented for the INEEL Stationary Low-Power Reactor (SL-1) closure cover. The long-term performance of this alternative is considered to be highly effective for preventing, external exposure to contaminated surface soil. This basic design will be evaluated and modified as needed during the post-ROD remedial design process. Sections 7 through 11 of the OU 2-13 Comprehensive RI/FS contain additional cover design information.

27. Comment: One commentor wanted to know where excavated contaminated materials (such as those from the Cold Waste Pond) were to be emplaced. Will they be shuffled around the INEEL

to temporary locations, or when and where will they be permanently disposed of? (W-15, W-20, W-23, W-24)

Response: The disposal location for these materials will be determined during remedial design. It is reasonable to expect that soil excavated from the Cold Waste Pond will be placed in the adjacent Warm Waste Pond cell to reduce the "footprint" of contaminated soil at the TRA facility and because they contain the same contaminants. The Warm Waste Pond cells will then be covered by an engineered barrier that is designed for the lenath of time needed for radioactive contaminants in soil to decay within acceptable levels.

28. Comment: One commentor thought that the publications were valid and informative and that Alternative 3b is by far the best choice based on cost and the environment. (W-10, W-12)

Response: The Agencies agree that Alternative 3b, containment by capping with a native soil barrier is the preferred alternative at the Chemical Waste Pond and the Sewage Leach Pond based on effectiveness, cost, and the other evaluation criteria discussed in the Proposed Plan. This

alternative appears in the ROD as the selected remedy for the Sewage Leach Pond and the Chemical Waste Pond.

Comments on Alternatives: Evaluation

29. Comment: One commentor felt that the short-term effectiveness rating for the Containment with Engineered Cover alternative was inaccurate because it rated the alternative as "good" for this criterion. The commentor stated that the alternative increased risks to the aquifer and posed additional worker risk in the short-term. Therefore, the alternative deserved to be ranked lower than the other alternatives. For the same reasons, the commentor also questioned the selection of the preferred alternative for the 1957 cell. (W-43, W-44)

Response: The plan for constructing an engineered barrier over the Warm Waste Pond was developed to ensure that the contaminated pond sediments would not be spread by wind erosion. This also ensures, that workers at the site would not he exposed to radiation and that future intrusion or excavation would be inhibited. The proposed design of the cap could allow a small increase in the amount of water movement through the Warm Waste Pond sediments. Current modeling suggest that the increased infiltration expected by the design assumed in the Feasibility Study and Proposed Plan would not alter overall risk results. The commentor's observations concerning potential increased infiltration to the aquifer as a result of the cap and slight increases in worker risks in the short-term are legitimate. Hovever, these concerns are not significant enough to relative adjust the relative rankings of the alternatives.

Comments on Alternatives: Cost

30. Comment Comnentors expressed concerns ahout the cost of covers and remedies with respect to their adequacy. Also, they stated that the public should know how much risk would be reduced per million dollars spent, but wondered if the calculations of risk to the public are reliable in the first place considering the uncertainty of whether the public will ever live at the site. (T-I12, T-I17, T-I18)

Response: One of the purposes of soliciting public comment on a Proposed Plan is to provide an opportunity for citizens to reflect their values concerning the expense of the proposed alternatives in relation to the benefits gained. A cost/benefit analysis of the various remedial alternatives for

TRA releases was included as part of the WAG 2 Feasibility Study to illustrate the projected range of construction costs. Although risk reduction per dollar spent is not evaluated, this analysis considered the alternatives in terms of how well they met the nine CERCLA evaluation criteria versus the amount of money that would be spent to implement each alternative. The alternatives recommended in the OU 2-13 Proposed Plan produced the highest potential benefit-to-cost ratios when compared to other alternatives that could be implemented at each site. Cleanup is being recommended for sites that pose an unacceptable risk.

Comments on Alternatives: Design

31. Comment: One commentor wondered why we would use a native soil cover for the Warm Waste Pond 1964 cell when three of the criteria for such a cover are rated as poor. Because the native soil cover is combined with a riprap or cobble layer, it should really be called an "engineered cover." (W-22)

Response: The 1964 cell of the Warm Waste Pond is different from the other two cells because the majority of contamination was removed and approximately 10 feet of clean soil were placed in the pond as backfill. Therefore, the criteria apply more directly to the other cells where higher levels of contamination were placed nearer to the ground surface. In the case of the 1964 cell, the existing soil cover is an effective remedy, However, consistent with the other two cells, a cobble layer will inhibit future intrusion potential. The cover was not defined as an engineered cover because there is no intent to engineer the cover design beyond the existing soil cover, with the exception of the cobble layer.

Comments on Alternatives: Monitoring

32. Comment: One person stated that groundwater monitoring in fractured rock aquifers is very difficult, expensive, and has a low probability of detecting groundwater contamination until the contamination is fairly widespread. He then asked, "Will there be vadose zone monitoring at any of the sites to warn of contaminant movement to the aquifer before contaminants reach the aquifer?" (W-51)

Response: Groundwater monitoring has been conducted in and around the TRA since the late 1950s. The groundwater system is well understood because of the long history of monitoring. The groundwater monitoring network at the TRA under the OU 2-12 monitoring plan currently consists of six deep perched and three aquifer wells. This continued monitoring effort

provides the necessary information for evaluation of contaminant migration trends between the perched water system within the vadose zone and the aquifer below. Therefore, no additional vadose zone monitoring will be performed at any of the sites.

Comments on Alternatives: Available Alternatives

33. Comment: One commentor stated that the failure to build a vitrification treatment plant identified in a 1977 EIS limited the RI/FS because fewer treatment alternatives were available. (T-M8)

Response: From a practical standpoint, existing treatment capabilities may be given special consideration during an RI/FS. However, the lack of an onsite treatment facility in no way limits the technologies or alternatives considered during an RI/FS. New treatment facilities have been constructed to implement other INEEL RODs. Vitrification of contaminated soils was considered and eliminated as a viable alternative in the Feasibility Study. For more information about this proposed treatment, see Section 7.6 of the OU 2-13 Comprehensive RI/FS.

Comments on Groundwater

34. Comment: Several commentors stated that, because contamination in perched water will get into the aquifer eventually, we should pump and treat the perched water immediately and that we should monitor contamination level after 20 years, then every 5 years after that. (T-M10, T-B1, T-B4, W-M13)

Response: Groundwater contamination produced by the perched water system infiltration and disposal well injection was evaluated as part of the OU 2-12 perched water system remedial investigation in 1992. A ROD was signed for the TRA Perched Water System in December 1992. In that ROD, it was determined that no remedial action was necessary for the perched water system at the TRA, and the agencies continue to support that decision. This decision was based on the results of the human health and ecological risk assessments, which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected current or future use of the Snake River Plain Aquifer beneath the perched water system at the TRA.

In addition, it was determined in the ROD that groundwater monitoring would be conducted to verify that contaminant concentration trends follow those predicted by groundwater computer modeling. Based on 3 years of monitoring, the expected contaminant concentration patterns

have
been observed for most wells. In some cases, expected declines in tritium and chromium concentrations have not occurred, but concentration are well below predictions in the OU 2-12 Perched Water RI/FS. Discontinuance of the discharges to the Warm Waste Pond appears to have caused a reduction in most, but not all, of the deep perched water wells. There has been a decline in hydraulic heads in the deep perched water system, but that decline appears to have been caused primarily by reduced discharges to the Cold Waste Pond. Contaminant flushing in the deep perched water system varies widely with location because of variations in hydraulic properties and the possible mixing and lateral spreading of the infiltration water and contaminants in the shallow perched water system. Continued monitoring of the perched water system and the aquifer is recommended in this OU 2-13 ROD.

35. Comment: A commentor stated that contaminated perched water should be pumped and treated. It was recommended that this be done using funds from nuclear material production. The commentor noted that groundwater contaminants behave in a variety of ways that raise environmental and public health concerns. To address this, contaminated groundwater should be removed. (W-M18)

Response: The No Action (with monitoring) decision for the perched water below TRA was officially adopted upon the signing of the OU 2-12 ROD in 1992. No new information was developed during the OU 2-13 RI/FS to alter that decision or to justify expenditure of federal funds, regardless of source.

With respect to contaminants in groundwater, each contaminant may behave differently. That is why a remedial investigation seeks to identify the contaminants causing unacceptable risk. The behavior of these contaminants is studied, modeled, and considered when developing alternatives and selecting a preferred alternative (see the OU 2-12 Perched Water ROD for more information on why the agencies determined they would monitor rather than remediate groundwater). Please refer to the response to Comment No. 20 in regard to tritium and chromium concentrations in the groundwater below the TRA. Contaminant concentrations are predicted to fall below MCLs before the end of the 100-year INEEL institutional control period.

36. Comment: Three commentors felt that, because of the nature of the contamination (how the data peaks and trails off) and the nature of the aquifer (as a natural filter), there is no need to be concerned about the perched water because it will go away and the contamination will not

get in
the springs if dumping is stopped now. (T-I11, T-I14, T-I20)

Response: Computer modeling and monitoring data support the comment. Contaminant levels in the aquifer have steadily decreased since contaminant discharges ceased and are expected to continue to decrease to within acceptable levels before reaching future residents on or off what is now the INEEL. Please refer to the response to Comment No. 20 in regard to tritium and chromium concentrations in the groundwater below the TRA. Contaminant concentrations are predicted to fall below MCLs before the end of the 100-year INEEL institutional control period.

37. Comment: Commentors asked why strontium was not identified in addition to the cesium. especially because strontium is more mobile than cesium and has been detected since 1964 in the deep perched water zone. (T-I24, T-I25)

Response: Strontium-90 is identified as a contaminant of concern at the TRA surface sites and was evaluated in the risk assessment to determine the risk associated with exposure to this contaminant. As a contaminant of concern, strontium-90 contributes to the overall risk at the site. Remedial action will be conducted at those sites where the cumulative risk, of which strontium-90 is a contributor, exceeds acceptable levels. Note that sampling and analysis of strontium-90 will continue under the OU 2-12 ROD for both the deep perched water system and the aquifer.

Comments on Infiltration

38. Comment: Several commentors suggested the need for an infiltration barrier. Many commentors felt that the existing native soils or a bentonite seal cover would contain contamimants better than an engineered bairrier, and that an engineered barrier would keep animals out but would increase the infiltration rate into the aquifer. In iddition, they asked for result of containment studies and

comparisons. The commentors stated that, because the engineered barrier described in the Proposed Plan does not decrease infiltration, it is not really a containment barrier, so the name of Alternative 3a should not have the word "containment" in it. Also, using the native soils as a containment barrier should be a completely separate alternative. (T-I4. T-I5, T-I13, T-I15, T-I22, W-5, W-6, W-31, W-34, W-37, W-38, W-39, W-40, W-41, W-49, W-50, W-52)

Response: Based on computer modeling, in no case did the model predict that contaminants at the

surface sites would migrate to the aquifer at concentrations of concern. This was true even when twice the annual average precipitation (23 cm/year) was input into the model. That was an important consideration when evaluating the two cover designs. Because migration of contaminants to the aquifer does not appear significant, the focus of the cover designs has been to inhibit exposure of contaminants to current and future receptors, rather than to prevent migration of those contaminants to the aquifer.

Though the use of an engineered barrier may increase the infiltration rate, computer modeling of two times the average infiltration shows that the risk to groundwater does not increase substantially. Both the engineered barrier and the native soil barrier were evaluated separately during the Feasibility Study. Results of the study evaluating these two harriers can be found in the OU 2-13 Comprehensive RI/FS Report contained in the Administrative Record.

39. Comment: Commentors asked what would happen if, after the engineered barrier is in place, future information indicates the barrier is ineffective? Would the barrier be removed? Why not put the engineered barrier in place in the future after institutional controls are removed? (W-45, W-47, W-48)

Response: Leaving the cover off would require that limited actions (institutional controls) be implemented. The Limited Action alternative was evaluated during the RI/FS and did not meet remedial action objectives as effectively as installation of an engineered barrier. The CERCLA process requires a review at least every 5 years after remedial action is completed to determine and ensure that the remedial action continues to he protective of human health and the environment. If, during that review, it is determined that the remedial action no longer is protective, then the agencies could determined what appropriate action would be necessary. If a fundamental change in the remedy were determined to be appropriate, a ROD amendment, including public comment, would be initiated.

Comments on Public Involvement

40. Comment: Some commentors stated that the documents and meetings should better educate the public. This should include providing specific number and facts, such as comparing contaminant levels to regulatory limits (e.g., drinking water standards) that indicate the magnitude of the contamination relative to a baseline. Another commentor stated that presenters should be better prepared and should not present conflicting information. Another commentor raised concerns about communication needing to be clear and to avoid the "fear factor" that might affect

communication. Also, one commentor felt that the focus group did not reveal the true feelings of the participants. (T-M4, T-B2, T-B3, T-B5, W-M21, W-4, T-M9)

Response: As a result of a citizen's focus group held to review the draft Proposed Plan and accompanying fact sheet, a number of statements were added to the text of the final documents to add candor and acknowledge problems caused by the release of contaminants to the environment. With reference to the need for providing specific facts and comparisons of contaminant levels (such as drinking water standards) and not down-playing or trivializing the presence of contaminants, the agencies will continue to pursue improved methods to communicate information to the public. Because there are no legal standards dealing with or regulating concentrations of contaminants in soil similar to those for drinking water, risk-based standards are used or calculated. The DOE will reference established standards, when applicable, to aid citizens in determining when contaminant levels exceed legal standards.

Presenters strive to be prepared and have facts at hand but are subject to unintentional mistakes. When occasional contradictions arise during public presentations concerning proposed cleanup plans, the agencies will make every effort to have the issue resolved during the discussion. Meeting facilitators are instructed to provide the attention necessary to either resolve the conflict or ask the agency representatives to provide a response to the interested parties.

In response to one commentor's request, focus group members were polled concerning their feelings about the agencies' preferred alternative. Each focus group member was called and asked their opinion of alternatives proposed by the agencies. One person opposed the agencies' recommendation; three people would have liked more of an aggressive remedial action; one person felt that even though they supported the alternative, the recommendation went farther than it needed to; and three people agreed with the recommendation. (The original intent of focus group review of the draft documents was to offer suggestions concerning readability, layout, completeness, and user friendliness rather than concerning the remedies.)

41. Comment: One commentor stated that the information presented at the public meeting was important and educational, and lamented the fact that only one citizen attended. The commentor observed that some people spread the idea that the greater the fear-the greater the risk. (T-B2, T-B3, T-B5)

Response: The agencies would receive greater benefits if increasing numbers of citizens would interact with project managers during the open public comment periods. Citizens are invited to evaluate and suggest new methods of communicating and improving public participation.

42. Comment: While critical of aspects of the project, a commentor stated that it was good that the environmental and public issues were being addressed. (T-121)

Response: Comment noted.

43. Comment: One commentor representing a group wanted an extension for comments. (W-3)

Response: In response to the request for an extension, the agencies extended the public comment period an additional 30 days.

44. Comment: One commentor supported the plan and implementation. (W-8)

Response: Comment noted.

45. Comment: One commentor asked whether access to public comments was available on the Internet. (W-2)

Response: All public comments received at the public meetings and compiled into meeting transcripts are available on the Internet under the OU 2-13 Comprehensive RI/FS at http://ar.inel.gov/home.html.

46. Comment: One commentor expressed frustration that public meeting dates were changed. (T-M7)

Response: With regard to having published different meeting dates in the draft and final plans, the DOE acknowledges and regrets the confusion that may have resulted from changes in meeting dates. The original intent of the draft, which contained tentative dates, was to allow eight focus group members an opportunity to review the user friendliness of the plan, and it was meant to be draft information. Following the review of the draft plan, the meeting dates were confirmed in the release of the final plan.

Comments on ER Programmatic Issues/DOE

47. Comment: A commentor noted that the contractor who operates the facility profits from expenditures on remediation, creating an incentive to pollute. The commentor also expressed concern about DOE self-regulation with respect to radioactive materials and called for an independent agency to oversee DOE activities. (W-M34)

Response: While having responsibilities for operations and environmental remediation from create a perception of an incentive to pollute, it is not believed to be true. Contractor incentives and awards as well as fines and penalties are based on compliance with environmental requirements. Deliberate actions of this nature would constitute prosecutable criminal behavior. The commentor's desire for independent oversight of DOE activities is achieved through State and EPA oversight of remedial actions.

48. Comment: The Shoshone-Bannock Tribes commented that they are primarily concerned that the contamination that has accumulated at the INEEL over the past 50 yeear will be cleaned up or mitigated to the maximum extent possible. In addition, all efforts should be made to alleviate impacts to the health, welfare, safety, and cultural and treaty rights of the Tribes and others on the Snake River Plain. The Tribes voiced the imperative need to respect and restore the environment. (W-14)

Response: The restoration process at the INEEL is designed to alleviate adverse impacts to human health and the environment. The long-term effects of accumulated contamination are Addessed in this procces, and risk-based review and cleanup provide the most effective means to identify, mitigate, and correct past practices.

Concerns With Previous Decisions

49. Comment: Several commentors expressed concerns about radionuclides (strontium-90 and cesium-137) not being permanently isolated in the Warm Waste Ponds. The commentors also expressed concerns about problems related to hot waste tanks TRA-15, TRA-16, TRA-19, and TRA-603/605. They stated that DOE is ignoring its cleanup responsibilities and should pursue containment strategies more aggressively. (T-M11, W-M10, W-M11, W-M15, W-M19, W-M28, W-M29, W-M31a, W-M33)

Response: It is recognized by DOE, EPA, and the State that there are a number of cleanup technologies that could have been or could still be applied at contaminated sites and that there are a number of opinions concerning what would be most effective. However, as stated in the Warm Waste Pond and the Perched Water Proposed Plans and RODs, the agencies believe the alternatives proposed and the decisions made were appropriate. The agencies have no plans to significantly alter the proposed alternatives contained in the Proposed Plan for the Comprehensive TRA OU 2-13 RI/FS.

At the time of the Interim Action ROD for Warm Waste Pond contaminated soils, the agencies knew that containment could be implemented to achieve the cleanup objectives established for that

ROD. However, in the spirit of CERCLA and the National Contingency Plan (which has a preference for treatment where reduction of toxicity, mobility, and volume can be achieved), a treatment option was attempted. Because the treatment option was unproven, the first step was to conduct treatability studies to determine whether the treatment would work and how it should be implemented. A contingency remedy of a soil cover was included in the ROD in case the treatment option was not successful.

As the commentor noted, the treatability study demonstrated that some contaminants could be removed from the soil. However, insufficient contaminants could be removed to achieve the cleanup goals. In addition, costs were high, safety issues were increasing, and the volume of secondary wastes generated by the treatment was a concern. Thus, implementing the contingency remedy of a soil cover was deemed to be the best option by the agencies. This was especially true when considering that the contaminants of concern have relatively short decay rates (5 years half-life for cobalt-60 and 33 years half-life for cesium-137). The decision to implement the contingency remedy of emplacing a soil cover after consolidation of contaminated soil into a smaller area was made through an Explanation of Significant Difference to the Interim Action ROD for the Warm Waste Pond, as one of the commentor's noted.

Comments on Budget

50. Comment: A couple of commentors questioned the expense of cleanup considering the future land use of the site being questionahle and that too much money has been spent to date on the risk assessment and characterization of these sites. (T-I19, W-53)

Response: The purpose of the CERCLA risk assesment is to provide the risk managers from the agencies with the information needed to make decisions regarding remedial action at a site. The risk assessment procces has very specific guidance regarding the quantitative analysis of site-

specific information necessary to make a determination if contaminants at a site pose an unacceptable or acceptable risk to human health and the environment. The question of whether a site poses an acceptable risk must be answered. The National Contingency Plan defines an acceptable risk range as 1 in 10,000 to 1 in 1,000,000. EPA uses this as a "target range" within which the agency strives to reduce risks as part of a Superfund cleanup.

Cost estimates for the alternatives analyzed were developed for comparison purposes. The actual

cost of implementing the selected alternative will vary somewhat during actual design and implementation. The cost estimates described in the Proposed Plan were developed on the basis of a preliminary conceptual design. Many details are not well defined. These details are accounted for within a contingency cost element that is included in each alternative.

51. Comment: One commentor was disappointed that DOE had eliminated funding for the Agency for Toxic Substances and Disease Registry (ATSDR) for doing health consultations and stated that funding should be restored to allow health consultations on all RODs. (T-M6)

Response: DOE has just completed an interagency agreement with ATSDR to complete the health assessments required by CERCLA. DOE is providing funding under the agreement so ATSDR can meet its requirements under CERCLA. Health consultations are provided on DOE's request as needed and as determined necessary.

Comments on the TRA Facility Interface

52. Comment: Several commentors wanted to know how the schedules for the Materials Test Reactor, the Engineering Test Reactor, the Chemical Leach Pond, the Cold Waste Pond, and continued operations of TRA would impact cleanup. (W-7, W-9, W-17)

Response: During the past 40 years, TRA has provided facilities, utilities, and support capabilities for government and private agencies to conduct experiments associated with the development, testing, and analysis used in nuclear and reactor applications. Because past and present activities associated with TRA facilities and structures are "co-located" with TRA release sites identified in the FFA/CO, an analysis was performed to address the potential for causing current risk to be underestimated (see Appendix D of the OU 2-13 Comprehensive RI/FS). The analysis performed includes a review of past and present operational activities at TRA and associated facilities and structures, and management control procedures to prevent and mitigate releases. All facilities and structures that are operational, that are not longer being used for their original mission, or that are in standby or abandoned mode are included in this analysis. Based on the analysis performed of co-located facilities and activities and management control to prevent releases to the environment, only the Warm Waste Treatment System and the Engineering Test Reactor stack are identified to have the potential to impact comprehensive risk at TRA. The analysis does not identify any structures or facilities that posed an imminent threat of release. However, five-year reviews will evaluate changing conditions that could result in unacceptable risk.

Except for the Brass Cap Area and TRA-19 (which are being addressed by limited action wit a contingent excavation and disposal option), it is not anticipated that current operations

at TRA will
inhibit cleanup operations.

Editorial Comments

53. Comment: One commentor suggested changing "and" to "sand" in the last paragraph of page 30 of the Proposed Plan. A commentor noted editorial changes suggesting "North Storage Area including North Storage Area Soil Contamination Area" (page 31, first paragraph) should be set off as a heading or made into a complete sentence. (W-26, W-27)

Response: Comments noted.

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Appendix B

Administrative Record File Index

Appendix B

Administrative Record File Index

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B-1. TRACK 1 INVESTIGATION OF TRA OU 2-01

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2859
Title: TRA-02, TRA Paint Shop Ditch
Author: Alexander, T.G.
Recipient: Clark, C.
Date O9/16/86

AR3.5 TRACK 1 INVESTIGATIONS

Document #: 3601
Title: TRA 02 Paint Shop Ditch (TRA-606)
Author: N/A
Recipient: N/A
Date: 09/13/91

B-2. TRACK 1 INVESTIGATION OF TRA OU 2-02

File Number

AR 1.7 INITIAL ASSESSMENTS

Document #: 2857
Title: TRA-21, TRA Inactive Tank North Side of MTR-643
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2856
Title: TRA-22, TRA Inactive Diesel Fuel Tank at ETR-648
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2871
Title: TRA-14, TRA Inactive Gasoline Tank at TRA-605
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2873
Title: TRA-17, TRA Inactive Gasoline Tank at TRA-616
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2875
Title: TRA-18, TRA Inactive Gasoline Tank at TRA-619
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

AR3.5 TRACK 1 INVESTIGATIONS

Document #: 5206
Title: TRA 14 TRA Inactive Gasoline Tank at TRA-605
Author: N/A
Recipient: N/A
Date: 10/05/92

Document #: 5287
Title: TRA-22 TRA Diesel Fuel Tank at ETR-648
Author: N/A
Recipient: N/A
Date: 01/06/93

Document #: 5288
Title: TRA-21 TRA Inactive Tank North Side of MTR-643
Author: N/A
Recipient: N/A
Date: 01/06/93

Document #: 5289
Title: TRA-17 TRA Inactive Gasoline Tank at TRA-616
Author: N/A
Recipient: N/A
Date: 01/06/93

Document #: 5290
Title: TRA-18 TRA Inactive Gasoline Tank at TRA-619
Author: N/A
Recipient: N/A
Date: 01/06/93

B-3. TRACK 2 INVESTIGATION OF TRA OU 2-03

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2858
Title: TRA-01, TRA Acid Spill Disposal Pit (TRA-608)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/16/86

Document #: 2868
Title: TRA-11, TRA French Drain at TRA-645
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2869
Title: TRA-12, TRA Fuel Oil Tank Spill (TRA-727B)
Author: Alexander, T.G.
Recipient: Clark, C.

Document #: 2879
Title: TRA-20, TRA Brine Tank (TRA-731) at TRA-631
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 578
Title: TRA-40, TRA Tunnel French Drain (TRA-731)
Author: Pigot, W.R.
Recipient: Clark, C.
Date: 02/08/89

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-10736
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 2-03
Author: Sherwood, J.A.
Recipient: N/A
Date: 08/01/93

AR3.22 TRACK 2 DECISION STATEMENT

Document #: AM/ERWM-532-93
Title: Transmittal of the Revised Track 2 Summary Reports for Operable Unit 2-03 and 2-06 and the DOE-ID Track 2 Decision Statements
Author: Lyle, J.L.
Recipient: Pierre,; W. Nygard, D.
Date: 08/13/93

Document #: 5506
Title: EPA Recommendation on the Track 2 Summary Report for the Test Reactor Area Operable Unit 2-03
Author: Meyer, L.
Recipient: Williams, A.C.
Date: 10/04/94

Document #: 5800
Title: IDHW Recommendation For OU 2-03 Track 2 Summary Report
Author: Koch, D.
Recipient: Williams, A.C.
Date: 10/13/93

Document #: 5855
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-03 Test Reactor Area (TRA) including TRA-01, TRA-11, TRA-12, TRA-20, TRA-40, and TRA-614
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-4. TRACK 2 INVESTIGATION OF TRA OU 2-04

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2844
Title: TRA-34, TRA North Storage Area
Author: Alexander, T.G.

Recipient: Clark, C.
Date: 07/08/87

Document #: 2866
Title: TRA-09, TRA Spills at TRA Loading Dock (TRA-722)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/11/86

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-11110
Title: Preliminary Scoping Track 2 Summary Report for the Test Reactor Area Operable Unit 2-04 Fuel Spills
Author: Sherwood, J.A.
Recipient: N/A
Date: 03/01/94

AR3.22 TRACK 2 DECISION STATEMENT

Document #: OPE-ER-78-94
Title: Transmittal of the Revised Track 2 Summary Report for Operable Unit 2-04 at the TRA at the INEL and the DOE-ID Decision Statement
Author: Green, L
Recipient: Pierre, W.; Nygard, D.
Date: 04/01/94

Document #: 5790
Title: IDHW-DEQ Recommendations for OU 2-04 Track 2 Summary Report
Author: Koch, D.
Recipient: Green, L.
Date: 11/04/94

Document #: 5513
Title: EPA Recommendation on the Track 2 Summary Report for Waste Area Group (WAG) 2, Operable Unit (OU) 2-04
Author: Meyer, L.
Recipient: Green, L.
Date: 10/11/94

Document #: 5861
Title: Decision Statement for the Track 2 Summary Report for the 0perable Unit (OU) 2-04 Test Reactor Area (TRA) TRA-653, TRA-626, TRA-619, PW-13, TRA-09, TRA-670, and TRA-627
Author: DOE, EPA, IDHW

Recipient: Not Specified
Date: 01/19/95

B-5. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-05

Administrative Record Volume I

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2872
Title: TRA-15, TRA Hot Waste Tanks #2, #3, #4 at TRA-613
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/16/86

Document #: 2874
Title: TRA-16, TRA Inactive Radioactive Contaminated Tank at TRA-614
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2876
Title: TRA-19, TRA Rad Tanks 1 & 4 at TRA-630, Replaced by Tanks 1,2,3, & 4
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/16/86

AR3.1 SAMPLING AND ANALYSIS PLAN

Document #: EGG-ER-10652, Rev. 1
Title: Track 2 Sampling and Analysis Plan for the Characterization of Waste Area Group 2, Operable Units TRA 2-05 and 2-07
Author: Jessmore, J.J.
Recipient: N/A
Date: 05/01/93

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-11114
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 2-05
Author: Holdren, K.J.
Recipient: N/A

Date: 04/04/94

Administrative Record Volume II

File Number

AR3.15 HEALTH AND SAFETY PLAN

Document #: EGG-ER-10634, Rev. 2
Title: Health and Safety Plan for Track 2 Characterization of Operable Units 2-05 and 2-07 at the Test Reactor Area
Author: Rice, R.S.
Recipient: N/A
Date: 06/01/93

AR3.22 TRACK 2 DECISION STATEMENT

Document #: OPE-ER-110-94
Title: Transmittal of the Revised Track 2 Summary Report for Operable Unit 2-07 at the Test Reactor Area (TRA) at the INEL
Author: Lyle, J.L.
Recipient: Pierre W.; Nygard, W.
Date: 05/04/94

Document #: 5789
Title: IDHW-DEQ Recommendations for OU 2-05 Track 2 Summary Report
Author: Koch, D.
Recipient: Green, L,
Date: 11/04/94

Document #: 5796
Title: EPA Recommendations for Track 2 Summary Report for Waste Area Group 2 Operable Unit 2-05
Author: Meyer, L.
Recipient: Green, L.
Date: 10/12/94

Document #: 5858
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-05 Test Reactor Area (TRA) TRA-16, TRA-15, TRA-19, and TRA-603/605 Tank
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-6. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-06

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2848
Title: TRA-30, TRA Beta Building Rubble Site
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2847
Title: TRA-31, TRA West Rubble Site
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2253
Title: TRA-35, TRA Rubble Site E. of West Road Neat Beta Building Rubble Pile
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 01/11/88

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-10806
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 2-06
Author: Sherwood, J.A.
Recipient: N/A
Date: 08/01/93

AR3.22 TRACK 2 DECISION STATEMENT

Document #: AM/ERWM-532-93
Title: Transmittal of the Revised Track 2 Summary Reports for Operable Units 2-03 and 2-06 and the DOE-ID Track 2 Decision Statements
Author: Lyle, J.L.
Recipient: Pierre, W.; Nygard, D.
Date: 08/13/93

Document #: 5801
Title: IDHW-DEQ Recommendations for Operable Unit 2-06 Track 2 Summary Report.

Author: Koch, D.
Recipient: Williams, A.C.
Date: 10/13/93

Document #: 5802
Title: EPA Recommendations for the Track 2 Summary Report for the Test Reactor Area Operable Unit 2-06
Author: Meyer, L.
Recipient: Williams, A.C.
Date: 10/04/93

Document #: 5856
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-06 Test Reactor Area (TRA), TRA-30, TRA-31, and TRA-35
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-7. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-07

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2254
Title: TRA-36, TRA ETR Cooling Tower Basin (TRA-751)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 01/11/88

Document #: 2239
Title: TRA-38, TRA ATR Cooling Tower (TRA-771)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 01/12/88

Document #: 2215
Title: TRA-39, TRA MTR Cooling Tower N of TRA-607
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 01/12/88

AR3.1 SAMPLING AND ANALYSIS PLAN

Document #: EGG-ER-10652, Rev. 1
Title: Track 2 Sampling and Analysis Plan for the Characterization of Waste Area Group 2, Operable

Units TRA 2-05 and 2-07
Author: Jessmore, J.J.
Recipient: N/A
Date: 05/01/93

NOTE: This document can be found in Administrative Record Binder Volume I, OU 2-05

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-11085
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 2-07
Author: Jessmore, P.J.
Recipient: N/A
Date: 04/01/94

File Number

AR3.15 HEALTH AND SAFETY PLAN

Document #: EGG-ER-10634, Rev. 2
Title: Health and Safety Plan for Track 2 Characterization of Operable Units 2-05 and 2-07 at the Test Reactor Area
Author: Rice, R.S.
Recipient: N/A
Date: 06/01/93

NOTE: This document can be found in Administrative Record Binder Volume II, OU 2-05

AR3.22 TRACK 2 DECISION STATEMENT

Document #: OPE-ER-109-94
Title: Transmittal of the Revised Track 2 Summary Report for Operable Unit 2-07 at the Test Reactor Area (TRA) at the INEL
Author: Lyle, J.L.
Recipient: Pierre, W.; Nygard, W.
Date: 05/04/94

Document #: 5788
Title: IDHW-DEQ Recommendations for OU 2-07 Track 2 Summary Report
Author: Koch, D.
Recipient: Green, L.
Date: 11/04/94

Document #: 5797
Title: EPA Recommendations for Track 2 Summary Report

for Waste Area Group 2 Operable Unit 2-05
Author: Meyer, L.
Recipient: Green, L.
Date: 10/11/94

Document #: 5857
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-07 Test Reactor Area (TRA) ETR Cooling Tower, MTR Cooling Tower, ATR Cooling Tower and TRA-653
Author: DOE; EPA; IDHW
Recipient: Not specified

Date: 01/19/95

B-8. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-08

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2240
Title: TRA-37, TRA MTR Canal in Basement of TRA-603
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 01/12/88

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-11113
Title: Preliminary Scoping Track 2 Summary Report for the Test Reactor Area Operable Unit 2-08
Author: Blackmore, C.S.
Recipient: N/A
Date: 03/01/94

AR3.22 DECISION STATEMENT

Document #: OPE-ER-72-94
Title: Decision Statement for the Track 2 Summary Report for Operable Unit 2-08
Author: Lyle, J.L.
Recipient: Nygard, W.; Pierre, W.
Date: 04/04/94

Document #: 5787
Title: IDHW-DEQ Recommendations for OU 2-08 Track 2 Summary Report
Author: Koch, D.

Recipient: Green, L.
Date: 11/04/94

Document #: 5798
Title: EPA Recommendations for Track 2 Summary Report for Waste Area Group 2, Operable Unit 2-08
Author: Meyer, L.
Recipient: Green, L.
Date: 10/11/94

Document #: 5854
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-08 Test Reactor Area (TRA) Materials Test Reactor (MTR) Canal
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-9. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-09

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2864
Title: TRA-07, TRA Sewage Treatment Plant (TRA-624 & Sludge Pit (TRA-732)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2865
Title: TRA-08, TRA Cold Waste Disposal Pond (TRA-702)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/12/86

Document #: 2870
Title: TRA-13, TRA Final Sewage Leach Ponds (2) by TRA-732
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

AR3.14 TRACK 2 SUMMARY REPORT

Document #: EGG-ER-10595
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 2-09 TRA Sewage Treatment Area and

Cold Waste Pond
Author: Salomon, H.
Recipient: N/A
Date: 07/01/93

AR3.22 DECISION STATEMENT

Document #: AM/ERWM-RPO-518-93
Title: Decision Statement for the Track 2 Summary Report for Operable Unit 2-09
Author: Lyle, J.L.
Recipient: Nygard. W.; Pierre, W.
Date: 08/10/93

Document #: 7673
Title: IDHW-DEQ Recommendations for OU 2-09 Track 2 Summary Report
Author: Koch, D.
Recipient: Green, L.
Date: 05/17/94

Document #: 5812
Title: EPA Recommendations for Track 2 Summary Report For The Test Reactor Area Operable Unit 2-09
Author: Meyer, L.
Recipient: Williams, A.C.
Date: 10/04/93

Document #: 5860
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-09 Test Reactor Area (TRA) TRA-08 Cold Waste Pond and the TRA Sewage Treatment Area
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-10. TEST REACTOR AREA WARM WASTE POND SEDIMENTS OPERABLE UNIT 2-10

Administrative Record Binder I

File Number

AR1.1 BACKGROUND

Document #: EPA/540/2-90/001
Title: Assessment of Technologies for the Remediation of Radioactively Contaminated Superfund Sites
Author: Environmental Protection Agency

Recipient: N/A
Date: 01/01/90

Document #: EPA/540/2-88/002
Title: Technological Approaches to the Cleanup of Radiologically Contaminated Superfund Sites
Author: Environmental Protection Agency
Recipient: N/A
Date: 08/01/88

Document #: EGG-ER-8644
Title: Conceptual Model and Description of the Affected Environment for the TRA Warm Waste Pond
Author: Hull, L.C.
Recipient: N/A
Date: 10/01/89

AR3.7 INTERIM ACTIONS

Document #: EGG-WM-9622
Title: Interim-Action Risk Assessment for the TRA Warm Waste Leach Pond
Author: Figueroa, I., McClellan, Y., and King, J.J.
Recipient: N/A
Date: 06/01/91

AR3.10 SCOPE OF WORK

Document #: 2916
Title: Scope of Work for An Interim Action of the TRA Warm Waste Pond
Author: Baumer, A.R.
Recipient: N/A
Date: 03/01/91

AR4.2 FEASIBILITY STUDY REPORTS

Document #: EGG-WM-10000
Title: Test Reactor Area Warm Waste Pond at the Idaho National Engineering Laboratory Sediment Treatability Study Phase I Report
Author: Beller, J.M.
Recipient: N/A
Date: 11/01/91

AR4.3 PROPOSED PLAN

Document #: 3558
Title: Proposed Plan for a Cleanup of the Warm Waste Pond Sediments at the TRA at the INEL

Author: Baumer, A.R.
Recipient: N/A
Date: 07/01/91

AR5.1 RECORD OF DECISION

Document #: 3320
Title: Declaration for the Warm Waste Pond at the TRA at the INEL - Declaration of the Record of Decision (ROD)
Author: Baumer, A.R.
Recipient: N/A
Date: 12/05/91

AR5.3 EXPLANATION OF SIGNIFICANT DIFFERENCE

Document #: 5253
Title: Explanation of Significant Difference for the Warm Waste Pond Sediments Record of Decision at the Test Reactor Area, at the INEL
Author: Jensen, N.R.
Recipient: N/A
Date: 03/15/93

Document #: 5241
Title: Technical review Comments for the Draft Treatability Study Report of the Warm Waste Pond Operable Unit 2-10
Author: Hoveland, R.D.
Recipient: Jensen, N.R.
Date: 03/08/93

Document #: 5243
Title: Results of the Pilot Scale Treatability Study for the TRA Warm Waste Pond Vol. I and II
Author: Meyer, L.
Recipient: Green, L.A.
Date: 03/08/93

Document #: 5244
Title: Presentation Slide Copies on the TRA Warm Waste Pond
Author: Montgomery, R.A.
Recipient: N/A
Date: 03/08/93

Administrative Record Binder II

Document #: EGG-ERD-10435
Title: Test Reactor Area Warm Waste Pond at the Idaho

National Engineering Laboratory Pilot-Scale
Treatability Study Work Plan
Author: Montgomery, R.A.
Recipient: N/A
Date: 09/01/92

Document #: EGG-ER-10616, Vol. 1
Title: Results of the Pilot-Scale Treatability Study for the
Test Reactor Area Warm Waste Pond
Author: Montgomery, R.A.
Recipient: N/A
Date: 04/01/93

Document #: EGG-ER-10616, Vol. 2
Title: Results of the Pilot-Scale Treatability Study for the
Test Reactor Area Warm Waste Pond
Author: Montgomery, R.A.
Recipient: N/A
Date: 04/01/93

Administrative Record Binder III

File Number

AR5.3 EXPLANATION OF SIGNIFICANT DIFFERENCE (continued)

Document #: 910521-N/C
Title: Warm Waste Pond Bench-Scale Treatability Study
Author: Nuclear Remediation Technologies Corporation
Recipient: ASI
Date: 09/01/92

AR7.2 ENDANGERMENT ASSESSMENTS

Document #: 2915
Title: Rare, Threatened and Endangered Plants and Animals
of Idaho
Author: Moseley, R.
Recipient: N/A
Date: 03/01/90

AR10.3 PUBLIC NOTICES

Document #: 5255
Title: Informal Meeting - Explanation of Significant
Difference for the Test Reactor Area Warm Waste
Pond
Author: INEL Community Relations
Recipient: N/A
Date: 03/21/93

AR 10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 3540
Title: Public Meeting Transcripts - Public Comment Meetings Concerning Proposed Cleanup Projects at the Test Reactor Area at the Idaho National Engineening Laboratory
Author: N/A
Recipient: N/A
Date: 07/07/91

B-11. TRACK 2 INVESTIGATION OF OPERABLE UNIT 2-11

File Number

AR1.7 INITIAL ASSESSMENTS

Document #: 2860
Title: TRA-03A, TRA Warm Waste Leach Pond (TRA-758)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/12/86

Document #: 2861
Title: TRA-04, TRA Warm Waste Retention Basin (TRA-712)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/11/86

Document #: 2862
Title: TRA-05, TRA Waste Disposal Well, Sampling Pit (764) and Sump (703)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 09/11/86

AR3.14 TRACK 2 SUMMARY REPORT

Document #: AM/ERWM-RPO-358-93
Title: Transmittal of Revised Track 2 Summary Report for Operable Unit 2-11 at the Test Reactor Area (TRA) at the INEL (DOE-ID Decision Statement incorporated in Track 2 Summary Report)
Author: Lyle, J.L.
Recipient: Nygard, W.; Pierre, W.
Date: 03/11/93

Document #: EGG-ERD-10518
Title: Scoping, Track 2 Summary Report for Operable Unit 2-11 at the Test Reactor Area
Author: Golder Associates
Recipient: N/A
Date: 03/01/93

AR3.22 DECISION STATEMENT

Document #: 7051
Title: IDHW-DEQ Recommendations for OU 2-11 Track 2 Summary Report
Author: Koch, D.
Recipient: Green, L.
Date: 08/02/93

Document #: 5811
Title: EPA Recommendations for Track 2 Summary Report For The Test Reactor Area Operable Unit 2-11
Author: Meyer, L.
Recipient: Williams, A.C.
Date: 10/04/93

Document #: 5859
Title: Decision Statement for the Track 2 Summary Report for the Operable Unit (OU) 2-11 Test Reactor Area (TRA) TRA-03, TRA-04, and TRA-05
Author: DOE, EPA, IDHW
Recipient: Not Specified
Date: 01/19/95

B-12. PERCHED WATER SYSTEM RI/FS OPERABLE UNIT 2-12

Administrative Record Volume I

File Number

AR1.1 BACKGROUND

Document #: EGG-ERD-10313
Title Selection Of Groundwater Flow And Contaminant-Transport Models
Author: Dames and Moore
Recipient: N/A
Date: 06/01/92

Administrative Record Volume IV

AR4.3 PROPOSED PLAN

Document #: 5130
Title: Dear Citizen Pamphlet on the Proposed Plan for the Perched Water System
Author: INEL Community Relations
Recipient: N/A
Date: 06/26/92

AR5.1 RECORD OF DECISION

Document #: 5230
Title: Record of Decision for the TRA Perched Water System
Author: INEL Community Relations
Recipient: N/A
Date: 12/01/92

AR10.3 PUBLIC NOTICES

Document #: 5136
Title: Attention: Agencies Seek Public Comment on Three Proposed Plans
Author: INEL Community Relations
Recipient: N/A
Date: 07/01/92

AR10.4 PUBLIC MEETING TRANSCRIPTS

Document #: 5164-TRA
Title: Public Meeting Transcripts on the Proposed Plan for the TRA Perched Water System
Author: N/A
Recipient: N/A
Date: 07/20/92

AR3.10 SCOPE OF WORK

Document #: 2377
Title: Scope of Work Perched Water System RI/FS
Author: Vernon, D.K.
Recipient: N/A

Date: 05/23/91

Document #: ERD-343-91
Title: Transmittal, Working Schedule for the TRA Perched Water RI/FS
Author: DOE, Lyle, J.
Recipient: EPA, Pierre, W. and IDHW, Nygard, D.
Date: 09/12/91

Document #: 3515
Title: Working Schedule for the TRA Perched Water RI/FS
Author: DOE, Lyle, J.
Recipient: EPA, Pierre, W. and IDHW, NyGard, D.
Date: 09/12/91

AR3.4 RI REPORTS

Document #: EGG-WM-10002
Title: RI Report for the TRA Perched Water System OU 2-12
Author: Lewis, S.M.
Recipient: N/A
Date: 06/01/92

Administrative Record Volume II

File Number

AR3.4 RI REPORTS (continued)

Document #: EGG-WM-10002(continued)
Appendices A through E

Administrative Record Volume III

Document #: EGG-WM-10002(continued)
Appendices F through I

B-13. PERCHED WATER SYSTEM RI/FS OPERABLE UNIT 2-13

Administrative Record Volume I

File Number

AR1.1 BACKGROUND

Document #: 10269

Title: Decision Documentation Package for Chemical Waste Pond (TRA-06)
Author: Not specified
Recipient: Not specified
Date: 01/23/92

Document #: EGG-WM-9193
Title: Closure Plan for the Test Reactor Area Chemical Waste Pond (COCA Unit TRA-06)
Author: Burns, S.M.; Stanisich, S.N.; Spry, M.J.; Shoop, D.S.
Recipient: Not specified
Date: 10/01/90

Document #: EG&G-85-17
Title: Unusual Occurrence Report - Facility Number ATR-85-3
Author: Sheldon, D.E.; Boyer, R.D.; Alletzhauser, G.J.; Mousseau, D.R.; Amidei, W.; Hong, J.A.
Recipient: Not specified
Date: 11/13/85

Document #: EG&G-85-41
Title: Unusual Occurrence Report - Facility Number ATR-85-8
Author: Sheldon, D.E.; Boyer, R.D.; Alletzhauser, G.J.; Mousseau, D.R.; Amidei, W,; Hong, J.A.
Recipient: Not specified
Date: 11/13/85

Document #: EGG-ER-10547, Rev. 1
Title: Post Record of Decsion Monitoring Plan for the Test Reactor Area Perched Water System Operable Unit 2-12
Author: Not specified
Recipient: Not specified
Date: 09/01/93

AR1.7 INITIAL ASSESSMENTS

Document #: 2863
Title: TRA-06, WAG 2 Comprehensive RI/FS Including TRA Chemical Waste Pond (TRA-701)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/15/86

Administrative Record Volume II

AR3.3 WORK PLAN

Document #: INEL-94/0026, Revision 0
Title: Work Plan for Waste Area Group 2 Operable Unit 2-12 Comprehensive Remedial Investigation/Feasibility Study
Author: Lientz, A.R.; Green, T.S.; Burns, D.E.; Burton, B.N.
Recipient: N/A
Date: 04/01/95

Administrative Record Volume III

Document #: OPE-ER-076-95
Title: Transmittal of Final Remedial Investigation/Feasibility Study Work Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (0U) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 04/26/95

AR3.4 RI REPORTS

Document #: OPE-ER-90-96
Title: Transmittal of Draft Remedial Investigation Report for Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS). Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 05/24/96

File Number

AR3.7 INTERIM ACTIONS

Document #: 02.010.2.1.209.01
Title: Draft Remedial Action Report Test Reactor Area Warm Waste Pond Interim Action Operable Unit (OU) 2-10
Author: N/A
Recipient: Green, L.A.
Date: 06/15/94

AR3.10 SCOPE OF WORK

Document #: INEL-94/0013
Title: Scope of Work for Operable Unit 2-13 WAG 2 Comprehensive Remedial Investigation Feasibility Study

Author: Lientz, A.
Recipient: N/A
Date: 11/01/94

AR3.12 RI/FS REPORTS

Document #: OPE-ER-129-96
Title: Transmittal of Draft Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 08/22/96

Document #: OPE-ER-191-96
Title: Transmittal of Draft Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 12/16/96

Document #: OPE-ER-10-97
Title: Transmittal of Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 02/03/97

Document #: OPE-ER-11-97
Title: Transmittal of Copies of Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 02/07/97

Administrative Record Volume IV

Document #: DOE/ID-10531, Rev. 0
Title: Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory
Author: Burns, D.E.; Davis, K.M.; Flynn, S.C.; Keck, J.F.; Hampton, N.L.; Owen, A.H.; VanHorn, R.L.
Recipient: Not specified
Date: 02/01/97

Administrative Record Volume V

AR3.15 HEALTH AND SAFETY PLAN

Document #: INEL-94/0002. Rev. 0
Title: Health and Safety Plan for Test Reactor Area OU 2-13 Comprehensive Remedial Investigation/Feasibility Study at the Idaho National Engineering Laboratory
Author: Sherwood, J.A.
Recipient: Not specified
Date: 04/01/95

AR4.3 PROPOSED PLAN

Document #: 10408
Title: Proposed Plan for Waste Area Group 2 - Test Reactor Area Idaho National Engineering and Environmental Laboratory
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/01/97

AR10.3 PUBLIC NOTICES

Document #: 10407
Title: Notice of Availability - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/09/97

Document #: 10406
Title: Comment Period Extended March 10 to May 9, 1997 - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/23/97

Document #: 10405
Title: Comment Period Extended - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/24/97

AR11.6 TECHNICAL MEMORANDUM

Document #: 10148
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Second Annual Technical Memorandum
Author: Meyer, L.
Recipient: Green, L.A.
Date: 09/22/95

Document #: 10149
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Second Annual Technical Memorandum
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 10/05/95

Document #: 10304
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Third Annual Technical Memorandum
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 10/08/96

Document #: 7782
Title: Technical Memorandum Post Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12
Author: Jessmore, P.J.
Recipient: Not specified
Date: 06/01/94

Document #: INEL-95/0408
Title: Post Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12 Second Annual Technical Memorandum
Author: Arnett, R.C.; Meachum, T.R.; Jessmore, P.J.
Recipient: Not specified
Date: 08/01/95

Document #: INEL-96/0305
Title: Post Record of Decision Monitoring for the Test

Reactor Area Perched Water System Operable Unit 2-12 Third Annual Technical Memorandum
Author: Arnett, R.C.; Meachum, T.R.; Jessmore, P.J.
Recipient: Not specified
Date: 09/01/1996

Document #: 10308
Title: OU 2-12 Third Annual Technical Memorandum and Three-Year Review
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 01/06/1997

Document #: 10005
Title: The Draft Work Plan for Waste Area Group 2 Operable Unit 2-13 Comprehensive Remedial Investigation/Feasibility Study
Author: Blood, H.R.
Recipient: Green, L.A.
Date: 02/10/95

AR12.1 EPA COMMENTS

Document #: 10288
Title: Comments On Draft Remedial Investigation Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.
Recipient: Green, L.A.
Date: 07/10/96

Document #: 10300
Title: Comments On Draft Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 10/09/96

Document #: 10314
Title: Comments On Draft Proposed Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.

Recipient: Jensen, N.R.
Date: 01/24/97

Document #: 10397
Title: Comments on: March, 1997 Draft Proposed Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering and Environmental Laboratory (INEEL)
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 02/14/97

AR12.2 IDHW COMMENTS

Document #: 10006
Title: Review Comments on WAG 2 Draft RI/FS Work Plan
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 02/13/95

Document #: 10289
Title: Review Comments on WAG 2 Draft Comprehensive RI/BRA Report
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 07/12/96

Document #: 10301
Title: Review Comments on WAG 2 Draft Comprehensive RI/FS Report
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 10/10/96

Document #: 10310
Title: Review Comments on WAG 2 Draft Final Comprehensive RI/FS Report
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 01/02/97

Document #: 10313
Title: Review Comments on WAG 2 Draft Proposal Plan
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 01/27/97

AR12.3 DOE RESPONSE TO COMMENTS

Document #: OPE-ER-20-97
Title: DOE Transmittal of Responses to Comments on the Draft Proposed Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 02/26/97

AR12.4 EXTENSIONS AND APPROVALS

Document #: OPE-ER-169-96
Title: Twenty Day Extension Notification for Submittal of the Waste Area Group (WAG) 2 Draft Final Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 11/12/96

Document #: OPE-ER-01-97
Title: Fifteen-day Extension for Finalization of the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) Report, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre. W.; Nygard, D.
Date: 01/15/97

AR12.5 PROJECT MANAGEMENT MEETING MINUTES

Document #: 5865
Title: WAG 2 Comprehensive Scoping Meeting Minutes
Author: IDHW, EPA, DOE, GEOTECH, EG&G Idaho, Inc.
Recipient: N/A
Date: 08/18/94

Administrative Record Volume I

File Number

AR1.1 BACKGROUND

Document #: 10269
Title: Decision Documentation Package for Chemical Waste Pond (TRA-06)
Author: Not specified

Recipient: Not specified
Date: 01/23/92

Document #: EGG-WM-9193
Title: Closure Plan for the Test Reactor Area Chemical Waste Pond (COCA Unit TRA-06)
Author: Burns, S.M.; Stanisich, S.N.; Spry, M.J.; Shoop, D.S.
Recipient: Not specified
Date: 10/01/90

Document #: EG&G-85-17
Title: Unusual Occurrence Report - Facility Number ATR-85-3
Author: Sheldon, D.E.; Boyer, R.D.; Alletzhauser, G.J.; Mousseau, D.R.; Amidei, W.; Hong, J.A.
Recipient: Not specified
Date: 11/13/85

Document #: EG&G-85-41
Title: Unusual Occurrence Report - Facility Number ATR-85-8
Author: Sheldon, D.E.; Boyer, R.D.; Alletzhauser, G.J.; Mousseau, D.R.; Amidei, W.; Hong, J.A.
Recipient: Not specified
Date: 11/13/85

Document #: EGG-ER-10547. Rev. 1
Title: Post Record of Decision Monitoring Plan for the Test Reactor Area Perched Water System Operable Unit 2-12
Author: Not specified
Recipient: Not specified
Date: 09/01/93

AR1.7 INITIAL ASSESSMENTS

Document #: 2863
Title: TRA-06, WAG 2 Comprehensive RI/FS Including TRA Chemical Waste Pond (TRA-701)
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/15/86

Administrative Record Volume II

AR3.3 WORK PLAN

Document #: INEL-94/0026, Revision 0
Title: Work Plan for Waste Area Group 2 Operable Unit 2-12 Comprehensive Remedial Investigation/Feasibility Study

Author: Lientz, A.R.; Green, T.S.; Burns, D.E.; Burton, B.N.
Recipient: N/A
Date: 04/01/95

Administrative Record Volume III

Document #: OPE-ER-076-95
Title: Transmittal of Final Remedial Investigation/Feasibility Study Work Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre. W.; Nygard, D.
Date: 04/26/95

AR3.4 RI REPORTS

Document #: OPE-ER-90-96
Title: Transmittal of Draft Remedial Investigation Report for Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering, Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 05/24/96

AR3.7 INTERIM ACTIONS

Document #: 02.010.2.1.209.01
Title: Draft Remedial Action Report Test Reactor Area Warm Waste Pond Interim Action Operable Unit (OU) 2-10
Author: N/A
Recipient: Green, L.A.
Date: 06/15/94

AR3.10 SCOPE OF WORK

Document #: INEL-94/0013
Title: Scope of Work for Operable Unit 2-13 WAG 2 Comprehensive Remedial Investigation Feasibility Study
Author: Lientz, A.
Recipient: N/A
Date: 11/01/94

AR3.12 RI/FS REPORTS

Document #: OPE-ER-129-96
Title: Transmittal of Draft Remedial Investigation/Feasibility

Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 08/22/96

Document #: OPE-ER-191-96
Title: Transmittal of Draft Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 12/16/96

Document #: OPE-ER-10-97
Title: Transmittal of Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W., Nygard, D.
Date: 02/03/97

Document #: OPE-ER-11-97
Title: Transmittal of Copies of Final Remedial Investigation/Feasibility Study (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 02/07/97

Administrative Record Volume IV

Document #: DOE/ID-10531, Rev. 0
Title: Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13, at

the Idaho National Engineering and Environmental Laboratory
Author: Burns, D.E.; Davis, K.M.; Flynn, S.C.; Keck, J.F.; Hampton, N.L.; Owen, A.H.; VanHorn, R.L.
Recipient: Not specified
Date: 02/01/97

Administrative Record Volume V

AR3.15 HEALTH AND SAFETY PLAN

Document #: INEL-94/0002, Rev. 0
Title: Health and Safety Plan for Test Reactor Area OU 2-13 Comprehensive Remedial Investigation/Feasibility Study at the Idaho National Engineering Laboratory
Author: Sherwood, J.A.
Recipient: N/A
Date: 04/01/95

AR4.3 PROPOSED PLAN

Document #: 10408
Title: Proposed Plan for Waste Area Group 2 - Test Reactor Area Idaho National Engineering and Environmental Laboratory
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/01/97

AR10.3 PUBLIC NOTICES

Document #: 10407
Title: Notice of Availability - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/09/97

Document #: 10406
Title: Comment Period Extended March 10 to May 9, 1997 - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified
Date: 03/23/97

Document #: 10405
Title: Comment Period Extended - Agencies Propose to Remediate Eight Sites at the Test Reactor Area
Author: INEEL Community Relations
Recipient: Not specified

Date: 03/24/97

AR11.6 TECHNICAL MEMORANDUM

Document #: 10148
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Second Annual Technical Memorandum
Author: Meyer, L.
Recipient: Green, L.A.
Date: 09/22/95

Document #: 10149
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Second Annual Technical Memorandum
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 10/05/95

Document #: 10304
Title: Post-Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12, Third Annual Technical Memorandum
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 10/08/96

Document 7782
Title: Technical Memorandum Post Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12
Author: Jessmore, P.J.
Recipient: Not specified
Date: 06/01/94

Document #: INEL-95/0408
Title: Post Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12 Second Annual Technical Memorandum
Author: Arnett, R.C.; Meachum, T.R.; Jessmore, P.J.
Recipient: Not specified
Date: 08/01/95

Document #: INEL-96/0305
Title: Post Record of Decision Monitoring for the Test Reactor Area Perched Water System Operable Unit 2-12 Third Annual Technical Memorandum
Author: Arnett, R.C.; Meachum, T.R.; Jessmore, P.J.
Recipient: Not specified
Date: 09/01/1996

Document #: 10308
Title: OU 2-12 Third Annual Technical Memorandum and Three-Year Review
Author: Underwood, E.J.
Recipient: Jensen, N R.
Date: 01/06/1997

Document #: 10005
Title: The Draft Work Plan for Waste Area Group 2 Operable Unit 2-13 Comprehensive Remedial Investigation/Feasibility Study
Author: Blood, H.R.
Recipient: Green, L.A.
Date: 02/10/95

AR12.1 EPA COMMENTS

Document #: 10288
Title: Comments On Draft Remedial Investigation Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Studv (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.
Recipient: Green, L.A.
Date: 07/10/96

Document #: 10300
Title: Comments On Draft Remedial Investigation/Feasibility Studv (RI/FS) Report for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 10/09/96

Document #: 10314
Title: Comments On Draft Proposed Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 01/24/97

Document #: 10397
Title: Comments on: March, 1997 Draft Proposed Plan for the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering and Environmental Laboratory (INEEL)
Author: Poeton, R.W.
Recipient: Jensen, N.R.
Date: 02/14/97

AR12.2 IDHW COMMENTS

Document #: 10006
Title: Review Comments on WAG 2 Draft RI/FS Work Plan
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 02/13/95

Document #: 10289
Title: Review Comments on WAG 2 Draft Comprehensive RI/BRA Report
Author: Underwood, E.J.
Recipient: Green, L.A.
Date: 07/12/96

Document #: 10301
Title: Review Comments on WAG 2 Draft Comprehensive RI/FS Report
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 10/10/96

Document #: 10310
Title: Review Comments on WAG 2 Draft Final Comprehensive RI/FS Report
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 01/02/97

Document #: 10313
Title: Review Comments on WAG 2 Draft Proposed Plan
Author: Underwood, E.J.
Recipient: Jensen, N.R.
Date: 01/27/97

AR12.3 DOE RESPONSE TO COMMENTS

Document #: OPE-ER-20-97
Title: DOE Transmittal of Responses to Comments on the Draft Proposed Plan for the Waste Area Group

(WAG) 2 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 02/26/97

AR12.4 EXTENSIONS AND APPROVALS

Document OPE-ER-169-96
Title: Twenty Day Extension Notification for Submittal of the Waste Area Group (WAG) 2 Draft Final Comprehensive Remedial Investigation/Feasibility Study (RI/FS), Operable Unit (OU) 2-13 at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 11/12/96

Document #: OPE-ER-01-97
Title: Fifteen-day Extension for Finalization of the Waste Area Group (WAG) 2 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) Report, Operable Unit (OU) 2-13, at the Idaho National Engineering Laboratory (INEL)
Author: Jensen, N.R.
Recipient: Pierre, W.; Nygard, D.
Date: 01/15/97

AR12.5 PROJECT MANAGEMENT MEETING MINUTES

Document #: 5865
Title: WAG 2 Comprehensive Scoping Meeting Minutes,
Author: IDHW, EPA, DOE, GEOTECH, EG&G Idaho, Inc.
Recipient: N/A
Date: 08/18/94

B-14. NO-ACTION SITES FOR THE TEST REACTOR AREA

Administrative Record Binder I

File Number

AR1.6 NO-ACTION SITES

Document #: 3608
Title: TRA-10 MTR Construction Excavation Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3609
Title: TRA-23 ETR Excavation Site Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3502
Title: TRA-24 TRA Guardhouse Construction Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3503
Title: TRA-25 TRA Sewer Plant Settling Pond Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3504
Title: TRA-26 TRA Rubble Site by USGS Observation Well
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3505
Title: TRA-27 TRA North Storage Area Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3506
Title: TRA-28 TRA North (Landfill) Rubble Site
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3507
Title: TRA-29 ATR Construction Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3508
Title: TRA-32 TRA West Road Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Document #: 3163
Title: TRA-33 TRA West Staging Area/Drainage Ditch

Rubble Pile
Author: N/A
Recipient: N/A
Date: 09/13/91

Administrative Record Binder II

AR1.7 INITIAL ASSESSMENTS

Document #: 2867
Title: TRA-10, MTR Construction Excavation Pile
Author: Alexander, T.G
Recipient: Clark, C.
Date: 10/03/86

Document #: 2855
Title: TRA-23, ETR Excavation Site Rubble Pile
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2854
Title: TRA-24, TRA Guardhouse Construction Rubble Pile
Author: Alexander, T.G.
Recipient: Clark, C
Date: 10/03/86

Document #: 2853
Title: TRA-25, TRA Sewer Plant Settling Pond Rubble Pile
Author: N/A
Recipient: N/A
Date: 10/03/86

Document #: 2852
Title: TRA-26, TRA Rubble Site by USGS Observation Well
Author: N/A
Recipient: N/A
Date: 10/03/86

Document #: 2851
Title: TRA-27, TRA North Storage Area Rubble Pile
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2850
Title: TRA-28, TRA North Landfill Rubble Site
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2849
Title: TRA-29, TRA ATR Construction Rubble
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2846
Title: TRA-32, TRA West Road Rubble Pile
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

Document #: 2845
Title: TRA-33, TRA West Staging Area/Drainage Ditch Rubble Site
Author: Alexander, T.G.
Recipient: Clark, C.
Date: 10/03/86

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD) - Explanation of Significant Differences (ESD):

ROD Date: 09/01/1998
Operable Unit: 18
ROD ID: EPA/541/R-98/062

Text: Full-text ROD document follows on next page.

EPA 541-R98-062

<IMG SRC 980620>

<IMG SRC 98062A>

Explanation of Significant Differences for the
Pit 9 Interim Action Record of Decision
at the Radioactive Waste Management Complex

at the Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Explanation of Significant Differences for the Pit 9 interim Action Record of Decision at the Radioactive Waste Management Complex

Idaho National Engineering and Environmental Laboratory

I. Introduction

This document is an Explanation of Significant Differences (ESD) from the Record of Decision (ROD) for the Pit 9 Interim Action, signed by the United States Department of Energy, United States Environmental Protection Agency, and State of Idaho Department of Health and Welfare (the Agencies), effective October 1, 1993, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan. This ESD is also prepared in accordance with the terms of the INEEL Federal Facility Agreement and Consent Order.

Site Name and Location

Pit 9, Subsurface Disposal Area, Radioactive Waste Management Complex
Waste Area Group 7, Operable Unit 7-10
Idaho National Engineering and Environmental Laboratory (INEEL)

The lead agency for this action is the United States Department of Energy Idaho Operations Office (DOE-ID). The United States Environmental Protection Agency and the State of Idaho Department of Health and Welfare (IDHW) both concur with, and approve the need for, this significant change to the selected remedy. The Agencies participated jointly in preparing this document.

Need and Purpose for an Explanation of Significant Differences

This ESD was prepared in accordance with Section 117(c) of the CERCLA, and 40 CFR 300.435(c)(2)(i) which

requires that an ESD be published "when the differences in the remedial or enforcement action, settlement, or consent decree significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost."

Accordingly, this explanation addresses the fact that the INEEL management and operating contractor (LMITCO) has terminated the subcontract to the Pit 9 remediation contractor (LMAES) for default, and DOE has adopted a contingency plan that will allow the DOE to meet its obligations for the remediation of Pit 9, without the participa-tion of the subcontractor. This and other relevant documents will become part of the Administrative Record file pursuant to 40 CFR 300.825(a)(2).

Copies of this ESD and the Pit 9 Administrative Record are available to the public in the INEEL Information Repository sections of the libraries and offices listed on the last page of this Explanation of Significant Differences.

II. Site History and Contamination Problems

The INEEL is located 32 miles west of Idaho Falls in southeastern Idaho and encompasses approximately 890 square miles of semi-arid desert overlying the Snake River Plain Aquifer. The Subsurface Disposal Area is located at the Radioactive Waste Management Complex, which is located in the southwest portion of INEEL. The area of focus is Pit 9, which is located in the northeast corner of the Subsurface Disposal Area. Pit 9 is designated as Operable Unit 7-10 and is scheduled as an interim action in the Action Plan of the Federal Facility Agreement and Consent Order.

Pit 9 was operated as a waste disposal pit from November 1967 to June 1969. It was used to dispose of approxi-mately 110,000 cubic feet (3,115 cubic meters) of transuranic waste (as defined in 1969, > 10 nCi/g) from the Rocky Flats Plant and additional low-level wastes (as defined in 1969, < 10 nCi/g) from waste generators located at the INEEL, for a total estimated waste volume of 150,000 cubic feet (4,248 cubic meters).The estimated volume of overburden is approximately 250,000 cubic feet (7,079 cubic meters). The estimated volume of soil between and below the buried waste is approximately 350,000 cubic feet (9,911 cubic meters). Most of the transuranic waste consists of drums of sludges (contaminated with a mixture of transuranic waste and organic solvents), drums of assorted solid waste, and cardboard boxes containing empty contaminated drums.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES AND BASIS

The significant change that necessitated this ESD relates to the change in subcontractor and implementation of a

contingency path to remediate Pit 9. Although this contingency path does not involve a change in the selected remedy type (i.e., physical separation/chemical extraction/stabilization), it does involve a change in design and operating assumptions.

This contingency path became necessary when the original subcontractor failed to perform its obligations under the subcontract in a timely manner. DOE did not meet two enforceable regulatory milestones, and in March 1997, the Agencies developed an Agreement to Resolve Disputes). 1

The DOE remains committed to executing the terms of the Pit 9 Record of Decision. As a result of the Agreement to resolve Disputes, DOE developed a revised Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan. 2 The revised Work Plan included a new schedule for implementation of the Pit 9 is ROD by the subcontractor, and a schedule for a contingency path, which would be implemented in the event the subcontractor failed to perform their subcontract. The DOE-ID, the EPA and the IDHW jointly developed this contingency plan. The Agencies agreed to proceed with the contingency planning in order to ensure future schedules would be met. In addition, there was a need to obtain information to support the Waste Area Group 7 decision process, including characterization and treatability information.

On June 1, 1998 the INEEL management and operating contractor (LMITCO) terminated the Pit 9 LMAES subcontract for default. Therefore, on June 18, 1998, DOE decided to pursue the contingency path, hereafter referred to as the OU 7-10 Staged Interim Action, described below. The OU 7-10 Staged Interim Action will remediate Pit 9 in accordance with the ROD.

OU 7-10 Staged Interim Action

The OU 7-10 Staged Interim Action, a three-stage approach agreed to by the Agencies, will satisfy the requirements of the ROD. The OU 7-10 Staged Interim Action, as the original subcontractor's approach, will result in the remediation of Pit 9. The OU 7-10 Staged Interim Action, like the original Pit 9 approach, is also designed to generate information to support the Remedial Investigation and Feasibility Study for the RWMC SDA.

Stage I activities will explore the subsurface via probe holes and coring, providing early information in the Stage II area of Pit 9. Stage II activities include design, construction, and retrieval of waste and soils from a 20'X20'X25' area of Pit 9. Characterization and treatability information obtained from Stage II is expected to support the WAG 7 decision. Stage III will complete the remediation of Pit 9.

1 "Agreement to Resolve Disputes," Docket No. 1088-06-29-120, March 18,1997.

2 "Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan: Operable Unit 7-10 (Pit 9 Project Interim Action), "October 1997, Revision 2, Document # INEL-94/0110.

The Agencies are aware of the amended rules under the Toxic Substance Control Act (Federal Register Volume 63, Number 124, Monday, June 28 1998, 35384, Disposal of Polychlorinated Biphenyls) effective August 28,1998 and have agreed to comply with the provisions under this rule in implementing the OU 7-10 Staged Interim Action.

Stage I

Stage I will focus on subsurface exploration to (1) more precisely determine the location of the Stage II excavation, (2) retrieve TRU radionuclide contaminated soil via drill cores for the Stage 1 Treatability Studies, and (3) obtain materials for characterization in support of the overall WAG 7 decision process. Specific details of the Stage I scope are available in the Work Plan for Stage I of the Pit 9 Contingency Project.3

Several different types of subsurface exploration methods will be implemented to meet the objectives of this work. A sonic vibratory drill will be used to core the waste site without introducing any drilling fluids. Monitoring activities will also be performed in conjunction with the subsurface exploration. This will be accomplished through radiological profiling, volatile organic profiling, and other techniques.

An objective for obtaining subsurface materials from Pit 9 is to provide information to support the WAG 7 decision process. The Stage I efforts Linder the contingency path will obtain data couceming waste form, contaminant migration, actinide speciation, volatile organic content of specific sludges, etc. Stage I will also perform bench-scale treatability study tests on TRU contaminated soil samples to test various soil treatment technologies that could be employed in Stage III.

Stage II

Under the OU 7-10 Staged Interim Action, approximately 200 cubic yards (equivalent to about nine hundred 55-gallon drums) of contaminated waste and soil is expected to be removed during the Stage II excavation. Stage II will consist of design and construction, startup activities, excavation and retrieval, characterization, and treatability study testing. Retrieved materials that are not returned to the pit as part of Stage II will be containerized and staged for further sampling within the area of contamination (AOC) pending final disposition.

The goal of the Stage II excavation is to develop information to support the design and operation of a Stage III system that will meet the requirements established in the Pit 9 ROD.

Stage III

Stage III consists of full-scale retrieval and treatment of Pit 9 to meet remediation goals set in the ROD. Treatment

technologies utilized will include chemical extraction and physical separation and stabilization of selected waste
streams.

Schedule

The INEEL Federal Facility Agreement and Consent Order and Action Plan governs the remediation work per-
formed at the INEEL, and was signed by all three agencies in December 1991. Under the terms of this agreement,
certain milestones were established, and others can be established, which the DOE must meet. Failure to meet these
milestones subjects the DOE to enforcement actions including fines and penalties. The milestones shown in table 2
were established in the Remedial Design/Remedial Action Scope of Work and the Work Plan for Stage 1 of the Pit
9 Contingency Project, and are enforceable.

3 "Work Plan for Stage 1 of the Pit 9 Contingency Project," June 1998, INEEL/EXT-98-10623.

Table 2. OU 7-10 Staged Interim Action Schedule

Milestone	Date
Stage I Work Plan	March 1998
Stage II RD/RA Work Plan	June 2000
Stage II RA Report	April 2003
Stage III RD Work Plan (90% Design)	April 2003
Stage III RA Work Plan and O&M Plan	September 2003
Stage III Draft Remedial Action Report	Within 60 Days of Final Stage III Inspection
Stage III O&M Report	90 Days of Stage III O&M Activities

Cost

A Rough Order of Magnitude (ROM) cost for the first two stages of the contingency path is presented in Table 3.
This cost is based on an analysis of the pre-conceptual design performed to estimate cost and schedule. As the
work plans for each stage are developed, a cost estimate will be developed. In accordance with RI/FS guidance, the
dollars presented are order-of-magnitude cost estimates. The costs presented are in FY-97 dollars.

Table 3. Cost estimate for Stages I and II.

	Estimated Cost
Operations and Maintenance	25M
Capital	61M
Present Worth	86M

Because the details of Stage III will be based on the results of work in Stages I and II, a cost

estimate for Stage III
is not presented at this time. As the details of Stage III are developed, one of the goals will be to complete the
overall project within the estimate presented in the 1995 ESD to the Pit 9 ROD.4

IV. AFFIRMATION OF THE STATUTORY DETERMINATION

Although there are uncertainties in the detailed implementation of the OU 7-10 Staged Interim Action that may
require future re-evaluation of the Affirmation of the Statutory Determination, currently available information does
not alter the remedy selected in the ROD. As presented in the ROD, the selected alternative provides adequate
overall protection of human health and the environment by minimizing potential contaminant migration from Pit 9.
The selected alternative also complies with the Applicable or Relevant and Appropriate Requirements of Federal
and State laws and regulations as identified in the ROD. Even with the project cost increases, which were identi-
fied in the 1995 ESD, the selected remedy was affirmed to provide the best balance of trade-offs in terms of long-
term effectiveness, reducing toxicity, mobility and volume of the contaminants, implementability, short-term
effectiveness, and cost. The issues presented in this ESD do not alter the beneficial attributes of the selected
remedy and its ability to achieve the remedial action objectives established in the ROD.

4 "Explanation of Significant Differences for the Pit 9 Interim Action Record of Decision at the Radioactive Waste Management Complex, Idaho National
Engineering laboratory," January 1995, Administrative Record # AR5.3-5862.

Considering the change to the project schedule and the development of a contingency plan (referred to as the OU
7-10 Staged Interim Action), the DOE,EPA and IDHW believe that the modified remedy remains protective of
human health and the environment and complies with Federal and State requirements that are applicable or relevant
and appropriate to this remedial action, and is cost-effective. In addition, the selected remedy meets the statutory
requirements to use permanent solutions and treatment technologies to the maximum extent possible. The Agencies
prefer a potential permanent solution whenever possible and, in the case of Pit 9, the goal is to meet the objectives
of an interim action and provide a potentially permanent treatment solution.

V. PUBLIC PARTICIPATION ACTIVITIES

A notice publishing the availability of this ESD has been placed in the Post Register - Idaho Falls, Idaho State
Journal - Pocatello, Times-News - Twin Falls, Idaho Statesman - Boise, Sho-Ban News - Fort Hall, and Daily
News - Moscow. Consistent with Section 300.435(c)(2)(i) of the National Contingency Plan, this ESD has been
placed in the Administrative Record Section of the INEEL Information Repositories listed below upon publication
of the Notice of Availability. A postcard announcing the availability of this ESD was sent to the INEEL mailing

list participants. This ESD and the contents of the Pit 9 Administrative Record are available for public review. In addition to the Administrative Record on file for the ROD, the Administrative Record for this action includes a copy of this ESD and relevant newspaper notices associated with the explanation (refer to the binder for OU 7-10).

The revised schedule and the implementation of the contingency path do not represent a fundamental change from that contained in the ROD, and therefore, a formal comment period is not required. Additional information or briefings may be requested by contacting the office listed below or calling the toll-free number for the INEEL at (800) 708-2680:

Erik Simpson
INEEL Community Relations Plan Office
P.O. Box 2047
Idaho Falls, Idaho 83403-2047
(208) 526-4700

LIBRARIES AND OFFICES CONTAINING INFORMATION REPOSITORIES

DOE Reading Room
INEEL Technical Library
1776 Science Center Drive
Idaho Falls, Idaho

University of Idaho Library
U of I Campus
Moscow, Idaho

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/29/1998
Operable Unit: 20
ROD ID: EPA/541/R-98/060

Media: Debris, Groundwater, Other, Residuals, Sediment, Soil, Solid Waste

Contaminant: Base Neutral Acids, Inorganics, Metals, PAH, PCBs, Pesticides, Petroleum Hydrocarbon, Radioactive, VOC

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The INEEL lands are within the aboriginal land area of the Shoshone-Bannock Tribes. These lands and waters provided the Tribes their home and sustained their way of life. DOE has documented an excess of 1,500 prehistoric and historic archaeological sites at the INEEL. Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing. In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government.

Public access to the INEEL is strictly controlled by fences and security personnel. State highways 22, 28, and 33 cross the northern portion of the INEEL. A total of 90 miles of paved highways pass through the INEEL and are used by the general public. The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. Most INEEL facilities are currently operated by one of three Government contractors. These contractors conduct various programs at the INEEL under the supervision of three DOE offices: DOE-Idaho (DOE-ID), Department of Defense (DoD)-Pittsburgh Naval Reactors Office, and DOE-Chicago (DOE-CH).

The INEEL was established in 1949 as the National Reactor Testing Station by the U.S. Atomic Energy Commission as a site for building, testing, and operating nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the area was designated as the Idaho National Engineering Laboratory to reflect the broad scope of engineering activities conducted there. The name was changed to the INEEL in 1997 to reflect the redirection of its mission to include environmental research. The U.S. Government occupied portions of the INEEL prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 square miles of the site as a gunnery range. The U.S. Army Air Corps once used an area southwest of the naval gunnery area as an aerial gunnery range. The present INEEL site includes all of the former military areas and a large adjacent shop withdrawn from the public domain for use by the DOE. The former Navy administration shop, warehouse, and housing area are presently the Central Facilities Area of the INEEL.

To better manage environmental investigations, the INEEL was subdivided into ten Waste Area Groups (WAGs). Identified contaminant release sites in each WAG were in turn divided into Operable Units (OUs) to expedite the investigations and any required remedial actions. The term "site" will herein refer to a named release site in one of the OUs. While "area" will herein be used to define all or a portion of an identified OU release site. In July 1989, the Environmental Protection Agency (EPA) proposed listing the INEEL on the National Priorities List (NPL). The EPA issued a final ruling that listed the INEEL as an NPL site in November 1989.

OU1:
The Test Area North (TAN) complex is located approximately 80 km (50 miles) northwest of Idaho Falls in the northern portion of the INEEL and extends over an area of approximately 30 square km (12

square miles). The Technical Support Facility (TSF) is centrally located within TAN and consists of several experimental and support facilities that are for conducting research and development activities on reactor performance. The TSF-05 Injection Well islocated in the southwest corner of TSF. Three other major test facilities are located near TSF and are considered part of TAN. These facilities are the Specific Manufacturing Capability/Containment Test Facility, the Initial Engine Test Facility, and the Water Reactor Research Test Facility. The Big Lost River and Birch Creek are the only natural surface water features present near TAN. Surface water can occur at TAN during and following periods of heavy rainfall and snowmelt. However, the presence of diversion systems, and playas located at the terminal points of the Big Lost River and Birch Creek, typically prevent surface water from reaching TAN.

Operations at TAN were initiated in the early 1950s to support the U.S. Air Force aircraft nuclear propulsion (ANP) project. The objectives of the ANP project were to develop and test various designs for nuclear-powered engines and fuels for use on aircraft. The principal source of groundwater contamination at TAN is the TSF-05 Injection Well, which was used from 1953 to 1972 to dispose of TAN liquid wastes into the fractured basalt of the Snake River Plain Aquifer. Releases to TAN groundwater were first identified in August 1987, in the production wells that supply drinking water to TSF. To mitigate potential risks to personnel at TAN, an air sparging system was installed on the drinking water supply system. A Record of Decision (ROD) was completed in August 1995, addressing the groundwater in the immediate vicinity of TAN as OU 1070B.

OU2:
OU2 is the 1-07A TAN Injection Well OU. The TSF-05 Injection Well is the principal source of groundwater contamination at TAN. In 1990, an initial effort removed process sludge from the bottom 17 m (55 feet) of the TSF-05 Injection Well. An Interim Action ROD was completed in September1992, addressing the groundwater contaminants near the injection well to prevent further degradation of groundwater while the OU 1-07B RI/FS was being completed.

OU4:
OU4 is the 2-12 Test Reactor Area (TRA) Perched Water OU. The TRA is located in the southwestern portion of the INEEL approximately 47 miles west of Idaho Falls. The TRA covers an area of approximately 1,700 by 1,900 feet and is surrounded by a double security fence. Located inside the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, laboratories and

offices. The facility contains three high neutron flux nuclear test reactors: the Materials Test Reactor, the Engineering Test Reactor, and the Advanced Test Reactor. Only the Advanced Test Reactor is currently operational. WAG 2 covers the TRA.

The TRA was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Wastewater generated during operations is disposed of in the wastewater ponds at the TRA. Six disposal units have been used that have contributed to the formation and contamination of the Perched Water System; four of which are currently active. The active units include the warm waste pond, which receives radiologically contaminated wastewater; the cold waste pond, which receives primarily reactor cooling water with no radiological activity; the chemical waste pond, which is used for disposal of wastewater from ion exchange units and water softeners; and the sanitary waste ponds, which are used for sanitary wastes. A number of groundwater investigations have been conducted since 1949 in the vicinity of the TRA to characterize the quality of the Snake River Plain Aquifer. The Perched Water System RI was conducted in 1992, and a ROD for no remedial action was completed in December 1992.

OU5:
OU5, also designated as OU 2-10, addresses the Warm Waste Pond sediments. The Warm Waste Pond consists of three wastewater infiltration cells excavated in 1952, 1957, and 1964, for the disposal of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange.

The release of radioactive and/or hazardous contaminant to the Warm Waste Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action requirements of the July 1987 DOE, State, and EPA Consent Order/Compliance Agreement. Additional sampling was conducted in 1990 in accordance with Superfund protocol. The Warm Waste Pond was proposed for an interim action under the Consent Order, and a ROD for the interim action was completed in December 1991.

OU6:
OU6, also designated as OU2-13, addresses the 55 known or suspected contaminant release sites that have been identified within WAG 2. Groundwater monitoring has been conducted at a network of Snake River Plain Aquifer wells in the vicinity of TRA and for selected deep perched water zone wells. Localized areas of radionuclide-contaminated soil were located in and north of the

North Storage Area. The soil contamination was removed in the summer of 1995 and 1996 as part of an INEEL-wide cleanup of radioactively contaminated surface soil. The OU 2-13 comprehensive RI/FS conducted at the TRA was completed in February 1997 and resulted in the identification of eight sites with potential risk to human health and requiring some type of remedial action. A ROD was completed in December 1997, providing for remedial action at the eight sites and no action for the remaining 47 sites.

OU8:
OU8, which is also known as the OU 4-12, consists of the Central Facilities Area (CFA) Landfills. The CFA is located in Butte County in the south-central portion of the INEEL. CFA Landfills I, II, and III are located approximately 0.5 miles north of the CFA proper. The Snake River Aquifer beneath the CFA is at about 480 feet. Flow of the aquifer in this region is generally to the south-southwest. The only naturally occurring surface water at CFA results from heavy rainfall or snowmelt, usually during the period from January to April.

The original facilities at the CFA were built in the 1940s and 1950s to house personnel. The facilities have been modified over the years to fit the changing needs of the INEEL and now provide craft, office, service, and laboratory space. The CFA landfills were operated as municipal-type landfills for the INEEL. CFA Landfill I was operated as a disposal facility from the early 1950s until the mid-1980s. The landfill covers a total surface area of approximately 8.25 acres. The landfill is composed of three major units, commonly referred to as the rubble landfill, the western waste trench, and the northern waste trench. CFA Landfill II, in use from 1970 until 1982, was a fill operation encompassing 15 acres in the southwestern portion of an abandoned gravel pit. CFA Landfill III, encompassing 12 acres, was opened in October of 1982, when operations at CFA Landfill II were terminated, and continued as a cut-and-fill operation until December 1984, when it also was terminated. An expansion to Landfill III was opened west of the original Landfill III and continued to handle the same type of waste. It was operational until 1993 and is no longer in use. This expansion is not considered part of OU 4-12. A ROD was completed in September 1995, documenting the results of the OU 4-12 RI/FS and the selected remedy for CFA Landfills I, II, and III.

OU9:
OU9, also referred to as OU 4-11, addresses the CFA Motor Pool Pond, that is located in an abandoned gravel pit approximately 366 m (1,200 feet) east of the CFA Equipment Yard. A small pond, approximately 36 by 18 meters (120 by 60 feet), formed in the low spot when wastes were being discharged. Currently, the pond is

typically dry; however, runoff may temporarily accumulate in the pond after storm events and during spring thaws. Wastewater discharged to the pond originated at the CFA Service Station. A 20-cm (8-inch) diameter concrete pipe extends southeast from the Service station and discharges to a ditch.

From 1951 until 1985, the CFA Motor Pool Pond received wastes from two sumps located at the CFA Service Station. One of the sumps collected wastes from bus washes and floor drains in the adjacent Service Bay, and the second sump collected wastes from the Steam Cleaning Bay. In late 1985, the wastes were diverted through an oil/water separator to a sanitary sewer line connected to the Sewage Treatment Plant, and discharge to the Motor Pool Pond ceased. The CFA Motor Pool Pond was sampled as part of an INEEL-wide preliminary assessment of waste streams conducted in 1982 and 1983. The pond was sampled again in 1988 as part of a DOE Environmental survey, and in 1989 in support of RCRA closure activities. Radiation surveys of the CFA Motor Pool Pond were conducted during periods when the pond contained water and when the pond was dry. The survey performed in September 1991 indicated only background levels of radiation. An RI risk assessment of the excavated sediments along the ditch and the sediments at the discharge pipe outlet, in the ditch, and in the pond, indicated that the contaminated sediments within these areas do not present an acceptable risk to human health and the environment. A ROD was completed in December 1992, for no further action at the CFA Motor Pool Pond.

OU12:
OU12 is the Auxiliary Reactor Area (ARA)-I Chemical Evaporation Pond, which is designated as OU 5-10 of WAG 5. The ARA is located in Butte County on the southern portion of INEEL, and consists of four separate facilities; ARA-I is the southernmost and oldest facility. The ARA facilities have been used for research reactor operations and support activities. All ARA reactors have been removed, and each facility has undergone partial decontamination and decommissioning. ARA-I was a support facility and has not been used for operations since 1988.

The ARA-I Chemical Evaporation Pond is an unlined surface impoundment that was previously used to dispose of laboratory wastewater from building ARA-627. The pond was constructed in 1970 by excavating native soil to create a topographic depression. Discharges to the pond ceased in 1988. The pond is now typically dry except after precipitation events. A sampling effort was conducted in 1990 to better characterize the ARA-I Chemical

Evaporation Pond. Results of the sampling were documented in a RI Report. A ROD was completed in December 1992, for no remedial action for pond sediments and sediments under the discharge pipe.

OU14:
OU14 addresses Pad A within the Radioactive Waste Management Complex (RWMC) of WAG 7. The RWMC encompasses 144 acres in the southwestern portion of INEEL and consists of two main disposal and storage areas: Transuranic (TRU) Storage Area and Subsurface Disposal Area (SDA). Pad A is located in the north-central portion of the SDA. Surface water is present at the RWMC only during periods of heavy rainfall and snowmelt. To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. To further enhance surface water diversion from the pits and trenches, berms have also been constructed immediately around the SDA.

The RWMC was established in the early 1950s as a disposal site for solid, low-level waste generated by INEEL operations. Within the RWMC, is the SDA where hazardous substances have been disposed in underground pits, trenches, soil vault rows, and Pad A (an aboveground pad). TRU waste was disposed in the SDA from 1952 to 1970. Approximately 13,341 cubic yards of containerized solid wastes were placed on Pad A from September 1972 to August 1978. Pad A was closed in 1978 and presently has a soil cover. A ROD was completed in January 1994, documenting the results of the RI/FS and the remedy selected for Pad A.

OU15:
OU15, which is designated as OU 7-08, addresses the organic contamination in the vadose zone (OCVZ) beneath and within the immediate vicinity of the RWMC (WAG 7). The presence of organic contaminants in the vadose zone is a result of the burial, and breach, at the SDA of containerized organic wastes from the Rocky Flats Plant, a DOE facility located west of Denver Colorado. The OCVZ OU only includes organic compounds that have migrated from the wastes, and does not address the waste materials disposed of in the pits of the SDA. Organic contaminants that are part of the OCVZ are present in the subsurface fractured basalt and sedimentary interbeds beneath and within the immediate vicinity of the RWMC, above the Snake River Plain Aquifer. The highest contaminant concentrations are found immediately beneath the SDA. Data from shipping records, along with process knowledge, written correspondence, and existing monitoring data, were available to allow OCVZ, OU 7-08, to be

evaluated in an expeditious manner. A ROD was completed in December 1994, addressing this OU.

OU18:
OU18, which is designated OU 7-10, addresses Pit 9 in the SDA of RWMC. Waste was placed in Pit 9 from November 1967 to June 1969. It presently has an overburden that averages about 1.8 m (6 feet) thick. Approximately 7,079.2 cubic meters of overburden, 4,247.5 cubic meters of packaged waste, and 9,910.9 cubic meters of soil were between and below the buried waste at the time of Pit 9 closure. No waste disposal has occurred in Pit 9 at the SDA since its closure in 1969. Pit 9 was identified for an interim action under the1987 Consent Order, and a ROD was completed in September 1993, documenting this interim action.

OU19:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to 3,300 people. NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

The NRF is designated as WAG 8, and consists of nine OUs. OU19 applies only to that portion of the Industrial Waste Ditch (IWD)outside the NRF perimeter (OU 8-07, the IWD), and the Landfill Units (OUs 8-06 and 8-05), which include nine separate locations situated on the west and northeast sides of the facility. Different landfill units were used at various times from 1951 through 1971. NRF discontinued use of the last landfill unit in 1971. Non-radioactive non-hazardous industrial waste water from water treatment operations and storm water runoff has been discharged to the IWD since 1953. In 1980, the NRF ceased the discharge of all wastes to the IWD except the acidic and basic ion exchange regenerant solutions, which were self-neutralizing. A ROD addressing ten sites in OUs 8-05 and 8-06, Landfill Areas, and OU 8-07, Exterior IWD, was issued in September 1994.

OU20:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to

3,300 people. NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

NRF is designated as WAG 8. A total of 87 known or suspected contaminant release sites, of which 71 were classified in nine OUs, were identified at NRF as requiring further study under the CERCLA process. Thirteen of the 87 sites were evaluated prior to the FFA/CO under the COCA and were not part of an OU. These 13 sites were identified as no action sites in the FFA/CO. A previous ROD addressed ten sites in OUs 8-05, 8-06, and 8-07. Eight of the nine OUs had been investigated prior to the NRF Comprehensive RI/FS. OU 8-08 represented the last OU to be investigated.

A total of 44 sites are associated with OUs 8-01, 02, 02, 04, and 09. OU 8-08 includes 18 sites that were not previously investigated under other OUs. The two new sites were not associated with any OU. OU 8-08 sites were grouped together because of similar constituents, release mechanisms, and migration paths. The OU 8-08 sites represent areas where past controlled releases of low-level radioactive water were discharged and areas where inadvertent releases to the environment occurred because of leaks from corroded piping, leaks in underground concrete basins, surface releases, and cross-contamination of non-radiological systems with radiological systems. A ROD addressing these 64 sites at NRF was completed in September 1998.

OU21:
OU21, which is designated OU 9-04, addresses the Argonne National Laboratory-West (ANL-W), which is part of WAG 9 and located in the southeastern portion of the INEEL. ANL-W houses extensive support facilities for three major nuclear reactors: Transient Reactor Test Facility (TREAT) Experimental Breeder Reactor II (EBR-II), and the Zero Power Physics Reactor (ZPPR). Drinking water for employees at ANL-W is obtained from two production wells located in the west-central portion of the ANL-W facility. Within the ANL-W site is a number of research and support facilities that contribute to the total volume of waste generated at ANL-W. These facilities currently generate radioactive low-level waste, radioactive TRU, hazardous waste, mixed waste, sanitary waste, and industrial waste. Approximately 750 people are employed at ANL-W facility.

The ANL-W was established in the mid1950s. The first reactor to operate at the ANL-W site was TREAT, which was built in 1959, and was designed for overpower transient tests of fuel. TREAT is now used mainly for safety tests for various fuel types as well as for

non-reactor experiments. The EBR-II, a 62.5-megawatt thermal reactor, went into operation in 1964 capable of producing 19.5 megawatts of electrical power in the liquid metal reactor plant. The ZPPR was put into operation at ANL-W in 1969 and is large enough to enable core-physics studies of full-scale breeder reactors that will produce up to 1,000 megawatts. ANL-W began a redirected nuclear research and development program in FY 1995. ANL-W is also currently in the process of conducting shutdown and termination activities for the EBR-II. ZPPR was placed in programmatic standby in fiscal year 1989.

Various chemical and radioactive wastes were generated from these three reactors and the support facilities at ANL-W. The operation of these facilities and the corresponding waste streams have been evaluated and documented in the Facility Assessment and Screening document of 1973. A total of 37 WAG 9 sites were evaluated during the OU 9-04 Comprehensive RI/FS completed in October 1997. A ROD was completed in September 1998.

OU22:
OU22, which is designated OU 5-13, addresses the Power Burst Facility (PBF) Evaporation Pond, Corrosive Waste Sump, and discharge pipe. The PBF, which operated from 1972 to 1985, is located in the south-central portion of the INEL. The reactor was built to support the Thermal Fuel Behavior Program's testing of pressurized-water reactor fuel rods under hypothetical reactor accidents. The PBF Evaporation Pond is a 140 by 140-foot lined surface impoundment enclosed by a cyclone fence, that was constructed in 1978 by borrowing native soil from a source located east of the pond. The Evaporation Pond is used to receive reactor secondary cooling water from the PBF reactor following neutralization in the Corrosive Waste Sump, an unlined concrete structure. The discharge pipe that leads from the Corrosive Waste Sump to the Evaporation Pond may also be contaminated.

The release of radioactive or hazardous contaminants to the Evaporation Pond was identified and evaluated during RCRA investigations. The PBF Evaporation Pond sediments have been sampled several times (1988 and 1989). A ROD was completed in September 1992, for an interim action at OU 5-13.

OU23:
OU23, which is designated as OU 10-05, addresses six ordnance areas in or near areas frequented by INEEL site personnel and therefore pose an immediate unacceptable risk to human health from the threat of uncontrolled detonation of unexploded ordnance. The

ordnance are primarily a result of past activities associated with the former Naval Proving Ground (NPG), which is an area of approximately 270 square miles within the INEEL. These activities included naval artillery testing, explosives storage bunker testing, and ordnance disposal. The NPG was used primarily during World War II. In addition, there are three suspected ordnance areas outside of the NPG that have been identified at the INEEL. A ROD was completed for an interim action at OU 10-05 in June 1992.

OU24:
The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approximately 38 and 52 miles west of Idaho Falls. The Sl-1 site is located about 1,600 feet northeast of the Auxiliary Reactor Area II and includes the surface-soil contamination area surrounding a 600 by 300-foot fenced burial ground. Approximately 99,000 cubic feet of radionuclide-contaminated debris, soil, and gravel are disposed of in the burial ground, with an estimated 2 feet of soil with a thick grass cover over the waste. The BORAX-I burial ground is located about 2,730 feet northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a 200 by 420-foot surface-soil contamination area surrounding the 100 by 100-foot fenced burial ground. The volume of buried radionuclide-contaminated soil and debris is approximately 6,336 cubic feet. The 84,00 square foot area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then. The SL-1 and BORAX-I burial grounds are historical disposal areas and do not host any current programs.

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-I burial ground was established in 1954; the SL-1 burial ground was established in 1961. Existing data were available to expedite evaluation of these sites. Therefore, the scope of the RI for the SL-1 and BORAX-I burial grounds did not include any sampling or acquisition of new data, and a focused FS was performed. A ROD was completed in December 1995.

Remedy: Based on Track 1 and Track 2 investigations and the Remedial Investigation/Feasibility Study (RI/FS) evaluation, a No Action decision is made by the agencies for those sites with no source present or a source present that represents an acceptable risk for unrestricted use. This No Action decision means no future evaluation or followups are required.

Based on the same information, a No Further Action decision is made by the agencies for those sites with a source or potential source present, but for which an exposure route is not available under current conditions. This No Further Action decision means that the site will be included in a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) review performed at least every five years to ensure that site conditions used to evaluate the site have not changed and to verify the effectiveness of the No Further Action decision. All monitoring data collected from the No Further Actions sites will be included in the CERCLA five year review. Although no additional remedial action is required at this time, present institutional controls, such as current fencing and administrative controls on excavation, sampling, monitoring, or action will be considered.

The following sites are defined as No Action or No Further Action sites.

Operable Unit 8-01 (OU8-01): Naval Reactors Facility-03 (NRF-03), Expanded Core Facility (ECF) Gravel Pit; NRF-06, Southeast Landfill; NRF-08, North Landfill; NRF-33, South Landfill; NRF-40, Lagoon Construction Rubble; NRF-41, East Rubble Area; and NRF-63, A1W Construction Debris Area.

OU 8-02: NRF-09, Parking Lot Runoff Leaching Trenches; NRF-37, Old Painting Room; NRF-38, ECF French Drain; NRF-47, Site lead Shack (Building #614); NRF-52A, Old Lead Shack (Location #1); NRF-52B, Old Lead Shack (Location #2); NRF-54, Old Boilerhouse Blowdown Pit; NRF-55, Miscellaneous NRF Sumps and French Drains; NRF-64, South Gravel Pit; and NRF-68, Corrosion Area Behind BB11.

OU 8-03: NRF-10, Sand Blasting Slag Trench; NRF-15, S1W Acid Spill Area; NRF-18B, S1W Spray Pond #2 and A1W Cooling Tower; NRF-20, A1W Acid Spill Area; NRF-45, Site Incinerator; and NRF-56, Degreasing Facility.

OU 8-04: NRF-28 A1W Transformer Yard; NRF-29, S5G Oily Waste Spill; NRF-31, A1W Oily Waste Spill; NRF-44, S1W

Industrial Wastewater Spill Area; NRF-58, S1W Old Fuel Oil Tank Spill; NRF-62, ECF Acid Spill Area; NRF-65, Southeast Corner Oil Spill; NRF-69, Plant Service Underground Storage Tank (UST) Diesel Spill; NRF-70, Boiler House Fuel Oil Release; NRF-71, Plant Service UST Gasoline Spill; NRF-72, NRF Waste Oil Tank; NRF-73, NRF Plant Services Varnish Tank; NRF-74, Abandoned USTs Between the NRF Security Fences; NRF-75, Fuel Oil Revetment Oil Releases; NRF-76, Vehicle Barrier Removal; and NRF-77, A1W Fuel Oil Revetment Oil Releases.

OU 8-08: NRF-13, S1W Temporary Leaching Pit; NRF-32, S5G Basin Sludge Disposal Bed; and NRF-79, ECF Water Pit Release.

OU 8-09: Interior Industrial Waste Ditch.

OU 8-02: NRF-42, Old Sewage Effluent Ponds; and NRF-61, Old Radioactive Materials Storage and Laydown Area.

OU 8-03: NRF-18A, S1W Spray Pond #1; and NRF-22, A1W Painting Locker French Drain.

OU 8-08: NRF-02, Old Ditch Surge Pond; NRF-16, Radiography Building Collection Tanks; NRF-23, Sewage Lagoons; NRF-43, Seepage Basin Pumpout Area; NRF-66, Hot Storage Pit; and NRF-81, A1W Processing Building Area Soil.

No Operable Unit (New sites identified after RI/FS): NRF-82, Evaporator Bottoms Tank Release; and NRF-83, ECF Hot Cells Release Area.

The following sites were determined by the NRF Comprehensive RI/FS to be sites of concern: NRF-11, S1W Tile Drainfield and L-shaped Sump; NRF-12A, Underground Piping to Leaching Pit; NRF-12B, S1W Leaching Pit; NRF-14, S1W Leaching Beds; NRF-17, S1W Retention Basins; NRF-19, A1W Leaching Bed; NRF-21A, Old Sewage Basin; NRF-21B, Sludge Drying Bed; and NRF-80, A1W/S1W Radioactive Line Near BB19.

The Limited Excavation, Disposal, and Containment alternative is selected for the nine sites of concern. The major components of the selected remedy for the nine sites of concern are:
excavating contaminated soil above remediation goals and debris from six of the nine sites; consolidating the excavated soil at one site (S1W Leaching Beds); disposing of radiological, non-hazardous debris to an INEEL disposal facility or an appropriate off-site (away from INEEL) disposal facility and, if necessary, disposing of

radiological, hazardous debris as a mixed waste per the INEEL Site Treatment Plan; constructing engineered covers primarily of native earthen materials in two areas that would cover the three sites not excavated, which includes the site where soil was consolidated. Cover materials will be determined in the Remedial Design/Remedial Action (RD/RA) Work Plan; radiation surveys and soil sampling during excavation; soil and groundwater sampling to monitor any potential releases from the covered areas; periodic inspection and maintenance of covers to ensure their integrity; establishing fencing or other barriers and land use restrictions.

Soil above 16.7 pCi/g of cesium-137 and 45.6 pCi/g of strontium-90 will be removed from sites NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80, if present. Lead was detected above remediation goals in only one sample in a location where a cover will be placed. Remediating the soil to below remediation goals for cesium-137 and strontium-90 will also reduce the risks associated with other radiological contaminants of concern (COCs). NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80 contain piping or concrete structures that are planned for removal during decontamination and dispositioning activities at NRF. Disposal of pipe and concrete debris will be through current decontamination and dispositioning practices and will likely be sent to the Radioactive Waste Management Complex (RWMC) located at the INEEL. Sampling concurrent with excavation activities will ensure all soil above remediation goals is removed. After the soil is excavated, it will be placed in NRF-14 (S1W Leaching Beds). The estimated contaminated soil volume from all the proposed excavation areas will fit into the present leaching beds. A single engineered earthen cover will be placed over site NRF-19 (A1W Leaching Bed). The cover design will be determined during the remedial design phase, but will likely include soil, gravel cobble, and/or rip-rap to ensure that proper containment of contaminants.

This alternative includes operation and maintenance costs for long-term maintenance and monitoring of the covers. Institutional controls including fencing or other barriers and land use restrictions will be implemented to prevent access to the covered areas. Long-term monitoring of NRF groundwater via the present groundwater well network and monitoring of soil around the covered areas will be performed. A review will be conducted at least every five years as required by CERCLA to verify the effectiveness of the selected remedy.

Estimated Capital Costs: Not Provided
Estimated Annual O&M Costs: Not Provided

Estimated Present Worth Costs: $8,905,751
Estimated Total O&M Costs: $3,486,561
Estimated Construction Costs: $4,512,135
Estimated RD/RA Management and Documentation Costs: $907,055

Text: Full-text ROD document follows on next page.

EPA 541-R98-060

<IMG SRC 980600>

<IMG SRC 98060A>

Final Record of Decision
Naval Reactors Facility
Operable Unit 8-08

September 30, 1998

Prepared for the
U.S. Department of Energy
Pittsburgh Naval Reactors Office
Idaho Branch Office
P. O. Box 2469
Idaho Falls, Idaho 83403-2469

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PART 1
DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Naval Reactors Facility, Waste Area Group 8

Operable Unit 8-08
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for nine sites in Operable Unit (OU) 8-08 at the Naval Reactors Facility (NRF) located on the Idaho National Engineering and Environmental Laboratory (INEEL). NRF has been designated as Waste Area Group (WAG) 8, which is one of ten WAGs at the INEEL identified by the U.S. Environmental Protection Agency (EPA) Region 10, the Idaho Department of Health and Welfare (IDHW), and the U.S. Department of Energy (DOE) in the Federal Facilities Agreement and Consent Order (FFA/CO). These remedial actions were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document also presents the decision of performing no remedial action for 55 additional sites at WAG 8. The decisions made in this document are based on information in the Administrative Record file for NRF.

The EPA and IDHW concur with the selected remedial actions for the nine sites of concern and the no remedial action decision for the 55 remaining sites.

ASSESSMENT OF THE SITE

The FFA/CO Action Plan describes OU 8-08 as the WAG 8 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) and includes several potential radiological sites. There have been nine operable units and 87 sites identified at NRF. Each operable unit contains a site or group of sites with similar characteristics. With the exception of 18 radiological sites and two post-RI/FS new sites, each site has been investigated under a previous assessment. These previous assessments evaluated the sites individually without respect to their proximity to other sites. Previous decision documents have been issued for 23 of the 87 sites. Decisions for the remaining 64 sites are provided in this Record of Decision. One purpose of the Comprehensive RI/FS was to thoroughly investigate 18 potential radiological sites that were not previously investigated. Another purpose of the Comprehensive RI/FS was to assess the potential cumulative, or additive, effects of all identified sites at NRF on human health and the environment including potential impacts to the groundwater. The 23 sites with previous decision documents were included in the comprehensive assessment to ensure the specified action or no action delineated in the decision document remains protective of human health and the environment from a cumulative perspective.

Thirteen of the 23 sites addressed by previous decision documents were not part of an operable unit and were determined to be no action sites under a Consent Order and Compliance Agreement (COCA) which preceded the FFA/CO. Ten other sites in OUs 8-05, 8-06, and 8-07 were addressed under a previous Record of Decision. The Comprehensive RI/FS determined that the decisions made for the 23 sites were appropriate and no additional human health or environmental concerns exist from a cumulative perspective.

This Record of Decision addresses 64 sites by providing selected remedial actions for nine sites and recommending no remedial action for 55 sites. Fifty-five sites present no risk or an

acceptable risk to human health or the environment, and therefore do not require a remedial action. The no remedial action sites are identified as follows: NRF-03, 06, 08, 33, 40, 41, and 53 in OU 8-01; NRF-09, 37, 38, 42, 47, 52A, 52B, 54, 55, 61, 64, and 68 in OU 8-02; NRF-10, 15, 18A, 18B, 20, 22, 23, 45, and 56 in OU 8-03, NRF-28, 29, 31, 44, 58, 62, 65, 69, 70, 71, 72, 73, 74, 75, 76, and 77 in OU 8-04; NRF-02, 13, 16, 32, 43, 66, 79, and 81 in OU 8-08; OU 8-09; and NRF-82 and 83 which are not included in an OU. Actual or threatened releases of hazardous substances from nine sites, if not addressed by implementing the response actions selected in this Record of Decision, may present an imminent and substantial endangerment to human health and the environment. These sites are NRF-11, 12A, 12B, 14, 17, 19, 21A, 21B, and 80 in OU 8-08.

DESCRIPTION OF REMEDY

Operable Unit 8-08 consists of 18 potential radiological sites and the sites addressed in the comprehensive assessment of all identified sites at NRF. The assessment of Operable Unit 8-08 was accomplished in the NRF Comprehensive RI/FS. The Rl/FS tasks were to thoroughly investigate 18 sites not previously evaluated (radiological areas including one OU 8-03 site) and
to comprehensively assess the cumulative risk posed by all NRF sites. The site assessments for the 18 radiological areas resulted in the identification of nine sites of concern. The comprehensive assessment included all sites at NRF and did not identify any additional sites of concern. Twenty-three of the 87 identified sites at NRF were addressed in previous decision documents, therefore, this Record of Decision addresses decisions made for the remaining 64 sites. Of the 64 sites, 55 do not require additional action. Forty-three of the 55 sites are recommended for No Action and the other 12 of 55 sites are recommended for No Further Action. A No Action decision indicates the sites have no source present or a source is present at a level with an acceptable human health and environment risk for unrestricted use. A No Further Action decision indicates the site has a source or potential source present that does not
have an exposure route available under current site conditions. Because the No Further Action decision potentially results in hazardous substances remaining onsite above risk-based levels, a CERCLA review will be conducted within five years after commencement of final remedial actions at NRF to ensure that the No Further Action decision remains effective.

For the protection of human health and the environment, remedial action objectives and goals were developed for the nine sites of concern. The remedial action objectives, associated goals, and the general actions necessary to meet the objectives and goals are as follows:

- Soil contaminated with cesium-137 greater than 16.7 picocuries per gram (pCi/g) will be excavated and/or covered with an engineered cap to prevent external gamma radiation exposure from exceeding an excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.
- Soil contaminated with strontium-90 greater than 45.6 pCi/g will be excavated and/or covered to prevent ingestion of soil and food crops from exceeding an excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.
- Soil contaminated with lead greater than 400 parts per million (ppm) will be excavated and/or covered to prevent direct contact with lead contaminated soil.
- To prevent the release of contaminated soils, an adequate cover will be used to inhibit erosion by natural processes and biotic intrusion by resident plant or animal species.
- Contaminated soil will be excavated and/or covered, as outlined above, to prevent exposure to contaminants of concern that may cause adverse effects on resident species populations.

In order to meet the objectives and goals for the protection of human health and the environment, the selected remedy for the nine sites of concern consists of limited excavation, disposal, and containment. The major components of the selected remedy include:

- Excavating contaminated soil above remediation goals and debris from six of the nine sites;
- Consolidating the excavated soil at one site (S1W Leaching Beds);
- Disposing of radiological, non-hazardous debris to an INEEL disposal facility or an appropriate off-site (away from INEEL) disposal facility and, if necessary, disposing of radiological, hazardous debris as a mixed waste per the INEEL Site Treatment Plan;
- Constructing engineered covers primarily of native earthen materials in two areas that would cover the three sites not excavated, which includes the site where soil was consolidated. Cover materials will be determined in the Remedial Design/Remedial Action Work Plan;
- Radiation surveys and soil sampling during excavation;
- Soil and groundwater sampling to monitor any potential releases from the covered areas;
- Periodic inspection and maintenance of covers to ensure their integrity;
- Establishing fencing or other barriers and land use restrictions.

The possibility exists that contaminated environmental media not identified in the FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dispositioning activities at NRF. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, the contaminant source will be evaluated and appropriate response actions taken in accordance with the FFA/CO.

STATUTORY DETERMINATION

The selected remedy for the nine sites of concern is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial actions, and is cost effective. This remedy utilizes permanent solutions; however, it does not satisfy the statutory preference for treatment as a principal element of the remedy. Treatment was found to be ineffective, difficult to implement, and/or not cost effective. The contaminated soils can be reliably contained at NRF.

Because this remedy may result in hazardous or radiological substances remaining on site above risk-based levels, a review will be conducted within five years after commencement of final remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment.

The agencies agree that no remedial action be taken for 55 of the 64 sites. For 12 of the 55 sites, where no action is being taken because an exposure route is not present under current site conditions (No Further Action decision), the site conditions will be reviewed at least every
five years to ensure that performing no action remains protective of human health and the environment. For the 43 of 55 sites with a No Action decision, follow-up reviews are not required.

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Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 8-08, located in Waste Area Group 8, Naval Reactors Facility at the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

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Acronyms

AOC	area of contamination
ARARs	applicable or relevant and appropriate requirements
A1W	Large Ship Reactor Prototype
BB	Butler Building
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminants of concern
COCA	Consent Order and Compliance Agreement

COPC	contaminants of potential concern
DOE	Department of Energy
ECF	Expended Core Facility
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
HEAST	Health Effects Assessment Summary Tables
HQ	hazard quotient
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRIS	Integrated Risk Information System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHPA	National Historic Preservation Act
NPL	National Priorities List
NRF	Naval Reactors Facility
NRHP	National Register of Historic Places
OU	operable unit
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
ppb	parts per billion
ppm	parts per million
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SDP	Bettis Atomic Power Laboratory Site Development Plan
SLERA	Screening Level Ecological Risk Assessment
SRPA	Snake River Plain Aquifer
S5G	submarine reactor plant prototype
S1W	Submarine Thermal Reactor Prototype
TRA	Test Reactor Area
UCL	upper confidence limit
USGS	United States Geological Survey
UST	underground storage tank
WAG	Waste Area Group

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PART II
DECISION SUMMARY

1.0 Site Background

1.1 Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles (Mi 2) of the northeastern portion of the Eastern Snake River Plain. Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management.

The INEEL was established in 1949 as the National Reactor Testing Station by the United States Atomic Energy Commission as a site for building, testing, and operating nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the area was designated as the Idaho National Engineering Laboratory to reflect the broad scope of engineering activities conducted there. The name was changed to the INEEL in 1997 to reflect the redirection of its mission to include environmental research.

The U.S. Government occupied portions of the INEEL prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 Mi 2 of the site as a gunnery range. The U.S. Army Air Corps once used an area southwest of the naval gunnery area as an aerial gunnery range. The present INEEL site includes all of the former military areas and a large adjacent area withdrawn from the public domain for use by the DOE. The former Navy administration shop, warehouse, and housing area are presently the Central Facilities Area of the INEEL.

The Bureau of Land Management manages the surrounding areas for multipurpose use. The developed area within the INEEL is surrounded by a 500 Mi 2 buffer zone used for cattle and sheep grazing. Communities nearest to the INEEL are Atomic City (south), Arco (west), Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Sheep, cattle, hogs, poultry, and dairy cattle are produced; and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. The U.S. Government or private individuals own most of the land surrounding the INEEL.

Fences and security personnel strictly control public access to facilities at the INEEL. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL and U.S. Highways 20 and 26 cross the southern portion. A total of 90 miles of paved highways pass through the INEEL and is used by the general public.

1.2 Naval Reactors Facility

The Naval Reactors Facility (NRF) is located on the west central side of the INEEL, as shown on Figure 1, approximately 50 miles west of Idaho Falls, Idaho. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. The Westinghouse Electric Company operates NRF for DOE, Office of Naval Reactors. NRF covers 7 square miles of

which 80 acres are developed and, at various times, was occupied by up to 3,300 people. Approximately 650 Westinghouse employees and 390 long-term subcontractor employees are currently working at NRF. The nearest public roads to NRF are approximately 7 miles west, 10 miles north, and 10 miles south.

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NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings. Construction of the Submarine Thermal Reactor prototype (S1W) at NRF began in 1951. The prototype completed operation in 1989. The Large Ship Reactor Prototype (AlW) was constructed in 1958 and completed operation in January 1994. The submarine reactor plant prototype (S5G) was constructed in 1965 and completed operation in May 1995. The prototypes were used to train sailors for the nuclear navy and were used for research and development purposes. The Expended Core Facility, which receives, inspects, and conducts research on naval nuclear fuel, was constructed in 1958 and is still in operation.

1.3 Physical Characteristics

The INEEL is located on the northeastern portion of the Eastern Snake River Plain, a volcanic plateau that is composed primarily of volcanic rocks and relatively minor amounts of sediments. Underlying the INEEL is a series of basaltic flows containing sedimentary interbeds. The Snake River Plain Aquifer (SRPA) is the largest potable aquifer in Idaho, and underlies the Eastern Snake River Plain and the INEEL. The aquifer is a approximately 200 miles long and 50 miles wide, and covers an area of approximately 9,600 mi 2. The depth to the SRPA at the INEEL varies from approximately 200 feet in the northeastern corner to approximately 900 feet in the southeastern corner. The distance between these extremes is 42 miles. The EPA designated

the SRPA as a sole-source aquifer under the Safe Drinking Water Act on October 7, 1991. The aquifer possesses a high hydraulic conductivity on a large scale because of the presence of fractures in the basalt, Local hydraulic conductivity may vary greatly due to the heterogeneous distribution of the physical properties of the aquifer. Groundwater flow in the SRPA is to the south-southwest at rates between 1.5 to 20 feet per day. In the vicinity of NRF, recharge to the SRPA occurs by infiltration from the Big Lost River, Little Lost River and Birch Creek, and to a lesser extent by infiltration due to precipitation. The average annual precipitation at the INEEL is approximately 8.5 inches.

NRF is located in the central portion of the INEEL. The land surface at NRF is relatively flat, with elevations ranging from 4,835 feet towards the distal end of the NRF industrial waste ditch, which is located approximately one mile north of NRF, to 4,870 feet at the south end of NRF. NRF is not located in the 100-year flood plain, although parts of the INEEL are on the flood plain. A flood with a recurrence interval of 5,000 to 8,000 years is capable of inundating NRF.

NRF is located on the alluvial plain of the Big Lost River. The thickness of alluvial sediment in the vicinity of NRF ranges from several inches to in excess of 60 feet north of NRF. Most of the soil near NRF is mapped as sandy loam or loess. The loess is an accumulation of wind deposited silt sized particles. Near surface sediments at NRF consist of alluvial deposits of the Big Lost River and are composed of unconsolidated fluvial deposits of silt, sand, and pebble-sized gravel.

A complex sequence of basalt flows and sedimentary interbeds underlie NRF. The sedimentary interbeds vary in thickness arid lateral extent and separate the basalt flows that underlie the surficial alluvium. Samples from basalt flows have been correlated into 23 flow groups that erupted from related source areas. Known source vents occur to the southwest, along what is referred to as the Arco volcanic rift zone, to the southeast along the axial volcanic zone, and to the north at Atomic Energy Commission Butte. The uneven alluvial thickness and undulating basalt surface at NRF are common of basalt flow morphology.

The SRPA occurs approximately 375 feet below NRF, and consists of a series of saturated basalt flows and interlayered pyroclastic and sedimentary material. Drinking water for employees at NRF comes from several production wells located in the central portion of the facility. Perched water, which sets above the regional water table, occurs in several locations beneath NRF. All perched water at NRF is associated with past or current large volume surface sources of water. The most significant perched water at NRF is located beneath the outfall of the NRF industhal waste ditch.

1.4 Ecological Characteristics

Fifteen distinctive vegetative cover types have been identified at the INEEL. The vegetation cover class at NRF is primarily shrub-steppe flats with sagebrush being the dominant species and providing the majority of habitat. No threatened, endangered, or otherwise regulated flora is known to be present in the NRF area.

The variety of habitats on the INEEL supports numerous species of reptiles, birds, and mammals. Several bird species warrant special concern because of their threatened status or sensitivity to disturbance, These species include the ferruginous hawk, bald eagle, prairie falcon, merlin, long-billed curlew, and burrowing owl. NRF is not known to be within a

critical
habitat for endangered or threatened species. The bald eagle, golden eagle, and American peregrine falcon have been observed, but are not know to frequent the area around NRF.

The Threatened Fish and Wildlife Act does not identify any fish or wildlife species of concern at
NRF. Migratory waterfowl frequent areas of NRF, but the areas with potential remedial actions

do not provide critical habitat. The Idaho Department of Fish and Game lists the ringneck snake, whose occurrence is considered to be INEEL-wide, as a Category C sensitive species.
NRF is a disturbed industrial area with continuous human activity that contains little suitable
habitat for most endangered, threatened or sensitive species. Potential remedial actions at NRF are not expected to affect these species, including adverse impacts to migratory waterfowl,
because of the limited area of concern, the previously disturbed nature of the area, and the expected limited duration of any potential remedial actions.

1.5 Archeological and Historical Characteristics

The area around NRF has been surveyed for archeological or historical value. Although some archeological remnants have been found around NRF, areas with potential remedial actions do not contain any known archeological or historical items of value. These areas have been previously disturbed and archeological or historical remnants would not be expected. Therefore, the regulatory requirements associated with the preservation of antiquities and archeological materials and sites are not a concern.

The Idaho State Historical Society has identified the INEEL as containing properties potentially
eligible for the National Register of Historic Places (NRHP). Several structures at NRF may be
eligible for the NRHP and, therefore, would be accorded the same protection under the National
Historic Preservation Act (NHPA) as if they were listed under the act. If potential remedial actions may adversely impact these structures, all applicable requirements established under the NHPA will be followed for the remedial actions.

2.0 Summary of CERCLA Activities at NRF

2.1 CERCLA Background at NRF

In 1987, a Consent Order and Compliance agreement (COCA) was established between DOE and the U.S. Environmental Protection Agency (EPA) pursuant to the Resource Conservation and Recovery Act (RCRA) Section 3008(h). The COCA required an initial assessment and screening of all solid and/or hazardous waste disposal areas at the INEEL and set up a

process for conducting any necessary corrective actions. In 1989, the INEEL was placed on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In 1991, the EPA, Idaho Department of Health and Welfare (IDHW) and DOE signed the Federal Facility Agreement and Consent Order (FFA/CO), which superceded the COCA. The FFA/CO established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This agreement and the associated Action Plan defined the decision process for conducting assessments and investigations of potential contaminant release areas.

To better manage the environmental investigations under CERCLA, the INEEL was divided into ten Waste Area Groups (WAGs), of which NRF was designated as WAG 8. Within each WAG, all areas with a potential for past contaminant releases were identified as sites. Those sites with similar releases and migration pathways were grouped into operable units (OUs). A total of 87 known or suspected contaminant release sites, of which 71 were classified in nine OUs, were identified at NRF as requiring further study under the CERCLA process. Table 1 lists the OUs and sites associated with NRF. Four sites, NRF-12, NRF-18, NRF-21, and NRF-52, were each divided into two separate sites for evaluation purposes (included in the 87 total sites). Figure 2 shows the status and decisions made for each identified OU at NRF. Figure 3 shows the location of each site with respect to NRF. The site numbers shown on Figure 3 correspond to the site numbers given on Table 1. The remainder of this section summarizes the CERCLA process used to determine the decisions made for each site.

2.2 CERCLA Investigations

Each of the 87 sites required an investigation to determine potential risks to human health and the environment. Thirteen of the 87 sites were evaluated prior to the FFA/CO under the COCA and were not part of an OU. The remaining 74 sites were assessed as CERCLA-type investigations. The CERCLA investigations included Track 1, Track 2, and Remedial Investigation/Feasibility Study (RI/FS) type investigations. A Track 1 investigation involved sites that were believed to have a low probability of risk and sufficient information available to evaluate the sites and recommend a course of action. A Track 2 investigation involved sites that did not have sufficient data available to make a decision concerning a level of risk; for these sites, collection of additional data was necessary. An RI/FS is the most extensive investigation and attempts to characterize the nature and extent of contamination, to assess risks to human health and the environment from potential exposure to contaminants, and to evaluate cleanup actions. In addition to the investigations performed for each site through a Track 1, Track 2, or RI/FS process, a comprehensive RI/FS was performed to assess the potential cumulative, or additive, effects to human health and the environment from all sites at NRF.

Table 1. List of WAG 8 Sites

Operable Unit	Site Number (1)	Site Name
None		
	NRF-04	Top Soil Pit Area
	NRF-05	West Landfill
	NRF-07	East Landfill
	NRF-24	Demineralizer and Neutralization Facility
	NRF-25	Chemical Waste Storage Pad
	NRF-27	Main Transformer Yard
	NRF-30	Gatehouse Transformer
	NRF-34	Old Parking Lot Landfill
	NRF-39	Old Radiography Area
	NRF-46	Kerosene Spill
	NRF-57	S1W Gravel Pit
	NRF-60	Old Incinerator
	NRF-67	Old Transformer Yard
8-01		
	NRF-03	ECF Gravel Pit
	NRF-06	Southeast Landfill
	NRF-08	North Landfill
	NRF-33	South Landfill
	NRF-40	Lagoon Construction Rubble
	NRF-41	East Rubble Area
	NRF-63	A1W Construction Debris Area
8-02		
	NRF-09	Parking Lot Runoff Leaching Trenches
	NRF-37	Old Painting Booth
	NRF-38	ECF French Drain
	NRF-42	Old Sewage Effluent Ponds
	NRF-47	Site Lead Shack (Building #614)
	NRF-52A	Old Lead Shack (Location #1)
	NRF-52B	Old Lead Shack (Location #2)
	NRF-54	Old Boilerhouse Blowdown Pit
	NRF-55	Miscellaneous NRF Sumps and French Drains
	NRF-61	Old Radioactive Materials Storage and Laydown Area
	NRF-64	South Gravel Pit
	NRF-68	Corrosion Area Behind BB11
8-03		
	NRF-10	Sand Blasting Slag Trench
	NRF-15	S1W Acid Spill Area
	NRF-18A	S1W Spray Pond #1
	NRF-18B	S1W Spray Pond #2 and A1W Cooling Tower
	NRF-20	A1W Acid Spill Area
	NRF-22	A1W Painting Locker French Drain
	NRF-23	Sewage Lagoons
	NRF-45	Site Incinerator
	NRF-56	Degreasing Facility
8-04		
	NRF-28	AlW Transformer Yard
	NRF-29	S5G Oily Waste Spill
	NRF-31	A1W Oily Waste Spill

Operable Unit	Site Number"'	Site Name
8-04 (con't)		
	NRF-44	S1W Industrial Wastewater Spill Area
	NRF-58	SIW Old Fuel Oil Tank Spill
	NRF-62	ECF Acid Spill Area
	NRF-65	Southeast Corner Oil Spill
	NRF-69	Plant Service Underground Storage Tank (UST) Diesel Spill
	NRF-70	Boiler House Fuel Oil Release
	NRF-71	Plant Service UST Gasoline Spill
	NRF-72	NRF Waste Oil Tank
	NRF-73	NRF Plant Services Varnish Tank
	NRF-74	Abandoned UST's Between the NRF Security Fences
	NRF-75	Fuel Oil Revetment Oil Releases
	NRF-76	Vehicle Barrier Removal
	NRF-77	A1W Fuel Oil Revetment Oil Releases
8-05		
	NRF-01	Field Area North of S1W
	NRF-51	West Refuge Pit #4
	NRF-59	Original S1W Refuse Pit
8-06		
	NRF-35	Lagoon Landfill #1
	NRF-36	Lagoon Landfill #2
	NRF-48	West Refuse Pit #1
	NRF-49	West Refuse Pit #2
	NRF-50	West Refuse Pit #3
	NRF-53	East Refuse Pits and Trenching Area
8-07	NRF-26	Industrial Waste Ditch
8-08		
	NRF-02	Old Ditch Surge Pond
	NRF-11	S1W Tile Drain Field and L-shaped Sump
	NRF-12A	Underground Piping to Leaching Pit
	NRF-12B	S1W Leaching Pit
	NRF-13	S1W Temporary Leaching Pit
	NRF-14	S1W Leaching Beds
	NRF-16	Radiography Building Collection Tanks
	NRF-17	S1W Retention Basins
	NRF-19	A1W Leaching Bed
	NRF-21A	Old Sewage Basin
	NRF-21B	Sludge Drying Bed
	NRF-32	S5G Basin Sludge Disposal Bed
	NRF-43	Seepage Basin Pumpout Area
	NRF-66	Hot Storage Pit
	NRF-79	ECF Water Pit Release
	NRF-80	A1W/S1W Radioactive Line Near BB19
	NRF-81	A1W Processing Building Area Soil
8-09		
	None	Interior Industrial Waste Ditch

New Sites

NRF-82	Evaporator Bottoms Tank Release
NRF-83	ECF Hot Cells Release Area

(1) NRF-78 was not assigned

The nine OUs at NRF were identified such that each OU contains one or more sites that have similar releases and involve the same type of CERCLA investigation. OUs 8-01, 02, 03, and 04 were Track 1 investigation sites. OUs 8-05, 8-06, and 8-09 were Track 2 investigation sites. OUs 8-07 and 8-08 were RI/FS units. Each site was investigated prior to the NRF Comprehensive RI/FS with the exception of the OU 8-08 sites and two newly identified sites. The OU 8-08 sites were investigated as part of the NRF Comprehensive RI/FS. The two new sites were investigated after the Comprehensive RI/FS using Track 1 investigations.

2.3 Summary of Past CERCLA Decisions

Thirteen of the 87 sites at NRF were evaluated prior to the FFA/CO under the COCA and were not part of an OU. These 13 sites were identified as no action sites in the FFA/CO.

In September 1994, a Record of Decision (ROD) was issued for ten sites in OUs 8-05 and 8-06, Landfill Areas, and OU 8-07, Exterior Industrial Waste Ditch. OUs 8-05 and 8-06 consist of nine sites and OU 8-07 is a single site. The decision for six sites in OUs 8-05 and 8-06 (NRF-35, 36, 48, 49, 50, and 59) and OU 8-07 was no action. The selected remedy for NRF-01, 51, and 53 within OUs 8-05 and 8-06 was the presumptive remedy for CERCLA municipal landfill sites, which consisted of containment of landfill contents with an engineered cover and monitoring of soil gas and groundwater.

2.4 Summary of Past CERCLA Response Actions

The construction of landfill covers for NRF-01, 51, and 53, as discussed above, were completed in September 1996. Seven rounds of soil gas and groundwater samples have been collected, The soil gas and groundwater samples are collected quarterly.

Two small removal actions were performed at sites NRF-20, AlW Acid Spill Area, and NRF-22, A1W Painting Locker French Drain. Soil contaminated with lead was removed from NRF-20 in August 1994 and sediment contaminated with various heavy metals was removed from NRF-22 in September 1994. NRF-22 was filled in with concrete eliminating any potential exposure pathway. NRF-20 and NRF-22 are part of OU 8-03.

2.5 Scope and Role of the NRF Comprehensive RI/FS

Eight of the nine operable units had been investigated prior to the NRF Comprehensive RI/FS. OU 8-08 represented the last OU to be investigated. The FFA/CO Action Plan describes OU 8-08 as the WAG 8 (NRF) Comprehensive RI/FS. OU 8-08 also included 18 potential radiological sites that were not assessed in any previous OU. The primary purposes of the NRF Comprehensive RI/FS were as follows: (1) investigate the 18 radiological OU 8-08 sites,

which were not previously assessed; (2) evaluate the cumulative, or additive, effects of all sites at NRF on human health and the environment; and (3) address the contamination associated with those sites that had unacceptable, or potentially unacceptable, risks, which were identified as sites of concern.

OU 8-08 includes 18 sites that were not previously investigated under other OUs. These sites were grouped under OU 8-08 because of similar constituents, release mechanisms, and migration paths. The OU 8-08 sites represent areas where past controlled releases of low-level radioactive water were discharged and areas where inadvertent releases to the environment occurred because of leaks from corroded piping, leaks in underground concrete basins, surface releases, and cross-contamination of non-radiological systems with radiological systems.

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The primary purpose of the radiological site assessments in OU 8-08 was to evaluate potential human health risks present at each site through various exposure pathways. Media which could create potential exposure pathways included soil, air, and groundwater. Contaminants of potential concern were determined based on risks from exposure pathways such as ingestion of soil or groundwater and direct exposure to radionuclides. Scenarios for current and future workers and future residents were considered.

The cumulative, or additive, assessment associated with the NRF Comprehensive RI/FS addressed the risks posed to human health and the environment from all identified NRF sites including the radiological areas in OU 8-08. The comprehensive assessment ineluded reviewing all past site investigations. Sites were screened based on the presence of a contaminant source at the site. Contaminants of potential concern (COPCs) were identified and exposure pathways that could result in a cumulative risk were determined. Exposure pathways were limited to air and groundwater exposure routes, since soil exposure routes were generally site specific and not cumulative. The comprehensive assessment also included an ecological assessment to evaluate potential impacts to ecological receptors.

2.6 Purpose of this Record of Decision

This ROD addresses 64 of the 87 sites identified at NRF. (No action determinations were made for 13 sites identified in the FFA/CO. A previous ROD addressed ten sites in OUs 8-05, 8-06, and 8-07.) The Comprehensive RI/FS included 85 sites in the comprehensive cumulative risk assessment; two new sites (NRF-82 and -83) were identified after the RI/FS, and were determined to have no effect on the cumulative risk. The NRF Comprehensive RI/FS also concluded that the remedies selected for the prior 13 No Action sites, and for the ten sites addressed by a previous ROD, are protective of human health and the environment from a cumulative evaluation.

Based on evidence compiled in the NRF Comprehensive RI/FS, 55 of the 64 sites included in this ROD do not have risks or have acceptable risks to human health and the environment and require no remedial action. This includes the two new sites identified after the Comprehensive RI/FS. These 55 sites have been defined as No Action or No Further Action sites (these designations are discussed in detail in Section 8.0). Nine of the 64 sites were determined in the NRF Comprehensive RI/FS to have unacceptable or potentially unacceptable risks that must be addressed. The nine sites were all radiological areas associated with OU 8-08. These nine sites of concern were included in a screening, development, and detailed analysis of remedial action alternatives and resulted in the selection of a preferred alternative.

The remainder of this ROD summarizes the NRF Comprehensive RI/FS, the public's role in the ROD decisions, and the conclusions and decisions made to remediate the NRF site.

3.0 Summary of Site Characteristics

This section provides an overview of the site characteristics for the 64 sites being addressed by this ROD. The first part of this section discusses the characteristics of sites in OUs 8-01, 02, 03, 04, and 09. These OUs were investigated through either Track 1 or Track 2 processes prior to the NRF Comprehensive RI/FS. The second part of this section discusses OU 8-08 sites and the two new sites identified after the NRF Comprehensive RI/FS. These sites are discussed in more detail because the OU 8-08 sites were investigated as part of the NRF Comprehensive

RI/FS and the new sites were not part of any other OU (OUs 8-05, 06, and 07 are not discussed because previous decision documents have been issued for these OUs.)

A total of 44 sites are associated with OUs 8-01, 02, 03, 04, and 09. Eighteen sites are associated with OU 8-08. NRF-23, Sewage Lagoons, was originally part of OU 8-03 but was included with the OU 8-08 sites as a recommended conclusion of the site's Track 1 investigation. The two new sites were not associated with any OU.

3.1 Site Characteristics (Previous Investigations)

As stated, OUs 8-01, 02, 03, 04, and 09 were investigated prior to the NRF Comprehensive RI/FS. Each OU represents a site or group of sites with similar releases and migration pathways. The Track 1 or Track 2 investigation for each of these 44 sites resulted in a determination that enough information was available to allow a recommended decision without collecting additional data. These OUs and associated sites are briefly explained below.

3.1.1 Operable Unit 8-01

OU 8-01 consists of seven construction rubble sites. These sites contain rubble from past construction projects at NRF. Each site was evaluated in a Track 1 investigation.

NRF-03 is an excavated pit that provided clean fill for construction projects. The east end of the pit has been used for disposal of construction debris such as gravel, concrete, metal, and wood. The southeast portion of the pit was used for 3 months in 1985 for routine nonhazardous discharge water. The pit has also been used as a gunnery range for security personnel. Soil sampling showed only slightly elevated amounts of metals. The risk was estimated to be low based on the Track 1 evaluation.

NRF-06, 08, 33, 41, and 63 are rubble piles from past construction projects. The rubble piles consist primarily of soil, concrete, metal, and wood. No hazardous source is present.

NRF-40 is a soil pile from an expansion project to enlarge the current sewage lagoons. No hazardous source is present.

3.1.2 Operable Unit 8-02

OU 8-02 consists of 12 miscellaneous sites that were initially designated as Track 1 low priority sites. Each site was evaluated in a Track 1 investigation.

NRF-09 is comprised of three parking lot runoff trenches that allow water from spring thaws and heavy rainfall to drain from the parking lot. Soil sampling showed elevated amounts of lead and silver; however, the risk was estimated to be low based on the Track 1 evaluation.

NRF-37 is the former location of a temporary painting booth and storage area. The area was used from approximately 1963 to 1970. Soil sampling showed no detectable solvents or elevated amounts of metals, therefore, it was determined that no hazardous source is present.

NRF-38 is a precast manhole that received steam condensate from the site steam system. The condensate would evaporate or infiltrate into the soil. The manhole was likely used from 1958 to the 1980s. No hazardous source is present.

NRF-42 is the location of a former temporary sewage pond used in the 1950s. There is no evidence that a hazardous source exists at the site, but elevated amounts of metal, semi-volatile organic, and low-level radionuclide contaminants may be present based on sampling performed in the current sewage lagoons. Based on groundwater sample results and using average concentration data from the current sewage lagoons, this site does not represent a significant groundwater threat. The site is currently covered with a 10 foot layer of soil, thus limiting ingestion or direct contact with any contaminants, if present. Based on current conditions (i.e., 10 foot soil cover), the risk was estimated to be low based on the Track 1 evaluation.

NRF-52A, 52B, and 47 represent three locations of a lead casting and storage building. NRF-52A and 52B consist of two former locations where the soil was disturbed during past construction activities after the building was relocated. Soil samples collected near the original building location (NRF-52A) showed elevated levels of lead; however, the levels were still below the EPA recommended screening level for lead cleanup of 400 ppm. The risk for the original building location was estimated to be low based on the Track 1 evaluation. The building was moved in 1956. There was no evidence of elevated lead levels at this second location (NRF-52B). No hazardous source is present at this second building location. The building was again moved in 1982 to its current location (NRF-47). Although the building is no longer used for lead casting, samples collected from the current building location showed the building siding and drainage system did not have elevated lead levels; thus, no hazardous source was determined to be present.

NRF-54 is a steam boiler blowdown pit that was used for several years in the 1950s. The pit has reinforced concrete walls and a dirt floor. The condition of the pit is not known since the pit and access to the pit are presently covered by grass. The pit received water from blowdown of the boilers to prevent scale buildup in the system. No hazardous source is present.

NRF-55 consists of 17 french drains located around NRF. Eleven of the drains are used for steam condensate, five for storm water, and one receives water from occasional washing of vehicles. The french drains are gravel filled excavations to promote infiltration. These drains

would not have received hazardous constituents, and therefore were determined to not contain a hazardous source.

NRF-61 is a former location of a radioactive material storage and laydown area that was used from 1954 to 1960. Soil sampling showed detectable amounts of cesium-137. The risk assessment assumed an institutional control period for the future residential scenario. The risk was estimated to be low based on the Track 1 evaluation.

NRF-64 is a gravel pit that has been used as a construction rubble pile. The rubble pile consists of concrete, metal, wood, and asphalt. A piece of asbestos was found at the site in 1989. A burn pile exists near the gravel pit and the ground appears stained with petroleum hydrocarbons. It is hypothesized that petroleum products were used to facilitate burning combustible waste. Soil sampling showed elevated total petroleum hydrocarbons. The risk was estimated to be low based on the Track 1 evaluation.

NRF-68 is an area that has been used for vehicle parking and construction pipe staging and cutting operations. This site was erroneously titled a "corrosion" area. Soil sampling showed detectable total petroleum hydrocarbons in the area. Small amounts of chlorobenzene were also detected in the soil. The risk was estimated to be low based on the Track 1 evaluation.

3.1.3 Operable Unit 8-03

OU 8-03 consists of eight miscellaneous sites that were initially designated as Track 1 high priority sites. Each site was evaluated in a Track 1 investigation.

NRF-10 is an area where sandblast grit from paint removal operations in the 1950s was deposited. The sandblast grit was removed in 1990. Verification sampling performed in 1991 showed elevated levels of several metals in the soil. Arsenic, chromium, and lead were detected at concentrations above background levels. A Track 1 risk assessment was performed that calculated risk-based soil concentrations for the residential and occupational scenarios . Although chromium and arsenic were detected in individual samples above risk-based soil concentrations, the risk assessment used very conservative estimates and a risk management decision was made that actual risks are acceptable.

NRF-15 and 20 are acid spill areas. Elevated levels of metals are present at each site. NRF-20 included lead contaminated soil above the EPA recommended screening level for lead cleanup. A soil removal action was performed at NRF-20 after receiving public comment on the proposed action. The only contaminants remaining at elevated levels after the removal action are mercury and lead (which is now below the screening level goal of 400 ppm). Sampling at NRF-15 showed elevated levels of chromium, lead, mercury, and nickel. The concentrations of contaminants at both sites were determined to be below risk-based concentrations. A risk assessment for each site estimated risks to be low based on the Track 1 evaluations.

NRF-18A and NRF-18B are the S1W Spray Ponds, A1W Cooling Tower, and portions of the fire protection system, and were originally designated as one site, NRF-18. At one time, a chromium based corrosion inhibitor was used in the water. The spray ponds are large concrete

structures that contained cooling water for S1W plant operations. The A1W Cooling Tower served a similar function for the A1W prototype plant. Leakage and overspray from the ponds, tower, and fire protection system caused elevated chromium concentration in the surrounding soil. The Track 1 risk assessment assumed the spray ponds would remain in place, limiting exposure to the soil below the basins if any contamination was present. The resulting risk assessment estimated a low risk based on the Track 1 evaluation, but additional evaluation of NRF-18 in the NRF Comprehensive RI/FS concerning the groundwater pathway was considered appropriate.

The A1W Cooling Tower was demolished in 1995. In 1997, a decision was made to demolish the S1W Spray Pond #2. Subsequent to the Comprehensive RI/FS, NRF-18 was split into two sites: NRF-18A, S1W Spray Pond #1, and portions of the fire protection system; and NRF-18B, S1W Spray Pond #2 and A1W Cooling Tower. Additional data was collected at Spray Pond #2 after the NRF Comprehensive RI/FS in preparation of demolishing the spray pond. Twenty-four boreholes drilled through the bottom of the spray pond and twenty boreholes outside the perimeter of the spray pond were used to collect additional samples. Sample results showed slightly elevated amounts of chromium. The risk associated with Spray Pond #2 was determined to be low with much less uncertainty than the initial assessment because of the additional data. Spray Pond #1 was not included in this evaluation since no additional data were collected from Spray Pond #1 and, therefore, Spray Pond #1 was given a separate site designation (NRF-18A).

NRF-22 is the location of a former french drain that may have received paints, solvents, and possibly mercury. A removal action was performed after receiving public comment on the proposed action. Sampling performed after the removal action showed elevated levels of lead and mercury remained. The excavated hole was 12 feet deep and was grouted to the surface eliminating all exposure pathways. The risk assessment after the removal action estimated the risk to be low based on the Track 1 evaluation. Although no exposure route is present, a source remains at the site.

NRF-45 is the former location of an incinerator used to burn outdated documents. The incinerator was used at this location from 1985 to 1992. Barium, silver, and zinc were detected at elevated levels during sampling of the ash from the incinerator. The concentrations were determined to be below risk-based concentrations for the occupational and residential scenarios. The risk for the site was estimated to be low based on the Track 1 evaluation.

NRF-56 is a former location of a pipe degreasing and pickling facility used between 1957 and 1961. The facility was replaced with a railroad car shed which was used as a pipe fitter and welder training shop and is currently a records storage building. The original facility was likely completely removed when the railroad car shed was placed at this location. No hazardous source is present.

3.1.4 Operable Unit 8-04

OU 8-04 consists of sixteen sites where spills, primarily petroleum products, have occurred. Each site was evaluated in a Track 1 investigation.

NRF-28, 29, 31, 58, 65, 69, 70, 71, 72, 74, 75, 76, and 77 represent sites of past petroleum product releases. Most of the sites were oil release areas with the exception of NRF-69 (diesel) and NRF-71 (gasoline). These spill areas were generally cleaned up, but some residual contamination exists. The contaminants of concern include polychlorinated biphenyls (PCBs), total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene. Each contaminant was determined to be below risk-based concentrations. A risk assessment for each site estimated the risk to be low based on the Track 1 evaluations.

NRF-44 is an area where wastewater was discharged between 1954 and 1959. The discharges included surface water runoff, steam condensate, cooling water, and water from an oil-water separator. No hazardous source is present.

NRF-62 is the location of a past nitric acid spill. Around 1960, 2,460 gallons of acid was spilled. The area has since been disturbed and covered by ECF expansion construction activity. No remaining hazardous source is present.

NRF-73 is a former varnish tank. The varnish tank was used from 1970 to 1980 and was removed in 1991. Xylene was the primary component of the varnish. There was no evidence of tank leakage when the tank was removed in 1991. No hazardous source is present.

3.1.5 Operable Unit 8-09

OU 8-09 consists of the interior industrial waste ditch system. The interior waste ditch system is comprised of a network of culverts, pipes, and uncovered drainage ditches with a combined length of 23,000 feet. The system collected discharges from prototype operations, support operational activities, and storm water. Various modifications to the ditch system have been made throughout the years. The ditch may have received small amounts of hazardous constituents from cooling systems, photographic operations, and laboratory operations between 1953 and 1985. No hazardous constituents have been discharged since 1985. Contaminants of concern included various metals, organics, and radionuclides (cesium-137 and cobalt-60). A Track 2 assessment was performed on this unit. The calculated risks were within the target risk range and are considered by the agencies to be acceptable.

3.2 Site Characteristics (Operable Unit 8-08 Sites)

OU 8-08 sites were investigated as part of the NRF Comprehensive RI/FS. OU 8-08 included several radiological areas and was the last OU investigated. The 18 sites associated with OU 8-08 are discussed in more detail below. The investigation of the radiological sites in OU 8-08 was one of the primary purposes of the NRF Comprehensive RI/FS.

3.2.1 Background

Low-level radioactive effluent, primarily water with small amounts of radioactivity, was generated

by each prototype facility as a result of past operations. Between June 1953 and April 1979, this low-level radioactive effluent was discharged to several leaching beds in accordance with established regulations at the time. These leaching beds are also referred to as leaching pits, ponds, lagoons, basins, or drainfields. These discharges were discontinued in 1979 when a water reuse system was established.

Beginning in 1953, low-level radioactive effluent from the S1W prototype was sent to a drainfield known as the S1W Tile Drainfield (NRF-11). This drainfield was also likely used for sewage discharges. In 1955, the sewage system and radioactive system were separated. NRF-11 was no longer used and radioactive effluent went to an underground perforated pipe drainfield (NRF-12A). Around 1957, a pit was dug at the end of the drainfield to allow the water to pond. The pit is known as the S1W Leaching Pit (NRF-12B).

A special basin or pit was constructed in 1956 for a one-time discharge of radioactive effluent that contained some oil. This basin was referred to as the S1W Temporary Leaching Pit (NRF-13). The pit was used to prevent the drainfields from receiving oily effluent thereby reducing their efficiency. The temporary pit was filled in with the soil immediately after the one-time discharge.

A1W began operation in 1958, with ECF beginning shortly thereafter. The A1W Leaching Bed (NRF-19) was constructed on the west side of NRF The bed received effluent from A1W and ECF. The leaching bed was used sporadically through 1972.

In 1960, a new leaching bed known as the S1W Leaching Bed (NRF-14) was constructed south of the S1W prototype to receive S1W prototype effluents. This bed was a ponding area to allow infiltration of liquid into the soil. A second pond was constructed adjacent to the first in 1963. These ponds primarily received effluent from S1W, but also received effluent from the other facilities (S5G,A1W, and ECF). The last discharge to the leaching beds was in 1979.

Most of the effluent associated with the S1W discharge areas (NRF-11, NRF-12B, and NRF-14) was stored in the S1W Retention Basins (NRF-17) prior to final discharge to the areas. The basins were constructed of concrete and were used from 1953 to 1972.

Approximately 417,000,000 gallons, containing 345.41 curies, were discharged to the various drainfields, pits, and beds at NRF between 1953 and 1979. Table 2 summarizes the curies and gallons released to each site. Table 3 gives a summary by year of the curies and gallons released to all the sites.

In addition to the controlled releases of low-level radioactive liquid, there have been occurrences of inadvertent releases to the environment because of leaks from underground piping (NRF-80) and concrete basins (NRF-17 and 79), surface releases (NRF-16, 66, and 81), and cross-contamination of non-radiological systems with radiological systems (NRF-02, 21A, 21B, 23, and 43). In most cases, these releases are small compared to the controlled discharges.

One site was used for a one-time sludge disposal area (NRF-32). This site represents the only site where potentially radioactive material (sludge) other than water may have been deposited.

Table 2. Total Controlled Discharges (gallons and curies) to Radiological Areas (1953-1979)

Unit	Volume (gallons)	Quantity (curies) (a)
NRF-11	17,500,000	5.33
NRF-12	64,102,650	67.861
NRF-13	28,000	0.003
NRF-14	249,809,113	131.35
NRF-19	85,500,310	140.866
Totals	416,940,073	345.41

(a) Based on discharge records from 1960 to 1979 to the S1W Leaching Beds (NRF-14), those radionuclides individually representing greater than 5% of the curie content include cobalt-60 (33%), tritium (28%), and cesium-137 (7.6%).
Discharges to NRF-11 and NRF-12 would be similar to NRF-14. The discharge to NRF-13 was primarily strontium-90.
Based on discharge reocrds to the A1W Leaching Bed (NRF-19), those radionuclides individually representing greater than 5% of the curie content include tritium (54%), cobalt-60 (15%), and cesium-137 (5.8%).

The vast majority of the discharges to the radiological areas were water with small amounts of radioactivity. Metal and organic constituents were likely present in very small quantities. The metal and organic constituents would have been from processes associated with the prototype plants and ECF. These processes included radiochemical laboratory operations, component decontamination procedures, bilge drainage, oil-water separation, and decontamination showers and sinks.

Radionuclides of concern are primarily the longer-lived radionuclides from testing and operation of prototype nuclear reactors or from spent fuel examinations. Most of the radionuclides with a radioactive half-life less than five years would have naturally decayed to almost undetectable levels by today for any releases between 1953 and 1979. The primary radionuclides with half-lives greater than five years released at NRF are cesium-137, cobalt-60, strontium-90, and tritium. Tritium, which was part of the water molecules in the effluent, would have migrated or evaporated with the water. Tritium would not be expected in the soil near the discharge areas

today, since water associated with the effluent is no longer present. Cesium-137 and strontium-90, with half-lives near 30 years, and cobalt-60, with a half-life slightly greater than 5 years, would be the primary radionuclides of concern present in the soil today.

3.2.2 OU 8-08 Site Assessments

Eighteen sites were identified as radiological areas requiring an individual assessment in the NRF Comprehensive RI/FS. The assessment included reviewing past historical information and past sample results. An initial list of contaminants of potential concern (COPCs) was established based on the discharges to the site and past sample data. This data included early monitoring data and characterization sample data collected between 1990 and 1992. The preliminary list of COPCs was compared to risk-based screening levels. These screening levels are concentrations resulting in an estimated increased cancer risk of 1 in 10,000,000 (1E-07) or a hazard quotient of 0.1. The development of risk-based screening levels is discussed in Section 4.1.2.1. Cancer risks and hazard quotients are discussed in more detail in Section 4.0. A conservative approach was used to establish the initial list of COPCs. Maximum contaminant levels from each site were used for screening purposes. Early monitoring data helped identify COPCs and the potential extent of contamination at some locations. The characterization data

Table 3. Yearly Controlled Radiological Discharges to Radiological Areas (NRF-11, 12, 13, 14, 19)

Year	Volume (gallons)	Quantity (curies)
1953	2,500,000	0.08
1954	10,000,000	2.25
1955	10,000,000	6.0
1956	10,928,000	3.467
1957	11,970,000	5.482
1958	15,260,000	31.29
1959	18,745,000	8.68
1960	24,373,000	31.104
1961	24,552,650	23.729
1962	28,118,770	40.893
1963	27,291,200	58.911
1964	27,328,598	32.4
1965	33,115,417	23.65
1966	36,904,836	18.49
1967	35,372,638	8.854
1968	37,987,954	13.453
1969	28,529,781	15.875
1970	20,399,951	12.263
1971	10,680,479	3.720
1972	1,232,098	0.696
1973	525,174	0.5165

1974	440,111	1.588
1975	276,852	1.002
1976	162,571	0.423
1977	194,298	0.303
1978	44,830	0.260
1979	5,865	0.028
Totals	416,940,073	345.408

from 1990-92 typically had the data quality currently required by the EPA for use in risk assessments.

The historical evaluation of the sites provided the basis for the remedial investigation sampling plans. The sampling served several different purposes depending on the area in which the sampling was being performed. In some cases, the determination of a contaminant source and the extent of contamination were the goals of the sampling. This allowed a risk assessment evaluation to be performed with a higher degree of certainty. For other areas, it was important to determine the potential volume of soil that may require a remedial action. In these areas, the nature of the contaminants was known from previous sampling, but a more definitive boundary was needed to provide accurate estimates of potential soil volumes requiring remedial actions. Enough past information was available for some areas that additional sampling during the remedial investigation was not required. After evaluating the historical and remedial investigation sample results, a final list of COPCs was established. These COPCs were used for risk assessments performed as part of the NRF Comprehensive RI/FS and are discussed in Section 4.0.

The following sections describe the characteristics associated with each of the OU 8-08 sites.

3.2.2.1 Old Ditch Surge Pond (NRF-02)

The surge pond area (NRF-02) was excavated in late 1958 or early 1959 as a gravel or soil pit for construction projects at NRF. The pit was approximately 110 feet in diameter and 12 feet deep. The pit was later connected to a drainage ditch and was likely used as a storm water drainage area for heavy precipitation events. Around 1963, the pit and drainage ditch were connected to the NRF interior waste ditch system. The pit, which then acted as a pooling place for water, was used as either an overflow or settling area. The pond area and a portion of the ditch were isolated from the waste ditch system in 1985 when portions of the ditch system were replaced with underground, corrugated piping.

This area was not included in the remedial investigation sampling. Surface soil samples have been collected in the area from 1986 to 1993. The samples were analyzed for cobalt-60 and cesium-137. Cobalt-60 was detected at a maximum activity of 11.28 picocuries per gram

(pCi/g) in 1991 and cesium-137 was detected at a maximum activity of 4.7 pCi/g in 1992. Characterization sampling was performed at the pond in 1991. Samples were collected from a borehole in the middle of the ditch to a depth of three feet where the basalt was encountered.

Samples were analyzed for pesticides, PCBs, organics and metals. The only COPCs detected were arsenic at 8.5 parts per million (ppm) and chromium at 90.2 ppm, which were both above background levels.

The extent of the contamination is limited to the pond area and attached ditch. The contamination is limited to, the upper two feet of soil.

3.2.2.2 S1W Tile Drainfield and L-shaped Sump (NRF-11)

NRF-11 consists of a below-surface sump and various underground, perforated drainfield pipes downstream of the sump. The drainfield was likely used between 1953 and 1955 for sewage and radioactive liquid discharges. The drainfield is approximately 36 feet wide by 200 feet long and consists of four lateral perforated pipes buried six to ten feet deep. The drainfield was connected to the sump, which is a L-shaped concrete structure. Each leg of the sump is 11 feet long and three feet wide with a depth of 12-1/2 feet. The sump was isolated from the drainfield in 1955 and was used until 1960 as part of the sewage system.

An estimated 17,500,000 gallons of radioactive effluent containing 5.33 curies of radioactivity were discharged to the drainfield via the sump. Although discharge records during the timeframe NRF-11 was used did not specify radionuclides, discharges to the drainfield would be similar to later discharges to other facilities. Discharge records from 1960 to 1979 show cobalt-60 (33%), tritium (28%), and cesium-137 (7.6%) were the primary radionuclides released.

By 1996, the radioactivity would have decayed to an estimated 0.33 curies. Cobalt-60, with a half-life of only five years, would have decayed to very small levels after 40 years. Tritium would have leached or evaporated with the water. Small amounts of chemicals and oil in the effluent may have been released to the drainfield.

The source of contamination around the L-shaped sump was the same as the drainfield. The sump may have leaked to surrounding soils. In addition, the sump was used until 1960 as part of the sewage system.

Characterization sampling efforts in 1991 collected samples to a depth of 22 feet from a borehole in the drainfield area. The samples were analyzed for pesticides, PCBs, organics, and metals. The only COPCs detected were arsenic (maximum of 7.6 ppm, which is slightly above background), dieldrin (a pesticide at 0.008 ppm in a single sample), cobalt-60 (maximum of 0.07 pCi/g), and cesium-137 (maximum of 0.3 pCi/g, which is actually below surficial soil background levels).

During the remedial investigation, attempts were made to locate the drainfield piping using

geophysical methods, but these attempts were inconclusive. Samples were collected from 11 boreholes at the drainfield and around the sump. Due to uncertainties in the location of the drainfield piping, the samples may not have been located adjacent to the piping where contamination is suspected. Samples were collected to a depth of 12 feet and analyzed for radionuclides, organics, PCBs, pesticides, and metals. The only COPC detected in the drainfield area was cobalt-60 at 2.7 pCi/g in one borehole from an eight foot depth. Several COPCs were detected around the sump. Arsenic (maximum of 8.92 ppm at an eight foot depth) was the only non-radiological COPC detected. Americium-241 (0.42 pCi/g in a single sample at a 12 foot depth), americium-243 (0.5 pCi/g in a single sample at a 12 foot depth), cesium-137 (maximum of 45.98 pCi/g at an eight foot depth), cobalt-60 (maximum of 1.17 pCi/g at a 12 foot depth), manganese-54 (0.06 pCi/g in a single sample at a eight foot depth), and plutonium-244 (0.09 pCi/g in a single sample at a 12 foot depth) were the radiological COPCs detected.

The remedial investigation sampling indicates that any significant contamination at the drainfield is likely confined to a small volume of soil near the underground pipes. The extent of contamination is estimated to be an area one foot around the perimeter of the underground piping, which is six to ten feet deep. The contamination around the sump is expected to be within three feet of the sump walls. Past sampling from within the L-shaped sump confirm the presence of cesium-137 above risk-based levels at this site. Based on historical and process knowledge, uncertainty regarding the actual location of the drainfield piping, and sample results from the L-shaped sump located upstream of the drainfield, the agencies have made the presumption that soils at the drainfield are contaminated with cesium-137 above risk-based levels.

3.2.2.3 Underground Piping to Leaching Pit (NRF-12A)

In 1955, a drainfield was constructed south of S1W, adjacent to NRF-11 (S1W Tile Drainfield). The drainfield was an underground, perforated pipe that ran from a manhole to a location 400 feet south of the manhole. The pipe depth was eight feet. This drainfield was used for radiological discharges after NRF-11 was no longer used. In 1957, a pit was dug at the end of the underground pipe to allow pooling of the water. The pit is known as the S1W Leaching Pit (NRF-12B). The drainfield was used for discharges until 1960. NRF-12A includes the manhole and the underground piping from the S1W Retention Basins (NRF-17) to the manhole and from the manhole to the leaching pit.

An estimated 64,100,000 gallons of radioactive effluent containing 67.9 curies of radioactivity were discharged to the drainfield via the manhole. Cobalt-60 and cesium-137 were likely the primary radionuclides released. Most of the cobalt-60 will have decayed away leaving cesium-137 as the primary radionuclide of concern.

Samples were collected from 18 boreholes to a depth of 10 feet during pre-RI/FS sampling in October 1995 along the underground pipe from the retention basins to the manhole. Samples were analyzed for radionuclides and metals. The COPCs detected were chromium (maximum

of 110 ppm at an eight foot depth), cesium-137 (maximum of 7,204 pCi/g at an eight foot depth), cobalt-60 (maximum of 70.8 pCi/g at a six foot depth), nickel-63 (maximum of 75.15 pCi/g at an eight foot depth), strontium-90 (maximum of 28.28 pCi/g at an eight foot depth), and plutonium-239 (a single sample of 0.0728 pCi/g at an eight foot depth).

The remedial investigation sampling included five boreholes along the underground pipe from the retention basins to the manhole, three boreholes around the manhole, and five boreholes along the underground, perforated pipe leading from the manhole. Samples were analyzed for PCBs, metals, and radionuclides. The following COPCs were detected: chromium (maximum of 97 ppm at a ten foot depth), mercury (maximum of 6.5 ppm at an eight foot depth), americium-241 (maximum of 0.60 pCi/g at a six foot depth), carbon-14 (maximum of 8.7 pCi/g at an eight foot depth), cesium-137 (maximum of 7,323 pCi/g at an eight foot depth), cobalt-60 (maximum of 104.9 pCi/g at an eight foot depth), nickel-63 (maximum of 329.06 pCi/g at an eight foot depth), plutonium-238 (maximum of 0.60 pCi/g at an eight foot depth), plutonium-239 (maximum of 0.20 pCi/g at an eight foot depth), plutonium-244 (maximum of 0.24 pCi/g at an eight foot depth), and strontium-90 (maximum of 35.35 pCi/g at an eight foot depth).

Most of the contamination at NRF-12A is within three to five feet of the underground pipe. Contamination exists along the entire 400 foot length of underground, perforated pipe from the manhole to the leaching pit location. Contamination is also present along approximately one-half the 500 foot length of underground pipe from the retention basins to the manhole. The contaminants are primarily present between the six and ten foot depth.

3.2.2.4 S1W Leaching Pit (NRF-12B)

In 1957, a pit was dug at the end of the underground, perforated pipe drainfield (NRF-12A). This pit was known as the S1W Leaching Pit (NRF-12B). The pit was used from 1957 until 1961 when it was filled in with soil. The pit was approximately eight feet wide, eight to ten feet deep, and 50 feet long. The releases to the pit were discussed in the previous section. Cesium-137 and cobalt-60 were the primary contaminants released. An asphalt cover was placed over the leaching pit location in 1978 and is present at the site today.

Historical sampling has shown elevated levels of radionuclides in the area of the leaching pit. Although the historical sampling did not meet modern data quality requirements for use in risk assessments, it did provide valuable information on the location of the pit and types of contaminants present. Characterization samples were collected in 1991 from a borehole near the leaching pit. Samples were collected to a depth of 18 feet and were analyzed for metals, radionuclides, organics, pesticides and PCBs. The COPCs detected were arsenic (maximum of 100 ppm at a three foot depth), lead (maximum of 1,140 ppm at a three foot depth), cesium-137 (maximum of 1.09 pCi/g at a three foot depth) and cobalt-60 (maximum of 0. 11 pCi/g at a 15 foot depth). Because of the low level of radionuclides detected, the borehole was probably outside the boundary of the leaching pit.

The leaching pit was evaluated in the NRF Comprehensive RI/FS with the S1W Leaching Beds (NRF-14) because the pit is adjacent to NRF-14. The sampling plan identified the leaching beds and leaching pit as one sampling area, since they had similar discharges, were located next to each other, and had the same sampling goals. The purpose of the RI/FS sampling was to provide enough data to estimate the volume and level of contamination of the soil outside the known discharge areas.

Samples were collected from ten boreholes outside the leaching beds and leaching pit down to a depth of 20 feet. Samples were also collected from a borehole that was estimated to be over the leaching pit. From the boreholes at or near the leaching pit the following COPCs were detected: cesium-137 (maximum of 1,600 pCi/g at a 14 foot depth), cobalt-60 (maximum of 9.2 pCi/g at a 14 foot depth), plutonium-239 (maximum of 0.13 pCi/g at a 14 foot depth), and strontium-90 (maximum of 37.3 pCi/g at a 14 foot depth). Carbon-14 may also be present because it was detected in samples collected upstream of the leaching pit (NRF-12A).

The contamination at NRF-12B is primarily at the location of the former pit, which was estimated to be eight feet wide and 50 feet long. The radionuclide contamination was generally found at the 14 foot depth. Some metals were detected at a three foot depth during characterization sampling in 1991, but this is suspected to be from soil placed over the area after it was no longer used.

3.2.2.5 S1W Temporary Leaching Pit (NRF-13)

A temporary pit (NRF-13) was dug in 1956 for the one-time discharge of 28,000 gallons of oily contaminated radioactive liquid. The pit was used to prevent other radioactive discharge areas from receiving oily effluent and reducing their efficiency. The pit was 15 feet in diameter and 18 feet deep. The 28,000 gallons of effluent contained 0.003 curie of radioactivity. The only identified radionuclide was a maximum of 0.00024 curie of strontium-90. Other suspected radionuclides include cobalt-60 and cesium-137. The pit was used for the one-time discharge and then was filled in with the excavated soil.

Characterization sampling was performed in the area in 1991. Samples were collected from the suspected location of the pit to a depth of 25 feet. Samples were analyzed for radionuclides, metals, organics, pesticides, and PCBs. The only COPCs detected at the site were arsenic (maximum of 9.3 ppm at a 13 foot depth), cesium-137 (maximum of 0.15 pCi/g at a 20 foot depth) and cobalt-60 (maximum of 0.1 pCi/g at a 15 foot depth). The cesium-137 and cobalt-60 data were near minimum detectable levels. No additional sampling was performed in this area.

The extent of contamination at NRF-13 is the 15 foot diameter of the pit with a conservatively estimated depth starting at 13 feet and ending at 23 feet below the surface.

3.2.2.6 S1W Leaching Beds (NRF-14)

The first S1W Leaching Bed was constructed in 1960. The bed was an open pond that allowed the water to evaporate or infiltrate into the ground. A second bed was constructed in 1963 adjacent to the first bed. Each bed was about 75 feet by 125 feet at the water line and was 13 to 15 feet deep. The beds originally received radioactive effluent from the S1W prototype plant and later received effluent from the S5G and A1W prototypes and ECF. The beds were used from 1960 to 1979 and received approximately 250,000,000 gallons of water containing 131 curies of radioactivity. The primary radionuclides released were cesium-137, cobalt-60, and tritium. Tritium, which exhibits similar properties as water, would not be expected in the soil today. The cobalt-60 would have decayed to much smaller levels. Small amounts of chemicals and oil may have been released to the leaching beds.

This site includes the underground pipe leading to the leaching beds. The pipe was known to have leaked on one occasion; however, much of the contaminated soil was excavated at that time.

Characterization sampling of the beds was performed in 1992. Samples were collected from a borehole in each bed down to the basalt layer below the beds. The basalt layer is approximately 35 feet below the surface. The samples were analyzed for radionuclides, metals, organics, PCBs, and pesticides. The following nonradiological COPCs were detected during the sampling (All depths noted are from the bottom of the beds): aroclor-1260 (a PCB at 0.245 ppm in a single sample at a three foot depth), arsenic (maximum of 18.3 ppm at a 29 foot depth), chromium (maximum of 65.1 ppm at a three foot depth), and mercury (maximum of 3.9 ppm at a three foot depth). The following radiological COPCs were detected during the sampling: americium-241 (maximum of 5.9 pCi/g at a three foot depth), cesium-137 (maximum of 2,040 pCi/g at a three foot depth), cobalt-60 (maximum of 407 pCi/g at a three foot depth), nickel-63 (maximum of 730 pCi/g at a four foot depth), plutonium-238 (maximum of 5.9 pCi/g at a three foot depth), plutonium-239 (maximum of 0.5 pCi/g at a three foot depth), and strontium-90 (maximum of 83 pCi/g at a four foot depth). The americium-241 and plutonium-238 were not distinguished from each other, and therefore, the 5.9 pCi/g represents the potential maximum for either radionuclide.

The S1W Leaching Beds were evaluated with the S1W Leaching Pit (NRF-12B) during the NRF Comprehensive RI/FS as explained in the previous section. Since the 1992 sampling sufficiently characterized the soil below the leaching beds, the purpose of the RI/FS sampling was to define the lateral extent of contamination outside the leaching beds, which would allow the estimation of soil volume contaminated above risk-based levels. Samples were collected from 10 boreholes to a depth of 20 feet adjacent to the beds and pit. Samples collected from boreholes, adjacent to the beds showed very little migration of contaminants in the upper 20 feet of soil. Cobalt-60 was the only COPC detected and was detected at a maximum concentration of 1.21 pCi/g at a 14 foot depth.

Three additional boreholes were drilled to the basalt on the north, west, and south side of the leaching beds where a historic perched water layer existed above the basalt. Small amounts of contaminants were found in these boreholes. The COPCs detected in these boreholes were arsenic (maximum of 8.61 ppm at a 30 foot depth), lead (maximum of 29.5 ppm at a 30 foot depth), cobalt-60 (maximum of 1.02 pCi/g at a 25 foot depth), neptunium-237 (0.79 pCi/g in a single sample at a 30 foot depth), nickel-63 (9.67 pCi/g in a single sample at a 25 foot depth), and strontium-90 (3.37 pCi/g in a single sample at a 25 foot depth).

The extent of contamination at NRF-14 is primarily within the soil directly below the leaching beds. The borehole sampling adjacent to the leaching beds showed only small amounts of contaminants. The contaminants are primarily retained within the top four feet of the bottom of the leaching beds. Contamination significantly drops off after the four foot depth.

The sampling performed at the historic perched water area showed no residual water and only minimal contamination with no exposure pathway available because of the significant depth of the residual contamination. Neptunium-237, which was not detected in the leaching beds, was detected at a very small concentration (0.79 pCi/g) in a single sample from the former perched water zone. It was the only contaminant detected at a higher concentration in the former perched water area than in leaching bed samples.

3.2.2.7 Radiography Building Collection Tanks (NRF-16)

The radiography building was constructed in 1954, north of the S1W prototype plant. The building was originally constructed to decontaminate radioactive equipment. Various solvents were likely used in the decontamination process. Two underground tanks were used to collect the solvents after the decontamination process. In 1960, the building was converted to perform radiography to find defects in various materials. The decontamination tanks were no longer used. The tanks and associated piping were removed in 1993. The tanks were in good condition with no apparent leaks from the tanks.

Historical sampling has been done around the tank and building area. Past spills of radioactive liquid occurred in this area and were generally cleaned up at the time of the spill. The historical sampling helped determine the likely location of past spills and establish an initial list of COPCs.
Characterization sampling was performed in 1990. Soil samples were collected from a borehole to a depth of 22 feet adjacent to the underground tanks. The only COPC detected above risk-based concentration was arsenic, which was detected at a maximum concentration of 9.6 ppm at the 22 foot depth.

Soil samples were collected from 20 targeted locations during the NRF Comprehensive RI/FS to evaluate potential past spills in the area. Samples were collected from the surface, one foot

depth, and two foot depth. The following COPCs were detected above background and risk-based concentrations near the radiography building: arsenic (maximum of 7.64 ppm at a ten foot depth), cesium-137 (maximum of 10.8 pCi/g at the surface), cobalt-60 (maximum of 0.36 pCi/g at the surface), and uranium-235 (0.18 pCi/g in a single sample at a one foot depth).

Uranium-235 is a naturally occurring radionuclide, but background levels at the INEEL are not known. Samples were also collected from a borehole adjacent to a sump located next to the building and from the sediment present in the sump. The sump, which is the lowest point near the building, is the most likely location to detect past spills. Samples were collected to a depth of ten feet, which was below the sump depth. Additional COPCs were detected in the sump sediment. They were benz(a)anthracene (0.26 ppm), benzo(a)pyrene (0.26 ppm), benzo(b)fluoranthene (0.430 ppm) and indeno(1,2,3-CD)pyrene (0.18 ppm).

The extent of contamination at NRF-16 is expected to be limited to the upper few feet of soil as a result of past surface spills. Very little contamination has been found in the subsurface soil.

3.2.2.8 S1W Retention Basins (NRF-17)

The S1W Retention Basins (NRF-17) were constructed in 1951. The basins are two concrete structures 140 feet long by 34 feet wide. The basins received radioactive effluent from the S1W prototype plant and later received effluent from the S5G and A1W prototype plants and ECF. The basins were used as a radioactive liquid storage facility prior to discharging the liquid to the discharge areas (S1W Tile Drainfield, S1W Leaching Pit, and the S1W Leaching Beds). One of the basins is known to have leaked approximately 33,000 gallons in 1971. The leak was directly below the basins.

Because of the difficulty in collecting samples below the basins, sampling was deferred until the basins are demolished under decontamination and dispositioning activities associated with the remedial action at NRF. Samples were collected during the NRF Comprehensive RI/FS adjacent to the basins where past surface soil contamination was suspected. Samples were collected from four locations to a depth of one foot. Arsenic (maximum of 17 ppm) and lead (maximum of 89 ppm) were the only constituents detected above background levels.

The extent and level of contamination below the S1W Retention Basins is unknown. However, soil sampling performed at downstream sites from the basins within the same disposal system showed an unacceptable risk for cesium-137 and strontium-90 to a potential 100-year future resident. It is also known that one of the basins leaked on at least one occasion and the leakage was capable of contaminating soils below the basins. Therefore, a presumptive decision was made that some of the soils beneath the retention basins are contaminated with cesium-137 and strontium-90 at concentrations which exceed risk-based levels.

3.2.2.9 A1W Leaching Bed (NRF-19)

The A1W Leaching Bed (NRF-19) was constructed west of NRF in 1957. The bed was not an open pond like the S1W Leaching Beds. The A1W Leaching Bed was similar to a drainfield with underground, perforated pipes distributing the liquid to an area constructed of gravel and sand.
The bed was 200 feet long and 50 feet wide. The bed was used continually from 1958 to 1964 for effluent discharges from the A1W prototype and ECF. The bed was used sporadically from 1964 until 1972, when use of the bed was discontinued.

A total of 85,500,000 gallons of water containing 141 curies of radioactivity was discharged to the leaching bed. The primary contaminants released were cesium-137, cobalt-60, strontium-90, and tritium. Cobalt-60 would have decayed to much smaller levels. Tritium, which exhibits similar properties as water, would not be expected in the leaching bed today. The leaching bed may have received small quantities of chemicals and oil associated with various processes at AlW and ECF.

Characterization sampling was performed at NRF-19 in 1991-92. Samples were collected from a borehole in the center of the leaching bed. The borehole depth was ten feet where the basalt layer was encountered. Arsenic (maximum of 8.0 ppm at a nine foot depth) and chromium (maximum of 298 ppm at a five foot depth) were the only nonradiological COPCs detected. The radiological COPCs detected were americium-241 (maximum of 20 PCi/g at a five foot depth), cesium-137 (maximum of 1,390 pCi/g at a five foot depth), cobalt-60 (maximum of 129 pCi/g at a six foot depth), nickel-63 (maximum of 730 pCi/g at a five foot depth), plutonium-238 (maximum of 20 pCi/g at a five foot depth), plutonium-239 (maximum of 1.18 pCi/g at a five foot depth), strontium-90 (maximum of 750 pCi/g at a five foot depth), and uranium-234 (maximum of 4.7 pCi/g at a five foot depth). The estimated depth of the underground, perforated pipe is five feet. The americium-241 and plutonium-238 results were not distinguished from each other and therefore, the 20 pCi/g represents the potential maximum for either radionuclide.

Sampling was performed during the NRF Comprehensive RI/FS around the perimeter of the A1W Leaching Bed. Four boreholes were drilled adjacent to the bed. The only COPCs detected above background and risk-based screening levels were carbon-14 (maximum of 6.73 pCi/g from a ten foot depth), cobalt-60 (maximum of 2.12 pCi/g from a 14 foot depth), and strontium-90 (maximum of 24.86 pCi/g from a 14 foot depth).

The RI/FS sampling also included three boreholes drilled northwest, north, and northeast of the leaching bed down to the basalt. These boreholes were in an area of a historic perched water layer. The only COPCs detected above background and risk-based concentrations in these samples were carbon-14 (3.35 pCi/g in a single sample at a ten foot depth) and cobalt-60 (maximum of 0.43 pCi/g at an 18 foot depth). Background levels for carbon-14 are unknown.

The extent of contamination at the A1W Leaching Bed is limited to the soil within and directly below the leaching bed. Very little migration of the contaminants was found. This represents an area 200 feet by 50 feet with a depth of 10 feet.

3.2.2.10 Old Sewage Basin (NRF-21A)

In 1956, a sewage basin (NRF-21A) was constructed to the southeast of NRF. The sewage basin was an open pond that was originally 72 feet by 72 feet and 11 feet deep. The basin was cross-contaminated with the radiological discharge system in 1956. The basin was enlarged in 1957 to approximately double the original length and was used until 1960. The basin has since been filled in with soil.

Soil samples were collected from a borehole in the estimated location of the basin during characterization sampling in 1991 to a depth of 20 feet. Samples were analyzed for radionuclides, metals, organics, pesticides, and PCBs. Arsenic (maximum of 8.5 ppm at a three foot depth) and n-nitrosodi-n-propylamine (0.92 ppm in a single sample at a 20 foot depth) were the only nonradiological COPCs detected above background and risk-based concentrations. Cesium-137 (maximum of 0.18 pCi/g at a one foot depth) and cobalt-60 (maximum of 0.13 pCi/g at a 20 foot depth) were the radiological COPCs detected.

Soil samples were collected during the NRF Comprehensive RI/FS from two boreholes at the basin. One borehole was near the expected discharge point, while the second borehole was near the center of the basin. Samples were collected to a depth of 14 feet and were analyzed for radionuclides, metals, and organics. No COPCs were detected in the second borehole. In the first borehole, the nonradiological COPCs detected above background and risk-based concentrations were antimony (maximum of 180 ppm at a 14 foot depth), cadmium (maximum of 13 ppm at a 14 foot depth), chromium (maximum of 1,000 ppm at a 14 foot depth), mercury (maximum of 10 ppm at a 14 foot depth), and silver (maximum of 55 ppm at a 14 foot depth). The radiological COPCs detected above risk-based concentrations were cesium-137 (maximum of 229 pCi/g at a 14 foot depth) and cobalt-60 (maximum of 2.6 pCi/g at a 14 foot depth). The 14 foot depth corresponds to the original depth of the basin and includes a three foot layer of soil that was mounded over the basin when it was filled.

Soil samples were also collected from 40 random sample locations over the basin and an adjacent area (NRF-43) that was used for a one-time pumpout of the basin. The soil over the basin was sampled because, when the basin was filled in, a three foot layer of soil was placed over the basin that likely came from the pumpout area. Samples were collected from the surface, one foot depth, and two foot depth. Samples were analyzed for cesium-137 and cobalt-60 and no detectable amounts were found at the one and two foot depths over the basin, Cesium-137 was detected at a maximum of 1.9 pCi/g at the surface.

The extent of contamination at NRF-21A is estimated to be a two foot layer of soil at the bottom of the original basin prior to the basin being elongated in 1957. The second borehole sampled during the RI/FS was in the location of the expanded basin and no COPCs were detected.

3.2.2.11 Sludge Drying Bed (NRF-21B)

The sludge drying bed (NRF-21B) was constructed in 1951 as part of the sewage system at NRF. The bed was a concrete slab that was 25 feet by 25 feet and slab was approximately five feet below surrounding ground elevation. The bed received sludge from the sewage system. The bed was suspected to have been contaminated with radionuclides when the sewage system was cross-contaminated with the radiological discharge system in 1956. The bed has since been filled in with soil to surrounding surface elevation.

The only sampling performed at NRF-21B was during the NRF Comprehensive RI/FS. Samples were collected from four boreholes at the bed down to the concrete slab. Samples were analyzed for radionuclides, metals, organics, and PCBs. The following nonradiological COPCs were detected above background and risk-based concentrations: antimony (maximum of 55 ppm), cadmium (maximum of 4 ppm), chromium (maximum of 420 ppm), mercury (maximum of 13.9 ppm), silver (maximum of 52 ppm), benzo(a)pyrene (0.1 ppm in a single sample), and benzo(b)fluoranthene (maximum of 0.19 ppm). The following radiological COPCs were detected: cesium-137 (maximum of 43.6 pCi/g), cobalt-60 (maximum of 1.06 pCi/g), and

uranium-235 (0.17 pCi/g in a single sample). All the sample results above were from the four foot depth.

The extent of contamination at NRF-21B is limited to the 25 foot by 25 foot concrete slab. The depth of contamination is between four to six feet.

3.2.2.12 Sewage Lagoons (NRF-23)

The NRF Sewage Lagoons (NRF-23) are located northeast of NRF The lagoons were constructed in 1960, and were expanded in 1972. The lagoons are open ponds measuring 425 feet by 725 feet at water level. The lagoon bottoms are clay lined. The southwest lagoon has only been used for occasional overflow from the northeast lagoon since 1984. The northeast lagoon is still in use.

Past sampling has shown organics, metals, and radionuclides present in the sediment of the lagoons. Sufficient sample results were available to calculate a 95% upper confidence limit (UCL) for most metal and radionuclide constituents. The following COPCs were detected during past sampling: arsenic (25.6 ppm, 95% UCL), cadmium (5.1 ppm, 95% UCL), chromium (571 ppm, 95% UCL), mercury (2.5 ppm, 95% UCL), silver (180 ppm, maximum concentration), benz(a)anthracene (0.22 ppm, maximum concentration), cesium-137 (3.6 pCi/g, 95% UCL), and cobalt-60 (0.39 pCi/g, 95% UCL). The cesium-137 and cobalt-60 data were from environmental monitoring sampling performed in 1994 and 1995, which is the most current reliable data available and represents randomly collected samples over the lagoon. The metal and organic data is from samples collected in 1988. The silver is shown as a maximum concentration since the 95% UCL for silver was much higher because of the wide range of silver concentrations detected during the sampling. All sample results are from the southwest lagoon although similar concentrations would be expected in the northeast lagoon.

Perched water is known to exist approximately 20 feet below the northeast sewage lagoon. The extent of this perched water zone is limited to within 50 feet of the edge of the lagoon. Other

minor perched water zones were discovered at various depths, 300 to 500 feet from the lagoon.
This information suggests that a stair-step migration pattern exist at the sewage lagoon.
Perched water sampling has shown slightly elevated levels of nitrates and several anions (e.g., chloride) and cations (e.g., sodium) associated with the sewage lagoons. Groundwater monitoring data indicates that the sewage lagoon is the primary source of nitrate to the aquifer near NRF. Other contaminants contained within the sewage lagoon sediment appear to remain bound in those sediments.

The vertical extent of contamination present at the sewage lagoons is estimated to be 12 inches, which represents the average sediment layer thickness on the bottom of the lagoons.
The horizontal extent of contamination is the area of the sediment on the bottom of the lagoons.
This represents an area approximately 360 feet by 680 feet for each lagoon.

3.2.2.13 S5G Basin Sludge Disposal Bed (NRF-32)

In 1967, sludge from a cleaning effort at the S5G prototype was disposed of to an area south of S5G. The S5G hull basin at one time held water to allow simulation of sea conditions. The contaminants present in the sludge were not known and may have contained small quantities of radionuclides. The volume of sludge disposed of to the area was conservatively estimated at a maximum of 3,000 cubic feet.

Sampling was performed during the NRF Comprehensive RI/FS at this site. Samples were collected from three boreholes where the sludge was buried. Samples were analyzed for radionuclides, organics, metals, and PCBs. The only COPC detected was arsenic at a maximum concentration of 8.49 ppm from a 10 foot depth.

3.2.2.14 Seepage Basin Pumpout Area (NRF-43)

A sewage basin (NRF-21A) was pumped out to the surrounding area (NRF-43) in August 1958. The basin had been cross-contaminated with the radioactive discharge system in 1956, and therefore, the basin contents likely contained some radioactivity. The volume or amount of radioactivity released from the basin is not known. Historic sampling has shown some detectable levels of radioactivity in the pumpout area. This sampling helped determine the location of the pumpout area and identify potential COPCs.

Characterization sampling was performed in the area in 1991. Soil samples were collected to a depth of five feet and analyzed for metals, organics, radionuclides, pesticides, and PCBs. The COPCs detected above background and risk-based concentrations were arsenic (maximum of 7.8 ppm at a five foot depth) and cesium-137 (maximum of 1.08 pCi/g at a three foot depth).

Soil samples were also collected from 40 random sample locations over the basin and the pumpout area during the NRF Comprehensive RI/FS. Samples were collected from the surface, one foot depth, and two foot depth. Sufficient samples were collected and analyzed for

cesium-137 that a 95% upper confidence limit for cesium-137 was calculated to be 1.31 pCi/g. Other COPCs detected above risk-based screening levels were carbon-14 (36.71 pCi/g in a single sample) and plutonium-239 (0.94 pCi/g in a single sample). This sampling showed that, where radioactivity was detected, most of the activity was in the upper two feet and only small activity levels were detected at the two foot depth.

The extent of contamination at NRF-43 is limited to the upper two feet of soil, which is a result of the one time pumpout of the sewage basin (NRF-21A). NRF-43 represents an area of approximately 97,000 square feet.

3.2.2.15 Hot Storage Pit (NRF-66)

NRF-66 was misidentified as a hot storage pit. The area was a waste tanker loading area where radioactive liquid waste was collected for processing at other INEEL facilities. Various inadvertent releases may have occurred in the tanker loading area. The releases would have been cleaned up to established standards at the time of the release. Contaminated soil was removed from the area in 1980.

Sampling was performed at NRF-66 during the NRF Comprehensive RI/FS. Soil samples were collected from 14 shallow boreholes to a two foot depth. The purpose of the sampling was to evaluate potential residual contamination in the soil from past surface spills in the area. The samples were analyzed for radionuclides. The only COPC detected above background and a risk-based concentration was cesium-137 at a maximum activity of 1.88 pCi/g.

The extent of contamination at NRF-66 is limited to a two foot depth. The area is approximately 10 foot by 45 foot.

3.2.2.16 ECF Water Pit Release (NRF-79)

A maximum one-time release of 62,500 gallons of water from ECF occurred in late 1991 and early 1992. The ECF water contained small amounts of carbon-14, cesium-137, cobalt-60, manganese-54, nickel-63, strontium-90, and tritium. A very conservative assumption was made for the risk assessment calculations discussed in Section 6.0 that the entire volume of water immediately migrated to the aquifer without any dilution and was available for consumption. No soil sampling was performed because contaminants, if present, would be 30 feet below the surface and unavailable for exposure to any receptors.

3.2.2.17 A1W/S1W Radioactive Line near BB19 (NRF-80)

During the construction of A1W, a pipe was installed from the A1W prototype to the S1W Retention Basins that allowed radioactive effluents from A1W to be sent to the S1W radioactive discharge system. The pipe was buried approximately six feet below the surface. The pipe is known to have leaked on one occasion (NRF-80). During decontamination and dispositioning

work at NRF in 1995, portions of the pipe were removed and contamination was detected in the soil. Cobalt-60 was detected up to 1,600 pCi/g and cesium-137 was detected up to 7 pCi/g.

Sampling was performed during the NRF Comprehensive RI/FS in an area likely to have been contaminated from a past pipe leak. Samples were collected from six boreholes to a depth of ten feet. The only COPC detected above risk-based concentrations was cobalt-60, which was detected at a maximum level of 14.56 pCi/g at an eight foot depth.

Some uncertainty exists with this site. The extent of contamination at NRF-80 is unknown. Past contamination is known to be present in the soil, but the contamination probably is sporadic making characterization sampling of the site very difficult. Process knowledge of the waste stream and sampling performed at discharge areas associated with this site suggest that the sampling performed in 1995 is not representative of all the contamination present at this site. Cesium-137 and strontium-90 have been detected above risk-based levels at other discharge areas associated with NRF-80. Therefore, a presumption is made that cesium-137 and stontium-90 are present in soils immediately beneath the depth of the remaining pipe at concentrations that exceed acceptable risk-based levels for a future 100-year resident.

3.2.2.18 A1W Processing Building Area Soil (NRF-81)

The A1W processing building area (NRF-81) is located west of the A1W prototype plant. The area contains several tanks and associated piping systems that were used to process radioactive effluent from the A1W plant. Several historical inadvertent releases have occurred in the area from past operations. Two known releases occurred in 1980 and 1982. Soil samples were collected from the area after the releases were cleaned up. In 1994, underground radioactive piping was removed from the processing building area during decontamination and dispositioning work at NRF. Soil samples were collected frequently during the excavation work and analyzed for radioactivity. No elevated radioactivity levels were found.

Sampling was not performed during the NRF Comprehensive RI/FS in this area because evidence suggests that past spills in the area were cleaned up and the area is very similar to other areas where Surface spills occurred. Cesium-137 was detected at a maximum of 2.1 pCi/g and cobalt-60 was detected at a maximum of 1.4 pCi/g during past sampling. A conservative assumption, was made that the maximum concentrations of other radionuclides detected at similar sites were present at this site. This includes 36.71 pCi/g of carbon-14, 0.94 pCi/g of plutonium-239, and 0.18 pCi/g of uranium-235.

The maximum extent of contamination at NRF-81 would be the upper three feet of soil and an area approximately 100 feet by 130 feet. The area represents a fenced in location around the processing building and the estimated size is considered conservative.

3.3 Site Characteristics (New Sites)

NRF-82 (Evaporator Bottom Tank Release) was an area identified after the NRF Comprehensive RI/FS was completed. This site consists of the soil surrounding an

underground storage tank vault. The tank and its contents will be managed under other regulatory actions. One spill was known to have occurred at the area in 1972. The spill was cleaned up to the standards at that time and additional construction has occurred in the area. Slightly elevated amounts of radioactivity were reported after the cleanup was performed in 1972. Additional cleanup was performed in 1977. This site was evaluated in a Track 1 investigation and the risk was estimated to be low based on the Track 1 evaluation. This site had no impact on the cumulative risk assessment.

NRF-83 (ECF Hot Cells Release Area) was also an area identified after the NRF Comprehensive RI/FS was completed. The site is the location of a radioactive liquid release that occurred in 1972. Radioactive liquid was released from a pipe to a concrete trench. The soil below and adjacent to the trench became contaminated. Cleanup actions taken in 1972 did not include the soil below the trench. The contaminated soil was discovered in 1997 when a concrete pad adjacent to the concrete trench was removed during ECF Hot Cell upgrade work. Cobalt-60 and cesium-137 were present in the soil. An estimated 28 cubic meters of soil is contaminated with cobalt-60 and cesium-137 below the trench. This soil remains in place to preserve the structural integrity of the trench. All accessible contaminated soils adjacent to the south side of the trench were removed during the construction project and replaced with clean soil. A new concrete pad was poured at the location of the old concrete pad excavation as part of the Hot Cell upgrade work. The contaminated soil beneath the trench is not presently accessible and no exposure route is available. The site was evaluated in a Track 1 investigation and the risk was estimated to be low based on the Track 1 evaluation. This site had no impact on the cumulative risk assessment.

3.4 Groundwater Characteristics

The remedial investigation included a hydrogeologic study. This study consisted of a review of past hydrogeologic data from multiple studies, review and interpretation of seven years of groundwater data collected near NRF, groundwater flow modeling of the Snake River Plain Aquifer (SRPA), modeling of contaminant fate and transport, and developing groundwater contour, flow direction and contaminant migration maps. Information from the study was used in the risk assessments (summarized in Section 4) for evaluating the groundwater ingestion pathway. Several specific conclusions of the hydrogeologic study are highlighted below.

Groundwater modeling at NRF confirmed that NRF is located over a portion of the SRPA that possesses a lower gradient than the surrounding aquifer. The lower gradient (i.e., flatter water table) and accompanying slower water flow through the aquifer, both consequences of a less permeable aquifer, allow surface recharge from NRF operations to increase the elevation of the water table under NRF. The result is a lobed-shaped high in the water table on the east side of NRF. The high extends from the north side of NRF to the south side of NRF.

In 1994, a well fitness evaluation was performed at NRF to determine the quality of the

wells used in the NRF groundwater monitoring network. At nearly the same time, NRF performed groundwater modeling, as outlined above, to assess aquifer flow paths near NRF and the optimal placement of groundwater monitoring wells. As a result of the fitness evaluation and modeling work, six new groundwater monitoring wells were constructed and were included in the NRF groundwater monitoring network. As of January 1996, the wells used in the groundwater monitoring network included five United States Geological Survey (USGS) wells and eight NRF wells. Of these wells, two are used to assess the general upgradient quality of the SRPA, two are used to assess the affects on groundwater of effluent discharged to the industrial waste ditch, and six are located in a semi-circular arc just south of NRF, and are used to sample the local SRPA water downgradient of NRF. The remaining three wells are located south of NRF and are used to sample the regional characteristics of the SRPA downgradient of NRF.

Samples have been collected from the NRF groundwater monitoring network since 1989. The recently constructed groundwater monitoring wells were specifically designed to monitor the upper 50 feet of the SRPA. Results obtained from analyses of samples collected from the USGS wells are primarily used for screening purposes, and verify that the new monitoring wells are sufficiently spaced so as to detect contaminants emanating from past or current activities at NRF.

Based on samples collected from nine downgradient wells, chromium, nitrates, tritium, and various salts were detected at slightly elevated levels. The average concentrations of these constituents occurring in groundwater monitoring wells downgradient of the source are as follows: chromium at 0.05 ppm, nitrates at 2.3 ppm, tritium at 308 picocuries per liter (pCi/l), and chloride (salt) at 226 ppm. Based on samples collected from 1989 to 1998, the chromium, nitrate, tritium, and salt concentrations show no apparent increasing trend.

Fate and transport modeling was performed using the GWSCREEN computer program. All contaminants detected at OU 8-08 sites above risk-based concentrations in the soil were included in modeling runs to assess their potential migration to the aquifer. No contaminants were predicted to reach the aquifer within 100 years under normal precipitation conditions. Additional fate and transport analyses of past and current aquifer recharge points (e.g., industrial waste ditch) were performed and concluded that the industrial waste ditch, active NRF sewage lagoon, and potential deep perched water associated with past discharges to the S1W Leaching Beds are the only NRF sites with appreciable quantities of contaminants currently migrating. Contaminants, include trivalent chromium (industrial waste ditch), tritium (S1W Leaching Beds), nitrates (active sewage lagoon), and various salts (industrial waste ditch and active sewage lagoon).

Perched water was found to be present at several locations beneath NRF. Perched water is almost universally associated with substantial recharge due to infiltration associated with surface discharge. A perched water zone is currently found beneath the industrial waste

ditch and another is located under the NRF sewage lagoon. The contaminants present in the perched water zones are reflective of their source. The industrial waste ditch perched water zone contains elevated levels of salts and chromium. Perched water beneath the sewage lagoon contains slightly elevated levels of nitrates, cations (e.g., sodium), and anions (e.g., chloride). Two former shallow perched water zones (approximately 20 to 30 feet) were known to exist (early 1960s) beneath the S1W and A1W Leaching Beds, but sampling performed during the remedial investigation show these perched water zones are no longer present.

Deep perched water (in excess of 100 feet) may currently exist beneath the S1W Leaching Beds. The elevated levels of tritium currently detected in samples from the groundwater monitoring wells nearest to the S1W Leaching Beds are probably due to residual deep perched water which contains small amounts of tritium. Tritium migrates in the environment as water; therefore, the majority of tritium released to the leaching beds has long since evaporated or migrated and dispersed into the SRPA. The remaining tritium associated with this deep perched water is gradually dispersing into the SRPA. This dispersion is slow because the recharge source (i.e., discharge to the leaching beds) is no longer present. Dispersion processes further lower tritium levels to below background in groundwater downgradient of NRF. Tritium levels found and monitored in wells located near the S1W Leaching Beds since 1996 are expected to decrease over time from decay, dilution, and depletion of the source.

The hydrogeologic study concluded that NRF has had a limited impact on the SRPA, primarily due to slightly elevated levels of chromium, nitrates, tritium, and various salts. Additionally, these constituents have not shown an increasing trend and are not expected to increase in the future.

4.0 Summary of Site Risks

Several different risk assessments were performed to evaluate the potential human health and environmental risks posed by the identified sites at NRF. Track 1 and Track 2 investigations were performed for OUs 8-01, 02, 03, 04, and 09 prior to the NRF Comprehensive RI/FS. The following risk assessments were performed as part of the NRF Comprehensive RI/FS: risk assessments for OU 8-08 sites not previously investigated, a cumulative risk assessment of all NRF sites, and an ecological risk assessment. The OU 8-08 site assessments evaluated the human health risk associated with contaminants present at each site. The cumulative risk assessment evaluated the potential cumulative, or additive, human health risks for receptors based on their proximity to multiple sites and potential for exposure from more than one site at a time. The ecological risk assessment evaluated the potential risk to ecological receptors.

The following sections describe the three different types of risk assessments performed at NRF. In addition, two new sites were identified after the NRF Comprehensive RI/FS and Track 1 risk assessments were performed on these sites.

4.1 Individual Site Risk Assessments

4.1.1 OUs 8-01, 02, 03, 04, and 09 Site Risk Assessments

A Track 1 or Track 2 investigation was performed for each site associated with OUs 8-01, 02, 03, 04, and 09 prior to the NRF Comprehensive RI/FS. The Track 1 investigations, including the determination of the level of risk (semi-quantitative), were performed using INEEL guidance manuals for conducting Track 1 and Track 2 investigations. These guidance manuals were developed under the direction of DOE, State of Idaho, and EPA Region 10 personnel and provide general guidance on toxicity assessment, exposure assessment, risk characterization, default exposure parameter, etc. Typical default exposure parameters used during the Track 1 or Track 2 risk assessments would be the same as those shown in Section 4.1.2.2.2, which discusses the exposure parameters used to assess OU 8-08 sites in the NRF Comprehensive RI/FS. The completed Track 1 or Track 2 investigation documents, which provide details of the risk assessments, are part of the Administrative Record (Appendix A provides a current list of documents available in the Administrative Record).

The risk assessments typically resulted in a low estimated risk or no hazardous source being present. The low estimated risk was due to the small amounts of contaminants present at the site or because an exposure to contaminants under current site conditions was not likely. Table 4 summarizes the risk assessments performed for the sites associated with OUs 8-01, 02, 03, 04, and 09. The table indicates if a source is present and the result of the risk assessment (identified as no risk, low risk, or acceptable risk). The table also shows if the resulting risk was due to no source being present, a small contaminant source being present, or current site conditions limiting exposure to contaminants at the site.

For those sites with no risk because no source is present or with a low or acceptable risk because the contaminant source is small, no remedial actions would be expected. For those sites with a low or acceptable risk because of current site conditions (contaminants inaccessible because of structures, soil covers, or administrative controls), maintaining those site conditions would be expected.

Table 4. Risk Assessment Summary Table for OUs 8-01, 02, 03, 04, and 09

Operable Unit	Site Number	Source Present	Estimated Risk	Basis for Risk Determination
OU 8-01				
	NRF-03	Yes	Low	Small Contaminant Source
	NRF-06	No	None	No Source
	NRF-08	No	None	No Source
	NRF-33	No	None	No Source
	NRF-40	No	None	No Source
	NRF-41	No	None	No Source
	NRF-63	No	None	No Source
OU 8-02				
	NRF-09	Yes	Low	Small Contaminant Source

	NRF-37	No	None	No Source
	NRF-38	No	None	No Source
	NRF-42	Yes	Low	Site Conditions
	NRF-47	No	None	No Source
	NRF-52A	Yes	Low	Small Contaminant Source
	NRF-52B	No	None	No Source
	NRF-54	No	None	No Source
	NRF-55	No	None	No Source
	NRF-61	Yes	Low	Site Conditions
	NRF-64	Yes	Low	Small Contaminant Source
	NRF-68	Yes	Low	Small Contaminant Source
OU 8-03				
	NRF-10	Yes	Acceptable	Small Contaminant Source
	NRF-15	Yes	Low	Small Contaminant Source
	NRF-18A	Yes	Low	Site Conditions
	NRF-18B	Yes	Low	Small Contaminant Source
	NRF-20	Yes	Low	Small Contaminant Source
	NRF-22	Yes	Low	Site Conditions
	NRF-45	Yes	Low	Small Contaminant Source
	NRF-56	No	None	No Source
OU 8-04				
	NRF-28	Yes	Low	Small Contaminant Source
	NRF-29	Yes	Low	Small Contaminant Source
	NRF-31	Yes	Low	Small Contaminant Source
	NRF-44	No	None	No Source
	NRF-58	Yes	Low	Small Contaminant Source
	NRF-62	No	None	No Source
	NRF-65	Yes	Low	Small Contaminant Source
	NRF-69	Yes	Low	Small Contaminant Source
	NRF-70	Yes	Low	Small Contaminant Source
	NRF-71	Yes	Low	Small Contaminant Source
	NRF-72	Yes	Low	Small Contaminant Source
	NRF-73	No	None	No Source
	NRF-74	Yes	Low	Small Contaminant Source
	NRF-75	Yes	Low	Small Contaminant Source
	NRF-76	Yes	Low	Small Contaminant Source
	NRF-77	Yes	Low	Small Contaminant Source
OU 8-09				
	None	Yes	Acceptable	Small Contaminant Source

4.1.2 OU 8-08 Site Risk Assessments

A human health risk assessment was performed for each of the 18 radiological areas that were not assessed in a previous investigation before the NRF Comprehensive RI/FS except for NRF-17 (S1W Retention Basins). The assessment included identifying COPCs for each site, an exposure assessment, a toxicity assessment, and a risk characterization. A risk assessment was not performed for NRF-17 because sampling was not done below the basins in the

suspected area of potential contamination.

4.1.2.1 Identification of Contaminants of Potential Concern

Past sampling, process knowledge, discharge records, and sampling during the NRF Comprehensive RI/FS were used to develop a list of COPCs. Since soil is the media of concern, a soil concentration term was established for each COPC at each site. The concentration term was typically the maximum concentration detected during characterization sampling performed in 1991-92, recent sampling from the Environmental Monitoring Program, or RI/FS sampling. These sampling evolutions provided data with the proper data quality for use in risk assessment calculations. In a few cases where sufficient sample results existed, the concentration term was the 95% upper confidence limit of the mean, which provides a more balanced depiction of the contaminant concentrations present at a site. Historical sampling prior to 1990 was not generally used because the data collected did not meet CERCLA quality assurance requirements needed for risk assessment calculations. Data prior to 1990 was used if it was the only data available and sufficient quality control of the samples could be determined. The historical data did, however, provide valuable information on site locations and COPCs.

The concentration terms were compared to risk-based soil screening levels and background levels. Risk-based levels were based on concentrations in the soil corresponding to an increased cancer risk of 1 in 10,000,000 (1E-07) or a hazard quotient of 0.1. The terms increased cancer risk and hazard quotient are discussed later in this section. The risk-based screening levels for non-radiological constituents were obtained from the EPA Region III Risk-Based Concentration Table. The table contains reference doses and carcinogenic potency slopes (discussed in Section 4.1.2.3) which were taken from the Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), and other EPA sources. These toxicity constants are combined with "standard" exposure scenarios to calculate risk-based concentrations. The risk-based level for lead is the EPA recommended screening level for lead cleanup (400 ppm). For radiological constituents, standard INEEL default exposure parameters were used and concentrations were calculated using standard INEEL Track 2 risk assessment equations given in the INEEL Track 2 guidance document. Background soil concentrations are INEEL published values. Those COPCs with a concentration term greater than background and risk-based levels were retained for evaluation in the risk assessment. Those contaminants with a concentration term less than background or risk-based levels were removed as COPCs.

4.1.2.2 Exposure Assessment

The exposure assessment estimates the magnitude of actual and/or potential receptor exposures, the frequency and duration of these exposures, and the pathways by which receptors are potentially exposed to various COPCs.

4.1.2.2.1 Exposure Scenarios

The human health risk assessment for each site evaluated residential and occupational scenarios. For the residential scenario, assessments were made for a receptor residing at the

site 30 years and 100 years in the future. The future residential scenario assumes the site remains under Federal government control for at least 30 or 100 years. An assumption is also made that the contaminants present at the site are available to the residential receptor for exposure regardless of the depth. This takes into consideration the construction of a residence with a basement and the availability of the excavated soil for exposure.

A current and 30-year occupational scenario is also evaluated. Again, it is assumed that the contaminants are available for exposure regardless of the depth. The occupational scenario assumes that no controls; are in place to prevent exposure to COPCs.

Soil ingestion, inhalation of fugitive dust, and external radiation exposure are the potential exposure pathways considered for the occupational and residential scenarios. In addition, the groundwater ingestion and food crop ingestion pathways are considered only for the residential scenario. For the occupational scenario, the food crop ingestion pathway is not a concern and, since the drinking water is continuously monitored, the groundwater ingestion pathway is not a concern. The dermal absorption pathway was qualitatively evaluated for the residential scenario.

4.1.2.2.2 Quantification of Exposure

Adult exposures were evaluated for all scenarios and pathways. Child exposures were considered separately only for the soil ingestion pathway in the residential scenario, because children are likely to ingest more soil than are adults.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reasonable maximum exposure at a site. Using this approach may tend to over-estimate the risk. Exposure duration and frequency are used to determine the total time of exposure. Exposure duration would be the number of years residing or working at a site, and exposure frequency is the number of hours per day and days per year that a receptor may be exposed to the site during the exposure duration period. The exposure parameters used in the risk assessment were:

Body Weight:
- Adult: 70 kilograms 154 pounds
- Child: 15 kilograms 33 pounds

Exposure Duration:
- Occupational: 25 years
- Residential: 30 years
  - Adult: 24 years

Child: 6 years

Exposure Frequency:
Occupational: 8 hours per day, 250 days per year
Residential: 24 hours per day, 350 days per year

Ingestion/inhalation Rate:
Soil Ingestion:
Occupational: 50 milligrams per day size of ¼ aspirin tablet
Residential:
Adult: 100 milligrams per day size of ½ aspirin tablet
Child: 200 milligrams per day size of 1 aspirin tablet

Inhalation:
Occupational: 20 cubic meters per work day equivalent to the volume of air in an 8 by 11 foot room by 8 foot high.
Residential: 20 cubic meters per day
Water Ingestion:
Residential: 2 liters per day

4.1.2.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at NRF A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values (slope factors and reference doses) for the sites were obtained from the EPA's IRIS database and EPA's HEAST The reference dose is the toxicity value used to evaluate noncarcinogenic effects that result from exposure to chemicals, and is based on the concept that there is a threshold that must be reached before adverse effects occur. The slope factor is the toxicity value used to evaluate potential human carcinogenic effects. The slope factors have been derived based on the concept that for any exposure to a carcinogenic chemical, there is some risk of a carcinogenic response. The slope factor is used in a risk assessment for the purpose of estimating an upper bound lifetime probability of an individual developing cancer from the exposure to a specific level of a carcinogen.

4.1.2.4 Risk Characterization

Carcinogenic effects are calculated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. Generally, CERCLA cleanup decisions are based on carcinogenic excess risk levels slightly greater than 1 chance in 10,000 (1E-04) where excess risk is the possibility of contracting cancer above the national average. The target risk range for CERCLA sites is between 1E-04 and 1E-06 and represents

an upper and lower risk level where a remedial action may be required if the agencies determine an action is justified. A remedial action is likely at risk levels greater than 1E-04, A risk less than 1E-06 is usually considered acceptable. A risk management decision on whether a remedial action is appropriate is made by the agencies when the calculated risk is between 1E-04 and 1E-06.

The potential for a noncarcinogenic effect is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a toxicity reference dose derived for a similar exposure period. The reference dose is a toxicity value representing the acceptable upper limit of a substance as determined by the Agencies based on various scientific studies. The ratio of exposure to the reference dose is called a hazard quotient. A hazard quotient less than one is considered acceptable, while a hazard quotient greater than one indicates a risk management decision is needed to determine if a remedial action is justified. The sum of all hazard quotients associated with a particular area is a hazard index. The calculation of the hazard index involves the use of uncertainty factors to ensure a large safety margin is present.

Table 5 summarizes the human health risk assessments performed for each site showing the contaminant, exposure pathway, and calculated risk or hazard quotient if the increased cancer risk was greater than or equal to 1E-06 or the hazard quotient was greater than or equal to 1. Some contaminants have both carcinogenic risks and noncarcinogenic effects, and therefore may have an increased carcinogenic risk and a hazard quotient (noncarcinogenic). Those constituents identified as COPCs during the site characterization for each site (Section 3.2.2), but which did not show a risk greater than 1E-06 or a hazard quotient greater than 1.0, are shown on Table 6 and were eliminated as COPCs.

Table 5. OU 8-08 Individual Site Risk Assessment Summary

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential	
Pathway(a)	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ
NRF-02 - Old Ditch Surge Pond (No Further Action site)								

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Cesium-137 5e-05 NA 3e-05 NA 1e-04 NA 3e-05 NA External Exposure (b)

Ingestion of Food Crops (b)

Cobalt-60 4e-04 NA 7e-06 NA 4e-05 NA - NA External Exposure

NRF-13 - S1W Temporary Leaching Pit
(No Action site)

No risks greater than 1e-06 or HQ greater than 1.0

NRF-23 - Sewage Lagoons
(No Further Action site)

Arsenic 7e-06 - 7e-06 - 8e-05 - 8e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Mercury (c) NA - NA - NA 6.6 NA 6.6 Ingestion of Food Crops (b)

Cesium-137 4e-05 NA 2e-05 NA 1e-04 NA 2e-05 NA External Exposure (b)

Ingestion of Food Crops (b)

Cobalt-60 2e-05 NA - NA 2e-06 NA - NA External Exposure

NRF-79 - ECF Water Pit Release
(No Action site)

Cesium-1 37 NA NA NA NA 1e-05 NA 3e-06 NA Ingestion of Groundwater (b)

Cobalt-60 NA NA NA NA 7e-06 NA - NA Ingestion of Groundwater

Tritium NA NA NA NA 5e-05 NA - NA Ingestion of Groundwater

Nickel-63 NA NA NA NA 3e-06 NA 2e-06 NA Ingestion of Groundwater (b)

Strontium-90 NA NA NA NA 3e-06 NA - NA Ingestion of Groundwater

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway(a)
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-81 - A1W Processing Building Area Soil (No Further Action site)									
Cesium-137	3e-05	NA	1e-05	NA	7e-05	NA	1e-05	NA	External Exposure(b)
Ingestion of Food Crops (b)									
Cobalt-60	8e-05	NA	2e-06	NA	8e-06	NA	-	NA	External Exposure
Uranium-235	-	NA	-	NA	1e-06	NA	1e-06	NA	External Exposure (b)
NRF-14 - S1W Leaching Beds (d) NRF-12B - S1W Leaching Pit (Remedial Action sites)									
Arsenic	3e-05	-	3e-05	-	3e-04	1.6	3e-04	1.6	Ingestion of Soil (b)
Ingestion of Food Crops (b)									
Mercury	NA	-	NA	-	NA	10	NA	10	Ingestion of Food Crops (b)
Americium-241	-	NA	-	NA	5e-06	NA	5e-06	NA	Ingestion of Soil (b)
Ingestion of Food Crops (b)									
Cesium-137	2e-02	NA	1e-02	NA	7e-02	NA	1e-02	NA	Ingestion of Soil (b)
Ingestion of Food Crops (b)									
External Exposure (b)									
Cobalt-60	2e-02	NA	4e-04	NA	2e-03	NA	-	NA	Ingestion of Soil
Ingestion of Food Crops									

External Exposure

Neptunium-237 - NA - NA 1e-05 NA 1e-05 NA Ingestion of Food Crops (b)

Nickel-63 - NA - NA 7e-06 NA 5e-06 NA Ingestion of Food Crops (b)

Plutonium-238 - NA - NA 3e-06 NA 2e-06 NA Ingestion of Soil (b)

Strontium-90 1e-06 NA - NA 1e-03 NA 9e-04 NA Ingestion of Soil

Ingestion of Food Crops (b)

Unit/Constituent Current Occupational 30-year 30-year Residential 100-year Residential Pathway(a)

Occupational

Risk HQ Risk HQ Risk HQ Risk HQ

NRF-19 - AIW Leaching Bed
(Remedial Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Americium-241 3e-06 NA 2e-06 NA 2e-05 NA 2e-05 NA Ingestion of Soil (b)

Ingestion of Food Crops (b)

External Exposure (b)

Cesium-137 2e-02 NA 8e-03 NA 4e-02 NA 9e-03 NA Ingestion of Soil (b)

Ingestion of Food Crops (b)

External Exposure (b)

Cobalt-60 7e-03 NA 1e-04 NA 7e-04 NA - NA External Exposure (b)

Plutonium-238 2e-06 NA 1e-06 NA 9e-06 NA 5e-06 NA Ingestion of Soil (b)

Ingestion of Food Crops (b)

Nickel-63 - NA - NA 7e-06 NA 5e-06 NA Ingestion of Food Crops (b)

Strontium-90 1e-05 NA 6e-06 NA 9e-03 NA 2e-03 NA Ingestion of Soil (b)

Ingestion of Food Crops (b)

NRF-12A - Underground Piping Leading to S1W Leaching Pit
(Remedial Action site)

Mercury NA - NA - NA 17 NA 17 Ingestion of Food Crops (b)

Cesium-137 9e-02 NA 4e-02 NA 2e-01 NA 4e-02 NA Ingestion of Soil (b)

Ingestion of Food Crops (b)

External Exposure (b)

Cobalt-60 6e-03 NA 1e-04 NA 6e-04 NA - NA External Exposure

Nickel-63 - NA - NA 3e-06 NA 2e-06 NA Ingestion of Food Crops (b)

Plutonium-244 1e-06 NA 1e-06 NA 7e-06 NA 7e-06 NA External Exposure (b)

Strontium-90 - NA - NA 4e-04 NA 7e-05 NA Ingestion of Soil

Ingestion of Food Crops (b)

Unit/Constituent Current Occupational 30-year 30-year Residential 100-year Residential Pathway(a)
Occupational

Risk HQ Risk HQ Risk HQ Risk HQ

NRF-11 (e)-S1W Tile Drainfield
(Remedial Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Cesium-137 4e-06 NA 2e-06 NA 1e-05 NA 2e-06 NA External Exposure (b)

Cobalt-60 2e-04 NA 3e-06 NA 1e-05 NA - NA External Exposure

NRF-11(continued) L-Shaped Sump (f)
(Remedial Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Cesium-137 5e-04 NA 3e-04 NA 1e-03 NA 3e-04 NA Ingestion of Soil

Ingestion of Food Crops (b)

External Exposure (b)

Cobalt-60 7e-05 NA 1e-06 NA 6e-06 NA - NA External Exposure

Manganese-54 1e-06 NA - NA - NA - NA External Exposure

Plutonium-244 - NA - NA 3e-06 NA 3e-06 NA External Exposure (b)

NRF-21A - Old Sewage Basin
(Remedial Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Antimony NA - NA - NA 1.8 NA 1.8 Ingestion of Soil (b)

Mercury NA - NA - NA 27 NA 27 Ingestion of Food Crops (b)

N-nitrosodi-n- 1e-06 NA 1e-06 NA 1e-05 NA 7e-04 NA Ingestion of Soil (b)
propylamine
Ingestion of Groundwater (b)

Cesium-137 3e-03 NA 1e-03 NA 8e-03 NA 1e-03 NA Ingestion of Soil (b)

Ingestion of Food Crop (b)

External Exposure (b)

Cobalt-60 1e-04 NA 3e-06 NA 1e-05 NA - NA External Exposure

Unit/Constituent Current Occupational 30-year 30-year Residential 100-year Residential Pathway(a)
Occupational

Risk HQ Risk HQ Risk HQ Risk HQ

NRF-43 - Seepage Basin Pump Out Area
(No Further Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Cesium-137 2e-05 NA 8e-06 NA 4e-05 NA 9e-06 NA Ingestion of Food Crops

External Exposure (b)

NRF-21 B - Sludge Drying Bed
(Remedial Action site)

Mercury NA - NA - NA 37 NA 37 Ingestion of Food Crops (b)

Benzo(a)pyrene - NA - NA 1e-06 NA 1e-06 NA Ingestion of Soil

Cesium-137 5e-04 NA 3e-04 NA 1e-03 NA 3e-04 NA Ingestion of Food Crops(bl

External Exposure (b)

Cobalt-60 6e-05 NA 1e-06 NA 6e-06 NA - NA External Exposure

Uranium-235 - NA - NA 1e-06 NA 1e-06 NA External Exposure (b)

NRF-16 - S1W Radiography Building Collection Tanks
(No Further Action site)

Arsenic 2e-06 - 2e-06 - 3e-05 - 3e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)

Benzo(a)pyrene - NA - NA 3e-06 NA 3e-06 NA Ingestion of Soil (b)

Cesium-137 1e-04 NA 6e-05 NA 3e-04 NA 8e-05 NA Ingestion of Food Crops (b)

External Exposure (b)

Cobalt-60 2e-05 NA - NA 2e-06 NA - NA External Exposure

Uranium-235 - NA - NA 1e-06 NA 1e-06 NA External Exposure (b)

NRF-66 - Hot Storage Pit
(No Further Action site)

Cesium-137 2e-05 NA 1e-05 NA 3e-05 NA 2e-06 NA Ingestion of Food Crops

External Exposure (b)

Unit/Constituent Current Occupational 30-year 30-year Residential 100-year Residential Pathway(a)
Occupational

Risk HQ Risk HQ Risk HQ Risk HQ

NRF-80 (e)- A1W/S1W Radioactive Line Near BB19
(Remedial Action site)

Cesium-137 8e-05 NA 4e-05 NA 2e-04 NA 4e-05 NA Ingestion of Food Crops (b)

External Exposure (b)

Cobalt-60 9e-02 NA 2e-03 NA 9e-03 NA - NA Ingestion of Soil

Ingestion of Food Crops

External Exposure

NRF-32 - S5G Basin Sludge Disposal Bed
(No Action site)

Arsenic 2e-06 - 2e-06 - 2e-05 - 2e-05 - Ingestion of Soil (b)

Ingestion of Food Crops (b)
NRF-17 (e) - S1W Retention Basins
(Remedial Action Site)

No risk assessment was performed for this site.

a) Pathways that showed a carcinogenic risk of 1 x 10 -6 or greater risk or a hazard quotient of 1.0 or greater. If no single pathway showed greater than 1 x 10 -6 risk or a hazard quotient of 1.0, the pathway that contributes most to the constituent overall risk is shown
b) These pathways show a risk greater than 1 x 10 -6 a or a hazard quotient greater than 1.0 at the 100-year residential scenario.
c) A risk management decision was made, based on the conservative nature of the risk assessment, to eliminate mercury as a contaminant of concern for this site even though the hazard quotient was calculated as greater than 1.0 (See discussion in Section 4.1.2.6)
d) NRF-14 and NRF-12B were evaluated as one area because of their close proximity to each other and similar history and discharges
e) An unacceptable risk is presumed to exist at these sides based on process knowledge and sampling results from downstream units.
f) S1W Tile Drainfield and L-Shaped Sump were evaluated separately.

NA Not Applicable
HQ Hazard Quotient
- Risk was below 1 x 10 -6 or hazard quotient was less than 1.0.

Table 6. Contaminants Eliminated as Contaminants of Potential Concern

Site	Contaminant with Risk < 1E-06 or HQ < 1.0
NRF-02	Chromium
NRF-11 (SIWF Tile Drainfield)	Dieldrin
NRF-11 (L-Shaped Sump)	Americium-241
	Americium-243
NRF-12A	Chromium
	Americium-241
	Carbon-14
	Plutonium-238
	Plutonium-239
NRF-12B,14	Aroclor-1260
	Carbon-14
	Plutonitum-239
	Chromium
NRF-13	Arsenic
	Cesium-137

	Cobalt-60
NRF-16	Benz(a)anthracene
	Benzo(b)fluoranthene
	Indeno(1,2,3-CD)pyrene
NRF-19	Chromium
	Carbon-14
	Plutonium-239
	Uranium-234
NRF-21A	Cadmium
	Chromium
	Silver
NRF-21B	Antimony
	Cadmium
	Chromium
	Silver
	Benzo(b)fluoranthene
NRF-23	Cadmium
	Chromium
	Silver
	Benz(a)anthracene
NRF-43	Carbon-14
	Plutonium-239
NRF-79	Carbon-14
	Manganese-54
NRF-81	Carbon-14
	Plutonium-239

4.1.2.5 Risk Assessment Uncertainties

There are many uncertainties associated with the risk assessment calculations. Uncertainties are associated with all estimates of carcinogen and noncarcinogen health hazards. These uncertainties result from incomplete knowledge of many physical and biological processes and assumptions made on such items as land usage and availability of contaminants. Where specific information is not available, it is necessary to make assumptions and/or use predictive models to compensate for lack of information. The assumptions, models, and calculations are chosen so that the resulting risk and hazard estimates are protective of human health. However, these assumptions usually result in a conservative estimate of risk. Table 7 shows the uncertainties associated with various aspects of the risk assessment performed for the individual sites.

Table 7. Uncertainties Associated with Individual Site Risk Assessments

Area	Uncertainties	Effect on Risk
Sampling and Analysis	All constituents, or their maximum values, may not have been identified.	Underestimate
	A representative concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate

Concentration Terms	Maximum values are used in the risk assessments.	Overestimate
	All risk assessments use one-half the detection limits when the constituent is not detected.	Overestimate
Fate and Transport	Use of generic modeling parameters may not be truly representative of NRF.	Overestimate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
	Chemical compounds are indeterminate.	Underestimate or Overestimate
	Physical parameters of soil on which analysis performed not known.	Underestimate or Overestimate
	The presence of oil and organics in the effluent complicate fate and transport determination.	Underestimate or Overestimate
GWSCREEN Modeling(used assessing groundwater pathway)	Peak concentration times of constituents that occur for over 10,000 years in the future are not included in the risk assessments.	Underestimate
	GWSCREEN input parameters (i.e., contaminant solubility limit, distribution coefficient (K d), and infiltration rate) are considered conservative, but contain some uncertainty.	Underestimate or Overestimate
	Maximum source term concentrations are assumed for the entire volume modeled for each site.	Overestimate

Area	Uncertainties	Effect on Risk
Exposure Assessment	Assumes residences could be established in areas that are uninhabitable due to physical or administrative limitations.	Overestimate
	Default exposure values assume maximum possible exposure times, particularly for the occupational scenario where exposure times were 8 hours per day rather than more realistic times of a maximum of a few hours a week.	Overestimate
	The dermal absorption pathway was not included in the risk assessment calculations.	Underestimate
	Withdrawn values from IRIS or HEAST are used in	Underestimate or

	the risk assessments.	Overestimate
	Assumes that maximum constituent concentrations are present for all pathways.	Overestimate
Toxicity Assessment	Use of parent nuclide slope factor plus daughter (D) rather than adding slopes for both.	Underestimate
	Extrapolation of values from nonhuman studies to humans, from high doses to low doses.	Overestimate or Underestimate
	Route-to-route extrapolations are used.	Underestimate or Overestimate
	Lead was not included in the risk assessment calculations.	Underestimate
	Chromium was assumed, based on sample data, to be present in the trivalent state and not the more toxic hexavalent state.	Underestimate
	An assumption is made of the chemical form.	Underestimate or Overestimate
Risk Characterization	Risks are added across constituents and pathways, although they may not affect the same target organ or mechanisms of damage.	Underestimate or Overestimate
	Assumption that constituents are evenly distributed at maximum concentrations throughout the source Volume.	Overestimate
	Toxicity values for some constituents (chromium, silver) are based on industrial conditions.	Overestimate
	Reference doses and slope factors were not adjusted from oral to dermal toxicity for the dermal pathway.	Underestimate

4.1.2.6 Individual Site Risk Assessment Conclusions

The INEEL future land use document states that the most likely land use scenario for the area around NRF will be industrial for the next 100 years. Land use is a consideration when determining the appropriate level of risks within an area of concern. NRF maintains strict control over the radiological areas identified in OU 8-08. Adequate management and operational controls are in place to control exposure at sites that show a potential risk to a current or 30-year occupational receptor. Cobalt-60 was one of the primary COPC for the occupational scenarios. However, with a half-life of near five years, the cobalt-60 will

have decayed to insignificant amounts within 100 years which would be the earliest a residence at NRF could be expected. Most of the sites that show an elevated risk are subsurface soil contaminated areas and excavation would be required for exposure to contaminants. NRF-12B, 19, and 14 are outside the NRF security fence, but have separate surrounding fences to prevent any human contact with the contaminants even though the contaminants are primarily subsurface. The risk assessments used default exposure parameters to determine the likely risk to an occupational receptor. These default parameters assume the receptor will be in the area for eight hours a day and 250 days a year. The default values are conservative compared to the actual time an occupational receptor would be at the OU 8-08 sites. The typical occupational receptor at NRF would rarely visit these sites (i.e., annual environmental monitoring and sampling, which requires two to four individuals less than eight hours per year, are the only times individuals enter the areas). Based on the above information, the 100-year residential scenario is the scenario of concern.

The contaminants of concern (COCs) are those constituents that show a risk above the NCP target risk range of 1E-04 to 1E-06 or a hazard quotient greater than 1.0 for the 100-year residential scenario. Those constituents that show a carcinogenic risk above 1E-06 or a hazard quotient above 1.0 for the individual site risk assessments include: arsenic, antimony, mercury, benzo(a)pyrene, n-nitrosodi-n-propylamine, americium-241, cesium-137, neptunium-237, nickel-63, plutonium-238, plutonium-244, strontium-90, and uranium-235.

Groundwater risks were evaluated using the GWSCREEN modeling program and by evaluating samples collected from a network of groundwater monitoring wells (Figure 3). The GWSCREEN modeling assessed residual contamination in the soil and the ability of the contaminants to migrate toward the aquifer. GWSCREEN modeling did not show any contaminants reaching the groundwater during the 100-year residential scenario, with the exception of n-nitrosodi-n-propylamine (at 114 years), for the individual OU 8-08 sites that do not have a current water source to drive contaminants toward the groundwater. GWSCREEN used very conservative modeling parameters, however, many of the radiological contaminants were shown to decay to below risk-based concentrations prior to reaching the aquifer.

Groundwater samples were also evaluated to assess those contaminants that may have reached the aquifer because a driving force is currently present (e.g., industrial waste ditch) or was present at one time (e.g., S1W Leaching Beds). Although some elevated levels of contaminants have been detected during sampling (see Section 3.4), none of the average concentration of contaminants were found to be above the stringent maximum contaminant levels (MCLs) of federal drinking water standards. These MCLs are based on allowable risk levels established by the EPA. The GWSCREEN and groundwater sampling show the groundwater pathway is not a pathway of concern at NRF.

Arsenic, antimony, mercury, benzo(a)pyrene, and n-nitrosodi-n-propylamine were eliminated as COCs for various reasons during risk management decisions. Risk assessment calculations for all five contaminants were very conservative in nature and likely overestimated the risks. The maximum detected concentration for each contaminant was generally used for risk

assessments and it was assumed the entire area was contaminated at that level. Antimony and

n-nitrosocli-n-propylarnine were COPCs at one site based on one sample collected below a 10 foot depth, which is the depth that would eliminate most exposure pathways. Mercury was assumed to be in the most toxic form (methylmercury) even though this is very unlikely at NRF.

Benzo(a)pyrene risks were calculated to be equal to or slightly greater than 1E-06 at two sites and sample results may not have been representative of the areas sampled (e.g., sample results from sediment in a concrete enclosed sump were used to estimate surrounding soil contamination even though there was no evidence of sump leakage). There was no known process release of arsenic at NRF and the background levels, which are used to screen potential contaminants, may be higher than published. In addition, the site with the highest calculated arsenic risk is an area where remedial action was anticipated (NRF-12B).

A risk assessment was not performed for lead, which was detected at one location (NRF-12B) above EPA recommended screening levels for lead cleanup. Lead was retained as a COC.

Those sites that contain or potentially contain one or more COC above the target risk range are identified as sites of concern. The sites of concern include:

- NRF-11, S1W Tile Drainfield and L-shaped Sump
- NRF-12A, Underground Piping to Leaching Pit
- NRF-12B, S1W Leaching Pit
- NRF-14, S1W Leaching Beds
- NRF-17, S1W Retention Basins
- NRF-19, A1W Leaching Bed
- NRF-21A, Old Sewage Basin
- NRF-21B, Sludge Drying Bed
- NRF-80, A1W/S1W Radioactive Line Near BB19

NRF-17, NRF-80, and the drainfield portion of NRF-11 were the only sites that did not show a risk above 1E-04. They are retained as sites of concern because of their potential to contain COCs above risk-based levels. NRF-80 is an underground pipe and NRF-17 is a concrete basin and both may have leaked in the past. The drainfield portion of NRF-11 was used for radioactive discharges in the early 1950s. A risk assessment for the soil below NRF-17 (S1W Retention Basins) was not performed because of the lack of sample data and the difficulty associated with collecting samples in this area. Sampling results from NRF-80 and NRF-11 (drainfield portion) may not be representative of present site conditions because NRF-80 represents potential sporadic contamination, making characterization sampling very difficult, and the underground piping at NRF-11 could not be found using geophysical surveys prior to sampling. NRF-17 and NRF-80 are retained as sites of concern because of the uncertainty associated with the potential leaks. The drainfield portion of NRF-11 is also retained as a site of concern because of the uncertainty with the location of the underground piping and associated contaminated soil. At each location, contamination above risk-based concentrations is presumed based on process knowledge and sampling performed downstream of sites NRF-17 and NRF-80.

For sites NRF-13, 32, and 79, the low risks are due to the small amounts of contaminants present. For sites NRF-02, 16, 23, 43, 66, and 81 the low risks are due to the relatively small amounts of contaminants present, the protective nature of present site conditions (contaminants inaccessible because of structures, soil covers, or administrative controls), and the assumption of 100 years of industrial control.

4.1.3 New Site Risk Assessments

Track 1 investigations were performed for sites NRF-82 and NRF-83. The assessments determined that a source was present at each site, but current site conditions limit exposure to the sources. For NRF-82, industrial control for 100 years is assumed and this results in a low estimated risk. For NRF-83, no exposure route is present from the contaminant to a receptor because the contamination is presently below a concrete pad. Since the assessment of these two areas was made after the NRF Comprehensive RI/FS, an additional evaluation was made to determine the potential impact of these two sites to the cumulative risk assessment of NRF. Each site was determined not to impact the cumulative risk assessment because of the small amount of contamination present at NRF-82 and the lack of an available exposure route at NRF-83.

4.2 Ecological Risk Assessment

A Screening Level Ecological Risk Assessment (SLERA) evaluated the known or potential sites at NRF where previous investigations and sampling had determined that a source of contamination remained. Risks were calculated for six representative wildlife species based on an INEEL guidance manual for performing SLERAs. Organic, inorganic, and radiological constituents were evaluated through the ingestion and external exposure pathways. Assessment results were used to compare risks. Calculated screening level quotients were not considered to be additive because of the potential for compounding the uncertainty.

Based on the results of samples collected since 1987 and toxicity values used at other INEEL facilities, the metals arsenic, lead, and mercury were the risk drivers for ecological receptors at NRF. Radionuclides and organics were also contributors to the overall ecological risk, but the risks were very low. No additional ecological risk assessment was deemed necessary for radionuclide and organic compounds. NRF-23 (Sewage Lagoons) presented the highest potential ecological risk based on accessibility, attractiveness, number of constituents present, and associated risk.

The results of the SLERA were also used to select receptors for additional ecological risk assessment. Receptors were selected on the basis of potential exposure and perceived value to society. The SLERA determined that deer mice, bald eagles, and mallard ducks were the

primary receptors of concern. Deer mice were calculated to receive some of the highest exposures in the vicinity of NRF. Bald eagles were selected because they prey upon deer mice, are a threatened species, and are perceived as a valued species by the general public. Mallards were a receptor of concern because they breed in the vicinity of the sewage lagoon. can be prey for bald eagles, and are a game species.

The ecological risk assessment addressed the effects of arsenic, lead, and mercury on the three receptors identified in the SLERA. Exposure values for these metals were calculated for each receptor and compared to a range of exposure values that resulted in no observable adverse effects to laboratory test animals. These comparisons were qualitatively assessed, since no studies were found that directly measured the effects of arsenic, lead, and mercury on the receptor species. The weighted average concentration for each of these constituents at NRF was also compared to background levels. The risks associated with the exposures to the ecological receptors are characterized as low. Although there are uncertainties associated with this screening assessment, the results indicate that no additional actions are required due to estimated risks to ecological receptors.

4.3 Cumulative Risk Assessment

A cumulative risk assessment was performed to determine if there are additional risks due to the cumulative, or additive, effects associated with having several individual sites near one another. The cumulative risk assessment evaluated all sites previously assessed and the OU 8-08 sites assessed during the NRF Comprehensive RI/FS. This included the 13 COCA sites evaluated prior to the FFA/CO and the 10 sites in OUs 8-04, 05, and 07 associated with a previous ROD. Each site was evaluated and screened out of the process if no constituent source was present or if the constituent concentrations were below screening levels. Screening levels corresponded to an excess cancer risk of 1E-07 or a hazard quotient of 0-1.

The 100-year future occupational worker and 100-year future resident were the scenarios considered for the Cumulative risk assessment. The exposure pathways considered were inhalation of fugitive dust, ingestion of groundwater, and direct radiation exposure. The soil ingestion and food crop ingestion pathways were not considered because they are not likely to occur from more than one release site at a time.

The cumulative risk assessment identified that chromium, n-nitrosodi-n-propylamine, and cesium-137 are the only constituents that showed a calculated risk value greater than 1E-06 or a hazard quotient greater than 1.0 for the scenarios evaluated. Although chromium and n-nitrosodi-n-propylamin(B showed elevated risk values during the 100 year scenarios, they are not considered COCs at NRF. A hazard quotient of 3.5 through the inhalation pathway was calculated for chromium. The concentration source term used for chromium was very conservative (i.e., maximum values from most sites). Considering the conservative nature of

the cumulative risk asserssment and the fact that the hazard quotient for chromium was less than an order of magnitude greater than 1.0, a risk management decision was made that chromium is not a COC. N-nitrosodi-n-propylamine was detected at only one location at the 20 foot depth. It was eliminated as a COC during the individual site risk assessment. The estimated risk valuefor cesium-137 through the direct exposure pathway is 2E-4 for the occupational scenario and 1E-3 for the residential scenario. Cesium-137 was identified as a COC in the individual site risk assessments.

In addition to the uncertainties identified in Section 4.1.2.5 for the individual site risk assessments, there are uncertainties associated with the cumulative risk assessment. To assess cumulative effects, theoretical areas were defined that represented the total area of sites. The concentration for each constituent in the theoretical area (the source term) was then estimated using a weighted average of the highest concentration found in each area. This is a very conservative source term estimate. Additionally, the groundwater transport model tends to overestimate the groundwater concentration that further adds to the conservatism of the risk assessment calculations. The estimated risk values are believed to overestimate the risk from these areas.

The cumulative risk assessment shows that the individual risk assessments do not underestimate the risk. No additional COCs were identified when considering cumulative effects from the many individual sites at NRF that would impact decisions made on a site by site basis. Actions taken on individual sites will be adequate for WAG 8 as a whole. The cumulative assessment also determined that the decisions made for the 13 COCA sites (all No Action) and the 10 sites associated with a previous ROD (three landfill covers and seven No Actions) were appropriate and no additional action is necessary for the sites.

4.4 Risk Assessment Conclusions

The risk assessment process described above identified nine sites of concern (all of which are OU 8-08 sites) that have or potentially have unacceptable risks to human health. In addition, 55 sites were found to have no risk or an acceptable risk. Sixteen of the 55 sites had no hazardous source present and, therefore, no risk. Twenty-seven of the 55 sites have a low or acceptable risk because of the small amount of contaminants present or potentially present. Twelve of the 55 sites have a low risk primarily because of site conditions (industrial control assumed for 100 years or no exposure route from contaminants to receptors are present). The cumulative assessment did not identify any additional sites of concern and concluded that the decisions made for 23 sites (13 COCA sites and 10 sites from a previous ROD) were appropriate. The ecological risk assessment determined that risks associated with exposures to ecological receptors are low, indicating no additional actions are required due to estimated risks to

ecological receptors. The sites of concern are shown on Figure 4 with respect to NRF.

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5.0 Description of Alternatives

Sections 5.0 and 6.0 of this ROD are applicable to the nine sites of concern identified in Section 4.0. This section describes the alternatives considered to address the risks associated with the nine sites of concern. Section 6.0 gives a summary of the comparison of the alternatives.

5.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) are medium-specific goals established to protect human health and the environment. Medium-specific means soil, air, or groundwater. The RAOs include contaminants of concern (COCs), exposure routes and receptors, and an acceptable risk for each exposure route. The RAOs are used to help identify potential remedial action alternatives. The RAOs for OU 8-08 are protective of ecological receptors as well as human health. The media of concern for OU 8-08 is soil. Infiltration of contaminants to the groundwater is not a pathway of concern. The 100-year future residential scenario was used for the development of RAOs because controls are presently in place to protect current and future occupational workers and NRF is expected to remain an industrial site for at least the next 100 years, The rationale for the 100-year future residential scenario being the scenario of concern is given in Section 4.1.2.6. The RAOs for OU 8-08 are as follows:

For Human Health Protection

- Prevent external gamma radiation exposure from all radionuclides of concern that exceed a total exposure pathway excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.

- Prevent ingestion of soil and food crops contaminated with radionuclides of concern that exceed a total pathway excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.

- Prevent exposure to soil contaminated with lead that exceeds the EPA recommended screening level of 400 ppm for lead cleanup.

For Environmental Protection

- Prevent erosion or intrusion by resident plant or animal species in contaminated soils

that could cause the release of contaminated soils.

- Prevent exposure to COCs that may cause adverse effects on resident species populations.

Specific remediation goals for the COCs were established based on the RAOs. The RAOs provide a target risk from which risk-based concentrations can be established. Generally, CERCLA risk management decisions are based on carcinogenic excess risk levels in the range of 1 chance in 10,000 to 1 chance in 1,000,000. Because of the conservative nature of the risk assessment assumptions used to calculate a corresponding soil concentration, a risk management decision was made to use the 1 in 10,000 excess carcinogenic risk as the target risk for calculating risk-based soil concentrations. Table 8 shows the COCs, the exposure routes of concern, and the soil concentration for each constituent corresponding to a 1 in 10,000 excess carcinogenic cancer risk (except for lead which reflects a corresponding soil concentration that is an EPA recommended screening level for lead cleanup) for the future 100-year residential scenario. Other exposure routes are available for the COCs shown on Table 8, but only those routes with an excess risk greater than 1 in 1,000,000 (1E-06) are shown since a risk less than 1E-06 would not significantly contribute to the overall risk associated with the COC.

Table 8 also shows the maximum concentration of each COC detected at each site of concern during characterization sampling performed in 1991 and 1992 or NRF Comprehensive RUFS sampling performed in 1996. The bold numbers on Table 8 represent those contaminants present above a risk-based concentration. Although NRF-11 (S1W Tile Drainfield portion), NRF-17, and NRF-80 do not show the presence of contaminants above risk-based concentrations, indirect evidence suggests that contaminants are present above risk-based concentrations.

The three primary contaminants of concern are lead, cesium-137, and strontium-90, which were the only contaminants detected above risk-based concentrations. Remediating the soil to specific lead, cesium-137, and strontium-90 soil concentrations would reduce the risk associated with those constituents and in all likelihood would reduce the other contaminants' risk values. For example, the maximum detected concentrations of americium-241, nickel-63, plutonium-238, and plutonium-244 all occurred in areas where cesium-137 was above cleanup levels.

Remediation goals, which generally refer to a specific contaminant concentration, are established to meet the RAOs and are based on lead, cesium-137, and strontium-90 concentrations. The remediation goals for OU 8-08 are 16.7 pCi/g of cesium-137, 45.6 pCi/g of strontium-90, and 400 ppm lead. The remediation goals are based on human health risks and are also protective to ecological receptors. As stated in Section 4.2, the ecological risk assessment concluded no additional action above those actions taken for protection of human health was necessary due to estimated risks to ecological receptors.

5.2 Summary of Alternatives

The NRF Comprehensive Feasibility Study identified four remedial action alternatives to be

considered for detailed analysis. These alternatives, with the exception of the No Action alternative, meet the RAOs, provide overall protection of human health and the environment, meet ARARs, and are cost effective. The four remedial action alternatives are as follows:

- Alternative 1: No Action
- Alternative 2: Limited Action
- Alternative 3: Limited Excavation, Disposal, and Containment
- Alternative 4: Complete Excavation and Off-site Disposal

5.2.1 Alternative 1: No Action

The National Contingency Plan (NCP) requires consideration of a no action alternative to serve as a baseline for evaluation of other remedial alternatives. No land-use restrictions, controls, or active remedial measures; are implemented at the site under this alternative beyond the projected Federal government 100-year institutionat control period. Thus, contamination is attenuated only through radioactive decay processes. Current monitoring and radiological controls would continue during the institutional control period, which is the time frame that NRF remains an industrial site.

Table 8. Risk-based Soil Concentrations and Maximum Concentrations (pCilg or ppm) of COCs Detected at Sites of Concern

Risk-based Soil Concentrations(a)	Lead (b)	Am-241	Cs-137	Np-237	Ni-63	Pu-238	Pu-244	Sr-90	U-235
Direct Contact	400(c)	NA	NA	NA	NA	NA	NA	NA	NA
External Exposure	NA	895	16.7	NA	NA	NA	3.3	NA	13.2
Ingestion of Soil	NA	283	24,860	NA	NA	590	NA	15,418	NA
Food Crop Ingestion	NA	301	164	19.8	15,846	1,153	NA	45.6	NA
Site of Concern									
NRF-11 S1W Tile Drainfield	11.1	ND	0.3	ND	9.96	ND	ND	ND	ND
L-Shaped Sump	13.0	0.42	45.98	ND	ND	ND	0.09	ND	ND
NRF-12A	13.0	0.60	7,323	ND	329.06	0.60			

								0.24	35.35	ND
NRF-12B	1,140	0.15	16,00	ND	171.40	0.15	ND	37.30	ND
NRF-14	31.5	5.9	2,040	0.79	730	5.9	ND	83	ND
NRF-17 (d)	89	ND	1.1	ND	ND	ND	ND	ND	ND
NRF-19	18.4	20	1,390	ND	730	20	ND	750	ND
NRF-21A	150	ND	229	ND	7.74	ND	ND	2.02	ND
NRF-21B	75	ND	43.9	ND	4.59	ND	ND	ND	0.17
NRF-80	14	ND	ND	ND	5.48	ND	ND	ND	ND

Bold indicates concentration of contaminant detected above a risk-based concentration.
ND - Not Detected
NA - Not Applicable

(a) Concentrations correspond to a 1 X 10 -4 carcinogenic risk
(b) Lead results derived from total metals analysis
(c) EPA recommended screening level for lead cleanup.
(d) Sample results were fron soil adjacent to the retention basins and not from suspected contamination below the basins.

The no action alternative would be easily implemented without any additional costs. However, the risk assessment performed for the OU 8-08 sites of concern indicates the presence of unacceptable risks to human health and the environment and therefore, the no action alternative is ineffective and does not meet the RAOs.

5.2.2 Alternative 2: Limited Action

Alternative 2 consists of the following institutional controls to protect human health and the environment against potential risks associated with OU 8-08 sites of concern:

- Long-term monitoring
- Fencing and/or other barriers
- Land use restrictions
- Existing cover inspection and maintenance
- Erosion control

Long-term monitoring would be performed at all sites. Monitoring would include continued

sampling of soils near the sites of concern and groundwater sampling. Specific monitoring parameters would be established during the remedial design phase, but would likely include radiological groundwater sampling from present monitoring wells. Such monitoring activities would be performed concurrently with any other ongoing monitoring programs at NRF and the INEEL. The monitoring would continue through the institutional control period, which is the time frame that NRF remains an industrial site.

Access to the INEEL is currently restricted for purposes of security and public safety. Since the location of all the OU 8-08 sites are within the boundaries of the INEEL, site-wide access restrictions would limit accessibility. In addition, the existing double security fence surrounding NRF encloses all of NRF-17, 21B, and 80, and portions of NRF-11 and 12A. The existing security fence would be maintained as necessary during the control period. Installation of additional fences or relocation of existing fences may also be necessary. Other access control measures may include (but are not limited to) warning signs, property border signs, land use restrictions, and establishing training requirements for persons allowed access. A description of the areas where access would be restricted, the specific controls (e.g., fences, signs) that would be used to ensure that access would be restricted, the types of activities that would be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls, would be determined during the remedial design phase and would be incorporated into the Bettis Atomic Power Laboratory Site Development Plan (SDP). This information would be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF would also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above.

Maintenance of surface integrity, including repairing effects of subsidence and erosion, would be performed as necessary to prevent exposure of subsurface contaminants. Maintenance crews would use the same type of native soil presently at NRF. Erosion control would be maintained by grading surface areas to provide drainage and runoff control, and revegetation may prevent erosion of existing cover materials.

The limited action alternative is considered to be easily implemented for both the short-and long-term, since the specified actions are essentially a continuation of the existing management practices conducted at the OU 8-08 sites of concern. The costs associated with this alternative are primarily due to environmental monitoring activities. Soil cover maintenance, fence maintenance, and erosion control would be performed only on an as-needed basis.

This alternative is generally considered to be effective for the protection of human health and the environment. However, after the institutional control period of the INEEL is discontinued, risks to human health and the environment would be dependent on access restrictions placed around the sites of concern. Assuming access restrictions are maintained even after the end

of
the institutional control period and the ability to enforce the access restrictions exists, Alternative 2 is considered effective for protection of human health if there is no degradation of the existing cover material. Alternative 2 may not be as effective to the protection of ecological receptors, since small animals may burrow into the soil or plants may establish residence in the cover material. The approximated time to implement this alternative would be one year.

5.2.3 Alternative 3: Limited Excavation, Disposal, and Containment

Alternative 3 consists of the following actions to isolate the contaminated soil at OU 8-08 sites of concern:

- Excavation using standard techniques
- Verification sampling
- Transportation
- Contamination control
- On-site consolidation
- Containment with engineered earthen cover
- Site restoration
- Institutional controls
  - Short-term monitoring
  - Long-term monitoring
  - Fencing and/or other barriers
  - Land use restrictions
  - Cover inspection and maintenance
  - Erosion control

This alternative removes soil and debris from six sites and consolidates the soil at NRF-14 (S1W Leaching Beds). An estimated 133,000 cubic feet of soil would be excavated of which an estimated 58,000 cubic feet would be contaminated above remediation goals and placed in NRF-14. Approximately 3,130 linear feet of underground piping would be removed. An engineered cover would be placed over NRF-14 and NRF-12B, which are adjacent to each other. Another cover would be placed over NRF-19. This alternative requires excavating contaminated soil, pipes, and concrete structures from the following sites: NRF-11, 12A, 17, 21A, 21B, and 80. Conventional excavation equipment has been demonstrated to be effective in retrieving radioactive soil and debris in other INEEL remedial responses. After excavation these sites would be filled with clean soil. In addition, the pipes leading to NRF-14 and 19 would be excavated. The pipe and concrete structures, which would have been removed during decontamination and dispositioning work regardless of remedial actions, would be managed and disposed of under current NRF radioactive waste management policies. Presently, this involves disposal at the Radioactive Waste Management Complex (RWMC) for radiologically contaminated debris or disposal per the INEEL Site Treatment Plan for mixed radiological and hazardous debris. NRF-12B (S1W Leaching Pit), NRF-14 (S1W Leaching Beds), and NRF-19 (A1W Leaching Bed) represent the sites with the greatest volumes and concentrations of contaminated soil. The soil at NRF-12B, 14, and 19 would not be removed.

A single area of contamination (AOC) will be defined to include the areal extent of contiguous contamination which will encompass both the excavation and consolidation sites. The specific

boundaries of the AOC would be identified and refined in subsequent documents such as the Remedial Design/Remedial Action Scope of Work and the Remedial Action Work Plan. Under this alternative, contaminated soils are not expected to be removed from the AOC. Movement

and stock-piling of contaminated soils within the AOC for purposes of consolidation during remedy construction is riot intended to trigger Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act land disposal restrictions. However, in the unlikely event that the volume of contaminated soils exceeds the capacity of the leaching beds, contingency actions could include disposal of contaminated soils outside of the AOC (i.e., probably away from the NRF). In such a case, the soils would be subject to the same waste management requirements that pertain to the contaminated debris leaving the AOC.

Real time gamma surveys could be used to delineate the extent of contamination to be removed as the excavation proceeded. Sodium iodide or germanium detectors could be calibrated to detect radiological contamination present at concentrations above remediation goals. Cesium-137, which is a gamma emitter, is the primary COC at each site. As deemed necessary in the remedial design phase, laboratory analysis of an agreed upon number of representative grab samples would be required to verify the real-time assessment. Real-time surveys can reduce the volume of clean soil removed and mixed with contaminated soil.

Current radiological controls practices could be used to reduce radiation exposure to the operator. Radiological controls could consist of limiting the amount of time an operator can work in the area, using containment structures around the contaminated material to prevent the spread of contaminants, ensuring containment structures around the contaminated material have a negative pressure to prevent airborne release of contaminants, wearing personnel protective equipment, and using distance and shielding to reduce radiation exposure.

Debris would be sampled during excavation for characterization purposes to ensure it is not RCRA hazardous. No RCRA hazardous debris is expected at any of the sites of concern. If sampling shows the debris to be RCRA hazardous and radiologically contaminated, then the debris will be disposed of as mixed waste per the INEEL Site Treatment Plan. The debris would be packaged according to the Site Treatment Plan requirements.

During excavation, dump trucks would most likely be positioned near the excavation site such that backhoes can place the contaminated soil directly into the dump truck. Possible dust suppression techniques used during excavation include: keeping the soil wetted during excavation activities, performing excavation in tented enclosures, halting excavation work during windy conditions, and keeping man-made covers over contaminated soils. The dump truck may contain tarps to prevent the release of soil in transit. The dump truck will then transport the soil to the S1W Leaching Seds (NRF-14) for on-site consolidation. The leaching beds contain dirt ramps to allow the dump truck to drive to the bottom of the leaching beds and empty the soil. Other means of transporting the soil, such as directly with a backhoe or in boxed containers, would be considered during the remedial design phase of the action. The estimated contaminated Soil Volume from all the proposed excavation areas would fit into the present leaching beds. All actions will require radiological controls as discussed above.

Contingency actions would include off-site (away from NRF) disposal of soil that exceeds the capacity of the leaching beds or continued consolidation at the beds above surface level, although these are unlikely to be necessary.

Verification sampling, consisting of radiation surveys and soil sampling and analysis, would be performed to confirm that all contamination exceeding remediation goals was removed from the site of concern. Following the removal of the contaminated soil from the sites, contouring to conditions of the surrounding landscape and filling excavated areas with clean materials would restore each site. Backfilled areas would be compacted to prevent future subsidence. Sites would be revegetated as appropriate.

The engineered cover could consist of geologic materials including native soil, gravel, basalt cobbles, and rip-rap. Variations from this conceptual design are possible based on layer thickness, layer material, layer order, location of a potential biobarrier in the cap profile, and other considerations. The conceptual design would be developed during the remedial design and modified as needed to meet defined functional and operational requirements, with the concurrence of regulatory agencies. The engineered barrier will be designed for use in arid climates, but may include designs limiting infiltration.

Specific performance goals (as given in 10 CFR 61, Licensing Requirements for Land Disposal of Radioactive Waste) are established for the cover and include:

- Installation of covers that are designed to discourage any indiv idual from--i'nadvertently intruding into the contaminated soil, or from contacting the contaminated soil at any time after active institutional controls over the sites are removed, up to the design life of the covers.
- Application of maintenance and surface monitoring programs for the containment systems capable of providing early warning of releases of radionuclides from the sites, before they leave the site boundary.
- Institution of restrictions limiting land use to industrial applications for at least 100 years.
- Implementation of surface water controls to direct surface water away from the contaminated soil.
- Elimination, to the extent practicable, of the need for ongoing active maintenance of the sites following closure so that only surveillance, monitoring, or minor custodial care are required.
- Placement of adequate cover to inhibit erosion by natural processes for the specified design lives of the cap.

· Incorporation of features to inhibit biotic intrusion into the contaminated soil areas.

Institutional controls would be implemented after the construction of the covers. Long-term monitoring, fencing and/or other barriers, land use restrictions, cover inspection and maintenance, and erosion control as explained for Alternative 2, Limited Action, would be applicable. A description of the areas where access would be restricted, the specific controls (e.g., fences, signs) that would be used to ensure that access would be restricted, the types of activities that would be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls, would be determined during the remedial design phase and would be incorporated into the SDP. This information would be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF would also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above.

Radiation surveys would be required at the covered sites. Additional surveys across and around the sites would be performed to detect radionuclides potentially mobilized by burrowing animals, erosion, or other natural processes. Cover integrity monitoring would be performed across and around the cover sites to assess maintenance requirements due to erosion, cracking, or other observable deterioration of the cover.

Maintenance to the protective cover would be performed based on the results of routine cover inspections. The protective cover would likely be inspected monthly during the first 12 months because potential problems (such as settling or subsidence) are most likely to occur within this period. After the initial 12 month period, cover inspection may be performed annually. Maintenance requirements may include periodic removal of undesirable vegetation and burrowing animals and filling animal burrows. In addition, unacceptable erosion or subsidence would require repair of the affected area. Operations and maintenance goals will be defined during remedial design.

The short-term effectiveness of this alternative for protecting human health is judged to be moderate. Equipment operators and site personnel could receive minor radiological exposures during removal activities, however, these exposures could readily be controlled using standard radiation control measures. Short-term protection of the environment is expected to be high because adequate contamination control measures are specified. Toxicity and volume of contaminants would not be reduced by this alternative.

This alternative is considered to be highly effective in preventing long-term exposure at the covered areas. The shielding effects of the various layers of natural media would reduce surface radiation exposure. The covers are designed for long-term isolation with minimal maintenance requirements. The engineered cover for this alternative would be effective in

preventing biointrusion and add a high level of inadvertent human or animal intruder protection, by both the mass and impenetrability of material overlying contaminated soils.

Installation costs of this engineered cover are financially feasible. Construction materials are readily available on-site. Long-term inspection and maintenance requirements are considered minimal. Long-term monitoring requirements, including radiation surveys, would be easily implemented during the institutional control period. The approximate time to implement this alternative would be three years.

5.2.4 Alternative 4: Complete Excavation and Off-site Disposal

Alternative 4 consists of the following actions to isolate the contaminated soil at OU 8-08 sites of concern:

- Excavation using standard techniques
- Verification sampling
- Transportation
- Contamination control
- Off-site (away from NRF) disposal
- Site restoration

This alternative would require excavating contaminated soil, pipes, and concrete structures from all the OU 8-08 sites of concern and disposing of the soil and debris to an off-site (away from NRF) location. An estimated 1,171,000 cubic feet of soil would be excavated of which an estimated 447,000 cubic feet would be contaminated above remediation goals requiring off-site disposal. Approximately 3,130 linear feet of pipe would be removed. The procedures and equipment used for excavating, surveying, and sampling soil would be the same as Alternative 3. Since NRF-12B, 14, and 19 would also be excavated, additional excavating, surveying, and sampling of the soil would be required. In addition, the soil would be characterized as described for the debris in the Alternative 3 discussion since the soil would be removed from the area of contamination (AOC). Filling excavated sites with clean soil, disposing of contaminated debris, and using currently practiced radiological controls would be the same as Alternative 3.

Similar to Alternative 3, dump trucks could be used to transport the contaminated soil. The dump truck would transport the soil to a transfer station or the disposal location. Actual shipping methods and packaging requirements would be determined during remedial design. Packaging may include placement of the soil in 4 foot wide by 4 foot deep by 8 foot long box prior to transportation away from NRF or the soil may be directly transported to the disposal facility by truck.

Disposal may occur at a proposed INEEL soil repository. The status of this facility is uncertain. The facility is currently projected to be south of the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)), which is only a few miles from NRF. The projected facility has not yet received funding or approval from DOE or regulatory agencies. A decision on the proposed disposal facility is expected in 1999. This alternative would require a secondary plan if the facility were not approved or available for

remedial actions occurring at NRF. Secondary disposal options include the RWMC, Test Reactor Area (TRA) Warm Waste Pond, or an off-INEEL disposal facility such as Envirocare in Utah.

The short-term effectiveness of this alternative for protecting human health is judged to be moderate. Complete excavation, which includes excavating all sites of concern rather than the limited excavation of Alternative 3 that does not excavate all sites of concern, would require the operators to be on-site longer and potentially exposed to contaminants for a longer duration. Equipment operators and site personnel could receive minor radiological exposures during removal activities, however, these exposures could readily be controlled using standard radiation control measures. Short-term protection of the environment is expected to be high because adequate contamination control measures would be specified. Long-term protection of human health and the environment is judged to be highly effective because contaminated soil would no longer exist at any NRF site. Toxicity and volume of contaminants would not be reduced by this alternative.

Short-term technical implementability of this alternative is considered moderate if the proposed INEEL soil repository is approved and available for NRF soil generated from remedial actions. Proposed excavation equipment is currently available. Characterization, packaging, and transportation of the contaminated material can be performed using currently available technology. Long-term implementability is considered high, since the contamination is removed. Long-term inspection and maintenance are considered minimal. Long-term environmental monitoring other than what is currently performed would not be required because the contaminant source would be removed.

The short-term costs of this alternative would be high. Significant costs would be incurred for safety analysis, satisfying ARARs, and operational and capital costs. The primary capital costs associated with this alternative would be disposal facility fees and transportation costs. Compared to other disposal options, the potential INEEL soil repository disposal costs are considered moderate. Operations and maintenance costs would be high during the excavation and disposal period primarily because of the radiological considerations. Long-term monitoring costs would be low assuming all contamination could be removed from the sites of concern. The approximate time to implement this alternative would be five years.

6.0 Summary of Comparative Analysis of Alternatives

The alternatives discussed above were evaluated using the nine criteria as specified by CERCLA:

- Overall Protection of Human Health and the Environment addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

- Long-term Effectiveness and Permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

- Short-term Effectiveness addresses any adverse impacts on human health and the environment,that may be posed during the construction and implementation period and the period of time needed to achieve cleanup goals.

- Reduction of Toxicity, Mobility, or Volume through Treatment addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the contaminants of concern, including how treatment is used to address the principal threats posed by the site.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital and operation and maintenance costs, expressed as net present-worth costs.

- State Acceptance reflects aspects of the preferred alternative and other alternatives that the state favors or objects to and any specific comments regarding state ARARs or the proposed use of waivers.

- Community Acceptance summarizes the publics general response to the alternatives described in the proposed plan and in the RI/FS, based on public comments received.

Each of the four alternatives were evaluated against the nine evaluation criteria identified above.
The criteria are subdivided into three categories: (1) threshold criteria that mandate overall protection of human health and the environment and compliance with ARARs; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction in toxicity, mobility, or volume through treatment, and cost; and (3) modifying criteria that measure the acceptability of alternatives to state agencies and the community. The selected remedial action alternative must meet the threshold criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the sites. The modifying criteria are used in the final evaluation of remedial alternatives and factors include the elements of the alternatives that are supported, not supported, or have strong opposition. The following sections summarize the detailed analysis of the four alternatives against the nine evaluation criteria.

6.1 Overall Protection of Human Health and the Environment

Alternative 1 (No Action) does not meet the RAOs, There would be no reduction in long-term risk to the public. The risk assessment performed in the NRF Comprehensive RI/FS shows that the no action alternative would not meet the criteria for overall protectiveness because some of the calculated risk values represent an increased cancer risk greater than the NCP upper limit of 1 in 10,000. With this alternative, the potential exists for direct exposure to humans. No surface water controls would exist to prevent erosion and exposure of contaminants to the environment.

Alternative 2 (Limited Action) initially meets the human health protection RAOs by providing restrictions on access and land use to prevent direct contact with the soil. This alternative

would also provide early detection of potential contaminant migration although this is not expected. Alternative 2 would also restrict access to the areas by larger animals such as deer and antelope, but may not restrict contact with the soil by smaller animals that could easily navigate through the established barriers. This alternative would also not prevent erosion or intrusion by plant species unless additional care is taken to repair erosion and prevent plants from establishing residence at the sites. No short-term effects would be created if Alternative 2
is implemented, because there would be no disturbance of the soil to affect the workers or the community. Long-term effectiveness would depend on the enforcement of land use restrictions, the effectiveness of posted signs, and continued maintenance operations to repair existing covers.

Alternative 3 (Limited Excavation, Disposal, and Containment) would meet all RAOs and provides a barrier (cover) against direct contact of contaminants by human and ecological receptors. This alternative also restricts access to the areas by fencing or other barriers and places land use restrictions while providing early detection of potential contaminant migration although this is not expected. The short-term effects would be limited to disturbance of the soil
and potential effects to the construction workers but not the community. Proper engineering controls along with personal protective equipment will reduce exposure hazards to the workers, Long-term effectiveness will depend on land use restrictions and adherence to posted signs Long-term effectiveness would also depend on the continued maintenance of the cover. In addition, long-term monitoring would provide meaningful data to measure this alternative's overall effectiveness.

Alternative 4 (Complete Excavation and Off-site Disposal) would meet all RAOs. The off-site (away from NRF) disposal area would provide a barrier (cover) against direct contact of contaminants by human and ecological receptors. The short-term effects would be limited to disturbance of the soil and potential effects to the construction workers but not the community. Proper engineering controls along with personal protective equipment will reduce exposure hazards to the workers. There will be no long-term consequences at the excavation sites because all contaminants would be removed, but long-term effectiveness at the off-site disposal area will depend on the enforcement of institutional controls and continued maintenance of the cover at the off-site disposal area.

Alternatives 3 and 4 equally satisfy the criteria of overall protection of human health and the environment. These alternatives cover the contaminants preventing direct contact with the soil, restrict future land use, minimize infiltration, and provide an early indication of contaminant migration although migration is not expected. Although Alternative 2 meets the general criteria of overall protection of human health, it does not prevent direct contact of contaminated soil by
ecological receptors. It also does not prevent erosion or intrusion by plant species unless additional care is given to repair erosion conditions and prevent plants from establishing residence at the sites.

6.2 Compliance with ARARs

Alternative 1 (No Action) would not meet DOE orders regarding protection of current or future receptors. Because Alternative 1 and Alternative 2 (Limited Action) do not provide containment of contaminants, they may not meet applicable rules regarding fugitive dust or control of air pollution, although there is no evidence that specific regulatory levels would be violated. No specific action would be taken to control fugitive dust or air pollution, which is possible for

surface soil contaminated areas; however, sampling and institutional controls for Alternative 2 would monitor the media of concern and prevent access to the sites of concern. Alternatives 3 and 4 would meet all ARARS and To-Be-Considered criteria provided proper engineering controls for dust suppression and emissions control are followed during excavation. If RCRA characteristic waste is encountered, which is not expected, those ARARs associated with RCRA requirements would be met.

6.3 Long-term Effectiveness and Permanence

The No Action alternative does not prevent future occupants from coming into direct contact with the contaminated soil or prevent exposure to contaminated soil through erosion by wind or water. This alternative does not maintain long-term effectiveness or permanence.

Limited Action (Alternative 2) would prevent future occupants from coming into direct contact with contaminated soils by establishing fencing or other barriers and by land use restrictions, but
does not prevent exposure to contaminated soil through erosion by wind or precipitation. The long-term effectiveness depends on the ability to enforce the land use restrictions and maintain existing covers. Long-term monitoring of groundwater and soil would provide early warning of potential contaminant migration, although this is not expected.

Limited Excavation, Disposal, and Containment (Alternative 3) consolidates most of the soil at NRF-14. An engineered earthen cover would be placed over NRF-14 and the adjacent area, NRF-12B. Another cover would be placed over NRF-19. This alternative would prevent the dispersion of contaminants through erosion by wind or precipitation and direct exposure by contact, and would limit infiltration from precipitation. The long-term effectiveness of this alternative depends on the durability of the designed cover and effectiveness of the engineered layers. Long-term effectiveness would also be achieved by using institutional controls, maintenance, and monitoring. Institutional controls (land use restrictions and fencing or other barriers) would be used,to restrict residential development of this land, which could breach the covers and expose the contaminated materials. In addition, long-term maintenance, including inspections and cover repairs, would prevent a breach of the cover. Long-term monitoring of the groundwater and soil would be initiated to provide early warning of contaminant migration, although this is not expected.

Complete Excavation and Off-site Disposal (Alternative 4) removes contaminated soil from NRF and transports the soil to a proposed INEEL soil repository or similar licensed facility. Since the
contaminants are removed from NRF, long-term effectiveness is achieved at the removal areas. The residual risk remaining at NRF would result from soil containing contaminants below the cleanup levels, which were established based on risk-based concentrations. Long-term effectiveness at the off-site (away from NRF) disposal area would depend on the institutional controls, maintenance, and monitoring performed at the off-site disposal area. Alternative 4 provides the best long-term effectiveness and permanence of all the alternatives because it removes the contaminant source.

6.4 Short-term Effectiveness

Alternative 1 does not perform a remedial action and therefore there is no increased short-term risk for this alternative. The short-term risks associated with Alternative 2 would be minimal since contaminants are not disturbed. Construction activities, such as building fences, would increase direct exposure to radionuclides, but this would be small compared to excavating

activities.

Alternatives 3 and 4 would not pose an increased risk to the community because the remedial actions would occur at a remote location from the community. Alternative 4 wouid likely involve the transportation of soil along highways within the INEEL boundary, but this would still be isolated from public highways. Protecting site personnel from potential hazards arising from construction activities would be a concern under both alternatives. The primary concerns would be radiation exposure to the workers and the inhalation or ingestion of contaminants caused by the disturbance of soil. These risks would be mitigated by the use of appropriate personnel protective equipment or other engineered controls used during the construction. Preplanning work evolutions would also minimize the time exposed to radionuclides.

Some impacts to the environment during excavation and capping activities for Alternatives 3 and 4 would be unavoidable during construction. Overall, construction activities represent a controllable risk and would not present a significant negative impact to site flora and fauna in the vicinity of the excavation or cover construction. There are no known rare or endangered plants or animals in the vicinity of the excavation or cover areas. The area around NRF has been surveyed and some areas of archeological or historical value were found and identified as culturally sensitive. The excavation areas do not occur in these identified areas and, therefore, these known cultural areas would be excluded from remedial action activities. Although unlikely, the potential exists that unknown culturally sensitive areas could be disturbed during construction activities.

Since Alternative 3 excavates and handles less radioactive soil, it has better short-term effectiveness than Alternative 4, which requires much more soil to be excavated, packaged, and transported. Alternative 2 has the best short-term effectiveness, since only minimal time is spent at the sites of concern.

6.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Treatment technologies were determined not to be practicable because they were ineffective, difficult to implement, and/or very costly. None of the alternatives use treatment as a remedial action and, therefore, do not reduce toxicity, mobility, or volume through treatment. Alternatives 3 and 4 do reduce mobility through containment.

6.6 Implementability

Each alternative is considered implementable. The remedial technologies of excavating, cover construction, land use restrictions, fencing, and monitoring have a proven reliability. The technologies associated with the alternatives are readily available, relatively simple, and easily constructed and maintained. The necessary equipment and specialized personnel would be available for any of the alternatives. The excavation, covering, and monitoring activities associated with Alternatives 3 and 4 can be conducted using common construction techniques. Alternatives 3 and 4 would have some limited impact on current site operations, increasing the difficulty in implementing the actions. These impacts include limiting access to portions of NRF during excavation and construction activities, the disruption of the NRF security fence, and modification of traffic patterns to implement the remedial actions. None of the actions would be expected to impact future operations. Alternative 2 would be the easiest to implement since

only minimal construction activities involving a small number of personnel and equipment would be necessary. Alternative 2 would have little impact on present site operations, but may have the greatest impact on future site operations, since various areas would be fenced off to prevent access. Alternative 4 would be the most difficult to implement because of the uncertainty in the availability of the various off-site (away from NRF) disposal options. Additional concerns with Alternative 4 include packaging and transportation to the disposal site.

6.7 Cost

Alternative 1 (No Action) would not entail any additional costs. The costs associated with Alternatives 2 and 3 include 30 years of monitoring. Most of the 30 year monitoring cost (approximately $2.8 million) is attributed to groundwater monitoring that is presently part of the Groundwater Monitoring Program at the NRF. This program was established in the ROD for OUs 8-05 and 8-06, Landfill Areas, and the identified cost does not necessarily represent an increased cost.

Alternative 2 would not require any excavation work. Alternative 3 would excavate an estimated total volume of 133,000 cubic feet of soil compared to 1,171,000 cubic feet for Alternative 4. Alternative 3 would excavate an estimated 58,000 cubic feet of contaminated soil compared to 447,000 cubic feet for Alternative 4. Each alternative would remove approximately 3,130 linear feet of pipe.

Alternative 4 represents the highest cost. Although Alternative 4 does not require long-term monitoring, significantly more contaminated soil (over seven times more) would be excavated in Alternative 4 than Alternative 3. Additional packaging and transportation of the soil would be required. These activities and the associated radiological controls represent the primary cost increase of Alternative 4 over Alternative 3. In addition, if disposal occurred away from NRF, disposal fees including overhead costs may be charged to NRF. Table 9 provides a summary of the costs in Net Present Value (in 1997 dollars) associated with each of the alternatives.

6.8 State Acceptance

The IDHW has been involved in the development and review of the NRF Comprehensive RI/FS, the Proposed Plan, and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs with the selected remedial alternative for the sites contained in this ROD and is signatory to the ROD with DOE and EPA.

6.9 Community Acceptance

Community participation in the remedy selection process included participation in the public meetings held in January 1998 and review of the Proposed Plan during the public comment period of January 12 through March 12, 1998. Community acceptance is summarized in Section 7 and the Responsiveness Summary presented in Part III of this document. The Responsiveness Summary includes comments received either orally or in writing from the public, and the agencies' responses to these comments.

Table 9. Cost Summary for Each Alternative

OU 8-08 Alternative 2 Limited Action, Monitoring Cost Estimate

Cost Elements		Estimated Costs
RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management (a)		$ 285,191
RA Construction Project Management (contractor)		$ 5,468
	Subtotal	$ 290,659
Construction Costs		
Access Restriction Fencing		$ 47,099
Contractor General Conditions (Includes Mobilization & Demobilization Costs)		$ 39,016
Contractor Overhead and Profit		$ 9,660
	Subtotal	$ 95,775
Operations and Maintenance Costs		
Oversite Management		$ 436,709
Operation & Maintenance (b)		$ 2,127,480
	Subtotal	$ 2,564,189
Net Present Value Cost (in 1997 dollars)		$ 2,950,623

(a) - RA Project Management and Oversight, Remedial Action Documents Preparation.

(b) - Includes 30 year Monitoring Costs. (Annual Net Present Value cost of $72,500 in 1997 dollars)

OU 8-08 Alternative 3 Limited Removal Capping Cost Estimate

Cost Elements		Estimated Costs
RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management (a)		$ 572,325
RA Construction Project Management (contractor)		$ 334,730
	Subtotal	$ 907,055
Construction Costs		

Excavation		$ 267,674
Load and Haul		$ 59,642
Demolition, Pipes		$ 97,942
Demolition, Catch Basins/Manholes		$ 10,734
Demolition, Buildings		$ 70,207
Cap Construction		$ 551,604
Sampling and Analysis		$ 60,920
Access Restriction Fencing		$ 100,332
Additional Costs Incurred during Work involving Radiological Controls (b)		$ 2,075,530
Contractor General Conditions (c)		$ 776,113
Contractor Overhead and Profit		$ 441,437
	Subtotal	$ 4,512,135
Operations and Maintenance Costs		
Oversite Management		$ 1,359,081
Operation & Maintenance (d)		$ 2,127,480
	Subtotal	$ 3,486,561
Net Present Value Cost (in 1997 dollars)		$ 8,905,751

(a) - RA Project Management and Oversight, Remedial Design/Remedial Action Documents Preparation.

(b) - Work involving radiological contrals includes excavation, demolition, loading and hauling, unloading and controlling soil in consolidation
area, and decontamination. Additional costs associated with work involving radiological controls include labor costs (due to lower labor
efficiency, additional manpower requirements, and additional training requirements), equipment costs (due to special or additional
equipment required, decontamination of equipment, loss of equipment), and material costs (personnel protective equipment, containment
materials, etc.).

(c) - Costs include mobilization and demobilization, subcontractor project management, various office equipment and personnel, safety
equipment and clothing, sales tax, per diem, insurance, temporary office structures, construction signs, photography, and equipment rental
This generally represents a percentage of construction task costs, which for this alternative is 24%.

(d) - Includes 30 year Monitoring Costs. (Annual Net Present Value cost of $72,500 in 1997 dollars)

OU 8-08 Alternative 4 Removal/Offsite Disposal Cost Estimate

Cost Elements	Estimated Costs

RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management (a)		$ 1,848,997
RA Construction Project Management (contractor)		$ 758,929
	Subtotal	$ 2,607,926
Construction Costs		
Excavation		$ 890,778
Landfill disposal fees (b)		$ 1,906,264
Landfill waste preparation and transportation costs (c)		$ 5,718,791
Demolition, Pipes		$ 98,138
Demolition, Catch Basins/Manholes		$ 10,755
Demolition, Buildings		$ 70,348
Sampling and Analysis		$ 163,392
Additional Costs Incurred during Excavation		$ 3,301,286
Work involving Radiological Controls		
Contractor General Conditions (d)		$ 2,955,332
Contractor Overhead and Profit		$ 1,327,085
	Subtotal	$ 16,442,169
Operations and Maintenance Costs		
Oversite Management		$ 4,037
Operation & Maintenance		$ 7,799
	Subtotal	$ 11,836
Net Present Value Cost (in 1997 dollars)		$ 19,061,931

(a) - RA Project Management and Oversight, Remedial Design/Remedial Action Documents Preparation

(b) - Assumed disposal fee of approximately $100 per cubic yard. This is based on site experience and is an anticipated average
cost associated with various disposal options away from NRF including an INEEL soil repository or off-INEEL commercial facility

(c) - The actual transportation costs are estimated to be small compared to the waste preparation, packaging, sampling, etc. costs
This cost includes the additional costs associated with work involving radiological controls during preparation, packaging, sampling,
etc. These additional costs include labor costs (due to lower efficiency, additional manpower requirements, and additional training
requirements), equipment costs (due to special or additional equipment required, decontamination of equipment, loss of equipment),
and material costs (personnel protective equipment, containment materials, etc.).

(d) - Costs include mobilization and demobilization, subcontractor project management, various office equipment and personnel,
safety equipment and clothing, sales tax, per diem, insurance, temporary office structures,

construction signs, photography, and equipment rental. This generally represents a percentage of construction task costs, which for this alternative is 24%.

6.10 Summary

The comparative analysis assesses the relative performance of the alternatives against the first seven evaluation criteria. Each alternative is evaluated individually against the threshold criteria and the primary balancing criteria. The modifying criteria was not used for the comparative analysis since the modifyiing criteria evaluates the state and public acceptance of the selected remedial action alternative after the comparative analysis is made. A comparative analysis summary indicates a relative ranking for each alternative in order to aid in identifying the recommended alternative. Alternative 1, which does not meet the threshold criteria of protection of human health and the environment and may not meet the threshold criteria of compliance with ARARs, and as such was eliminated from consideration. A comparison was not made for reduction of toxicity, mobility, or volume through treatment since none of the alternatives included treatment as an action.

Each of the alternatives, with the exception of the no action alternative, would meet the RAOs associated with the protection of human health. Alternative 2, Limited Action, may not meet the RAOs for protection of environmental receptors. The risk assessment given in the NRF Comprehensive RI/FS showed that preventing access to and direct contact with the contaminated soil would be protective of human health. Preventing access to the areas of concern would place the receptor at a sufficient distance that external exposure to radionuclides would not be a pathway of concern. These restrictions on access to the area would also prevent soil ingestion and food crop ingestion associated with the contaminated soil. Alternative 2 was determined that it may not meet the ARAR requirements associated with controlling fugitive dust and air pollution, although there is no evidence that specific regulatory levels would be violated. Alternatives 3 and 4 meet all RAOs and provide overall protection of human health and the environment. Both alternatives meet all ARARs established for each alternative. Based on the criteria given in Section 6.0, Alternative 3 (Limited Excavation, Disposal, and Containment) was ranked higher than Alternative 4 (Complete Excavation and Off-site Disposal) because of more favorable comparative ratings due to lower costs, easier implementation, and better short-term effectiveness. Based on the above information and comparative analysis, Alternative 3 was the recommended selected remedial action for the sites of concern.

7.0 Highlights of Community Participation

In accordance with CERCLA §113(k)(2)(B)(i-v) and §117, a series of opportunities for public information and participation in the investigation and decision process for WAG 8 was provided to the public from September 1995 through March 1998. The opportunities to obtain information and provide input included INEEL Reporter newsletter articles (a publication on the INEEL's Environmental Restoration Program); Citizens' Guide supplemental updates; a proposed plan; focus group interactions, which included teleconference calls, briefings, and presentations to interest groups; and public meetings. In addition, several public involvement activities were conducted during previous investigations including an RI/FS and two small removal actions.

The ROD for the Industrial Waste Ditch (OU 8-07) and Landfill Areas (OUs 8-05 and 8-06) contains a summary of the public involvement activities that were associated with these former investigations at NRF.

Regular reports concerning the status of the project were included in bimonthly issues of the INEEL Reporter and were mailed to those on the mailing list. Reports also appeared in two issues of a Citizen's Guide to environmental restoration at the INEEL in early 1996 and 1997 and one issue of Environmental Restoration Progress, A Status Report of Environmental Cleanup at INEEL in February 1998. Both of these reports are supplements to the INEEL Reporter.

On January 12, 1998, DOE issued a news release to more than 100 contacts concerning the beginning of a 30-day public comment period pertaining to the NRF Comprehensive Proposed Plan. This comment period began on January 12, 1998. In response to a request from the public, the comment period was extended 30 days and ended on March 12, 1998. Many of the news releases resulted in a short note in community calendar sections of newspapers and public service announcements on radio stations. The news release gave notice to the public that NRF investigative documents would be available from the beginning of the comment period. These documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls and public libraries in Fort Hall and Moscow.

The types of public participation used in the decision-making process for the public included receiving the proposed plan, receiving telephone calls, attending the availability sessions one-half hour before public meetings to informally discuss the issues, and submitting oral and written comments to the agencies during the 60-day public comment period. At the request of the Shoshone-Bannock Tribes, a briefing on the proposed plan was given to Tribal members and their technical staff at Fort Hall in January 1998. A briefing of the proposed plan was also given to a subcommittee of the Idaho National Engineering and Environmental Laboratory Citizens Advisory Board in December 1997 and was followed up with a presentation to the whole board in January 1998. The advisory board is made up of individuals representing the citizens of Idaho who make recommendations to DOE, EPA, and the State of Idaho regarding environmental activities at the INEEL.

Copies of the proposed plan were mailed on January 6, 1998 to 700 members of the public on the INEEL Community Relations mailing list and approximately 50 people not on the mailing list, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the availability of the proposed plan, the locations of public meetings, and comment period extensions appeared in six regional newspapers during the weeks of January 11 and February 8 in Boise, Fort Hall, Idaho Falls, Moscow, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Idaho Statesman (Boise); the Sho-Ban News (Fort Hall); the Post Register (Idaho Falls); the Daily News (Moscow); the Idaho State Journal (Pocatello); and the Times News (Twin Falls).

A series of three news releases and newspaper advertisements, including the notice of the extension of the comment period, provided public notice of these public involvement activities. Offerings for briefings and the 30-day public comment period (including the 30-day extension of the comment period) that was to begin January 12 and end March 12, 1998 were also announced. Personal telephone calls were made to stakeholders in Idaho Falls, Pocatello, Boise, and Moscow areas the weeks of January 5 and 12 to remind individuals about the meetings and to see if a briefing was desired.

Written comment forms (including a postage-paid business-reply form) were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. The reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to record discussions and public comments. The meeting transcripts were placed in the Administrative Record section for WAG 8, OU 8-08, in three INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

Public meetings were held on January 20 in Boise, January 21 in Moscow, and January 22, 1998 in Idaho Falls. Also on January 21, a briefing was given to a risk assessment class at the University of Idaho. Approximately 80 people not associated with the project attended the public meetings. Overall, 12 citizens provided formal comments; of these, three citizens provided oral comments, and 11 provided written comments (two citizens provided oral and written comments). All comments received on the proposed plan were specifically considered during the development of this ROD. The agencies appreciate the public's participation in this process and acknowledge the value of public comment. A Responsiveness Summary has been prepared as part of the ROD. The formal oral comments presented at the public meetings and written comments are included in Part III of this ROD and in the Administrative Record for NRF.

8.0 Selected Remedy

The results of the NRF Comprehensive RI/FS identified nine sites of concern where an unacceptable or potentially unacceptable risk to human health exists. Those sites that contain or potentially contain contaminants resulting in an increased cancer risk greater than 1 in 10,000
to a future 100-year resident or lead concentrations above suggested screening levels for cleanup represent an unacceptable risk. There are 55 other sites that have no risk or an acceptable risk and do not require a remedial action. Based on the consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE, EPA, and IDHW have selected the alternatives as described in the following sections.

8.1 No Action/No Further Action Sites

Based on Track 1 and Track 2 investigations and the RI/FS evaluation, a No Action decision is made by the agencies for those sites with no source present or a source present that represents an acceptable risk for unrestricted use. This "No Action" decision means no future evaluations or followups are required.

Based on the same information, a No Further Action decision is made by the agencies for those sites with a source or potential source present, but for which an exposure route is not available
under current conditions. This "No Further Action" decision means that the site will be included in a CERCLA review performed at least every five years to ensure that site conditions used to evaluate the site have not changed and to verify the effectiveness of the No Further Action decision. All monitoring data collected from the No Further Actions sites will be included in the
CERCLA five year review. Although no additional remedial action is required at this time, present institutional controls, such as current fencing and administrative controls on excavation,
will be maintained. If site conditions change, including present institutional controls, additional

sampling, monitoring, or action will be considered.

The following sites are defined as No Action or No Further Action sites.

NO ACTION SITES:

Operable Unit 8-01

- NRF-03, ECF Gravel Pit
- NRF-06, Southeast Landfill
- NRF-08, North Landfill
- NRF-33, South Landfill
- NRF-40, Lagoon Construction Rubble
- NRF-41, East Rubble Area
- NRF-63, A1W Construction Debris Area

Operable Unit 8-02

- NRF-09, Parking Lot Runoff Leaching Trenches
- NRF-37, Old Painting Booth
- NRF-38, ECF French Drain
- NRF-47, Site Lead Shack (Building #614)
- NRF-52A, Old Lead Shack (Location #1)
- NRF-526, Old Lead Shack (Location #2)
- NRF-54, Old Boilerhouse Blowdown Pit
- NRF-55, Miscellaneous NRF Sumps and French Drains

- NRF-64, South Gravel Pit
- NRF-68, Corrosion Area Behind BB11

Operable Unit 8-03

- NRF-10, Sand Blasting Slag Trench
- NRF-15, S1W Acid Spill Area
- NRF-18B, S1W Spray Pond #2 and A1W Cooling Tower
- NRF-20, A1W Acid Spill Area
- NRF-45, Site Incinerator
- NRF-56, Degreasing Facility

Operable Unit 8-04

- NRF-28, A1W Transformer Yard
- NRF-29, S5G Oily Waste Spill
- NRF-31, A1W Oily Waste Spill
- NRF-44, S1W Industrial Wastewater Spill Area
- NRF-58, S1W Old Fuel Oil Tank Spill
- NRF-62, ECF Acid Spill Area
- NRF-65, Southeast Corner Oil Spill
- NRF-69, Plant Service Underground Storage Tank (UST) Diesel Spill
- NRF-70, Boiler House Fuel Oil Release
- NRF-71, Plant Service UST Gasoline Spill
- NRF-72, NRF Waste Oil Tank
- NRF-73, NRF Plant Services Varnish Tank

- NRF-74, Abandoned UST's Between the NRF Security Fences
- NRF-75, Fuel Oil Revetment Oil Releases
- NRF-76, Vehicle Barrier Removal
- NRF-77, A1W Fuel Oil Revetment Oil Releases

Operable Unit 8-08

- NRF-13, S1W Temporary Leaching Pit
- NRF-32, S5G Basin Sludge Disposal Bed
- NRF-79, ECF Waiter Pit Release

Operable Unit 8-09

- Interior Industrial Waste Ditch

NO FURTHER ACTION SITES:

Operable Unit 8-02

- NRF-42, Old Sewage Effluent Ponds
- NRF-61, Old Radioactive Materials Storage and Laydown Area

Operable Unit 8-03

- NRF-18A, S1W Spray Pond #1
- NRF-22, A1W Painting Locker French Drain

Operable Unit 8-08

- NRF-02, Old Ditch Surge Pond
- NRF-16, Radiography Building Collection Tanks
- NRF-23, Sewage Lagoons
- NRF-43, Seepage Basin Pumpout Area
- NRF-66, Hot Storage Pit
- NRF-81, A1W Processing Building Area Soil

No Operable Unit (new sites identified after RI/FS)

- NRF-82, Evaporator Bottoms Tank Release
- NRF-83, ECF Hot Cells Release Area

8.2 Selected Remedy for Sites of Concern

The following sites were determined by the NRF Comprehensive RI/FS to be sites of concern:

- NRF-11, S1W Tile Drainfield and L-shaped Sump
- NRF-12A, Underground Piping to Leaching Pit
- NRF-12B, S1W Leaching Pit
- NRF-14, S1W Leaching Beds
- NRF-17, S1W Retention Basins
- NRF-19, A1W Leaching Bed
- NRF-21A, Old Sewage Basin

- NRF-21B, Sludge Drying Bed
- NRF-80 A1W/S1W Radioactive Line Near BB19

The Limited Excavation, Disposal, and Containment alternative (Alternative 3) is selected for the nine sites of concern. Alternative 3 best satisfies the nine evaluation criteria. The Limited Action alternative (Alternative 2) may not be protective of ecological receptors and would have a potential impact on future site operations by eliminating access to various portions of NRF. Alternative 3 was evaluated to be equally protective of human health and the environment as the Complete Excavation and Off-site Disposal alternative (Alternative 4). Alternative 3 will comply with all ARARs. In addition, Alternative 3 has greater short-term effectiveness, is easier to implement, and costs less than Alternative 4. Alternative 3 was also supported by the State of Idaho and generally had community acceptance. The major components of the selected remedy for the nine sites of concern include:

- Excavating contaminated soil above remediation goals and debris from six of the nine sites;
- Consolidating the excavated soil at one site (S1W Leaching Beds);
- Disposing of radiological, non-hazardous debris to an INEEL disposal facility or an appropriate off-site (away from INEEL) disposal facility and, if necessary, disposing of radiological, hazardous debris as a mixed waste per the INEEL Site Treatment Plan;
- Constructing engineered covers primarily of native earthen materials in two areas that would cover the three sites not excavated, which includes the site where soil was consolidated. Cover materials will be determined in the Remedial Design/Remedial Action Work Plan;
- Radiation surveys and soil sampling during excavation;
- Soil and groundwater sampling to monitor any potential releases from the covered areas;
- Periodic inspection and maintenance of covers to ensure their integrity;
- Establishing fencing or other barriers and land use restrictions.

Soil above 16.7 pCi/g of cesium-137 and 45.6 pCi/g of strontium-90 will be removed from sites NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80, if present. Lead was detected above remediation goals in only one sample in a location where a cover will be placed. As explained in Section 5.1, remediating the soil to below remediation goals for cesium-137 and strontium-90 will also reduce the risks associated with other radiological contaminants of concern. NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80 contain underground piping or concrete structures that are planned for removal during decontamination and dispositioning activities at NRF. Disposal of pipe and concrete debris will be through current decontamination and dispositioning practices and will likely be sent to the RWMC located at the INEEL. Sampling concurrent with excavation activities will ensure all soil above remediation goals is removed. After the soil is excavated, it will be placed in NRF-14 (S1W Leaching Beds). The estimated contaminated soil volume from all the proposed excavation areas will fit into the present leaching beds. A single engineered earthen cover will cover NRF-14 and the adjacent NRF-12B(SlW Leaching Pit). Another cover will be placed over site NRF-19 (A1W Leaching Bed). The cover design will be determined during the remedial design phase, but will likely include soil, gravel cobble, and/or rip-rap to ensure proper containment of contaminants. Performance goals established for the proposed cover were given in Section 5.2.3.

This alternative includes operation and maintenance costs for long-term maintenance and monitoring of the covers. Institutional controls including fencing or other barriers and land use restrictions will be implemented to prevent access to the covered areas. A description of the areas where access will be restricted, the specific controls (e.g., fences, signs) that will be used to ensure that access will be restricted, the types of activities that will be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls will be determined during the remedial design phase and will be incorporated into the SDP. This information will be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF shall also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above. Long-term monitoring of NRF groundwater via the present groundwater well network and monitoring of soil around the covered areas will be performed. A review will be conducted at least every five years as required by CERCLA to verify the effectiveness of the selected remedy. Contingency actions would include off-site (away from NRF) disposal of soil that exceeds the capacity of NRF-14 or continued consolidation at NRF-14 above surface level, although these are unlikely to be necessary. The remedial actions will be performed in accordance with all ARARs. See Section 5.2.3 for a more detailed discussion of Alternative 3.

9.0 Statutory Determination

The selected remedies (including No Action and No Further Action decision sites) meet the statutory requirements of CERCLA Section 121, the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. All remedies meet the threshold criteria established in the NCP (i.e., protection of human health and the environment and compliance with ARARs), CERCLA also requires that the remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action be cost effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy addresses these statutory requirements.

9.1 Protection of Human Health and the Environment

As described in Section 8, the selected remedy for the sites of concern satisfies the criterion of overall protection of human health and the environment.

9.1.1 No Action/No Further Action Sites

For the 55 No Action and No Further Action sites covered by this ROD, no remedial action is necessary to ensure continued protection of human health and the environment. The 55 sites are identified in Section 8. The 43 No Action sites have no risk or an acceptable risk to human health and the environment were they to be released for unrestricted use, and therefore No Action is justified. The 12 No Further Action sites contain sources or potential sources that may pose unacceptable risks to human health and the environment, but an exposure pathway is not available, thus providing overall protection of human health and the environment. Because a source may still be present at the 12 No Further Action sites, a review will be performed every

five years to ensure the No Further Action decision remains protective of human health and the environment.

9.1.2 Limited Excavation, Disposal, and Containment

Limited Excavation, Disposal, and Containment is the selected remedy for the nine sites of concern. This remedy satisfies the criterion of overall protection of human health and the environment by preventing direct contact with the contaminated soils by all potential receptors, reducing radiation external exposure through shielding by the cover, and reducing the likelihood of biointrusion.

9.2 Compliance with ARARs

The Limited Excavation, Disposal, and Containment remedy for the nine sites of concern will meet all federal and state ARARs. The selected remedy will be designed to comply with all action-specific, location-specific, and chemical-specific federal and state ARARs, as presented in Table 10.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those same standards mentioned for applicable requirements, except while not applicable at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site such that their use is well suited to the particular site.

Three types of ARARs exist: location-specific, action-specific, and chemical-specific. In general, location-specific ARARs place restrictions on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations. Action-specific ARARs are usually technology or activity based requirements or limitations on actions or conditions involving specific substances. Chemical-specific ARARs are health or risk-based numerical values or methodologies that result in the establishment of numerical values. The values establish the acceptable concentrations of chemicals or substances that may be found in or discharged to the environment.

9.2.1 Location-specific ARARs

The Idaho State Historical Society has identified the INEEL as containing properties potentially eligible for the National Register of Historic Places (NRHP). Several structures at NRF are eligible for the NRHP including NRF-17 (S1W Retention Basins) and, therefore, the National Historic Preservation Act (NHPA) (16 USC 470) is considered applicable for the remedial action associated with NRF-17. A final designation under the NRHP would mean this site must be accorded the same protection under the NHPA as a site listed under the Act. All applicable requirements established under the NHPA will be followed for remedial actions associated with NRF-17. Administrative controls are in place at NRF to ensure the requirements are met.

9.2.2 Action-specific ARARs

The action-specific ARARs identified for the sites of concern are listed in Table 10. The Idaho Fugitive Dust Emission (IDAPA 16.01.01.651) requirements are applicable due to the disturbance of soil at these sites. Because of the potential of encountering hazardous wastes in the debris that leaves the, area of contamination (AOC) during the remedial action activities

(i.e., demolition and disposal), state regulations (with reference to the specific sections in the federal regulations) concerning hazardous waste identification (IDAPA 16.01.05.005) and determination (IDAPA 16.01.05.006.01) are considered applicable. These requirements for hazardous waste management become applicable for the debris generated during the remedial work activities because the debris must be transported off the NRF site; therefore, the debris must be characterized for the presence of hazardous constituents for proper disposal. The land disposal restrictions (IDAPA 16.01.05.011) will be applicable in the event that the debris leaving the AOC is found to contain hazardous wastes.

Portions of the state regulation (IDAPA 16.01.05.008) with reference to the specific federal regulations as listed in Table 10, pertaining to surveying, closure, and post closure care requirements for RCRA landfill sites are considered relevant and appropriate for the two CERCLA sites identified to be capped with an engineered cover under the selected remedy, Alternative 3. Since the two sites to be capped were not fully characterized, there remains an uncertainty concerning the types and quantity of wastes that may remain in place. Therefore, the specific regulatory sections pertaining to the closure and post closure care requirements as listed in Table 10 are considered relevant and appropriate. The specific regulatory section pertaining to surveying requirements for identifying the exact locations and dimensions of the boundaries for the capped areas with respect to permanently surveyed benchmarks is also considered relevant and appropriate. Although unlikely, in the case where contaminated debris generated during the remedial work activities could be transported off the INEEL to an EPA approved disposal facility, the procedures for planning and implementing off-site (away from INEEL) response actions (40 CFR 300.440) are considered applicable.

Table 10. ARAR and To-be-Considered List

Title	Citation	Relevancy
Location-Specific		
National Historic Preservation Act	16 USC 470	Applicable
Action-Specific		
Standards for Owners and Appropriate Operators of Hazardous Waste Treatment, Storage and Disposal Facilities [Specific Appropriate Federal Regulation Sections: Surveying, Closure and Post Closure Care for Landfills]	IDAPA 16.01.05.008 [40 CFR 264.309(a), 40 CFR 264.310(a)(1)(2)(3)(4)(5) and 40 CFR 264.310(b)(1)(4)(5)(6)]	Relevant &
Identification and Listing of Hazardous Waste (Specific Applicable Federal Regulation)	IDAPA 16.01.05.005 (40 CFR 261)	Applicable
Standards Applicable to	IDAPA 16.01.05.006.01	Applicable

Generators of Hazardous Waste (Specific Applicable Federal Regulation Section: Hazardous Waste Determination)	(40 CFR 262.11)	
Land Disposal Restrictions (Specific Applicable Federal Regulation Sections)	IDAPA 16.01.05.011 (40 CFR 268.7,.9,.40,.45, and .48)	Applicable
Procedures for Planning and Implementing Off-site Response Actions	40 CFR 300.440	Applicable
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.651	Applicable
Chemical-Specific		
National Emission Standards for Hazardous Air Pollutants	40 CFR 61.92	Applicable
Increments for Toxic Air Pollutants	IDAPA 16.01.01.585 &.586	Applicable
Idaho Groundwater Quality	IDAPA 16.01.11.200.01 (a)	Relevant & Appropriate

To-Be-Considered List

Environmental Protection, Safety and Health Protection Standards	DOE Order 5480.4
Low-level Radioactive Waste Management	DOE Order 5820.2A
Radiation Protection of the Public and Environment	DOE Order 5400.5
Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities	EPA Guidance Document

9.2.3 Chemical-specific ARARs

The chemical-specific ARARs identified for the sites of concern are also listed in Table 10. Because of the potential for the release of contaminants (radionuclides) into the air from the remedial work activities involving soil movement and consolidation under the selected remedy, the emission standard for radionuclide emissions to ambient air under the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61.92) are applicable. The State of Idaho's increments for toxic air pollutants (IDAPA 16.01.01.585 and 586) are considered applicable because of the potential for the release of some of the listed contaminants into the air during excavation activities. In addition, the Idaho Groundwater Quality Rule (IDAPA 16.01.11.200.01 (a)) is considered to be relevant and appropriate due to the potential, although not likely, for the
migration of contaminants into the aquifer. The selected remedy provides for long term

monitoring of the aquifer beneath NRF. The Idaho Groundwater Quality Rule includes a wide variety of constituents, including radiological constituents, with limits based on the protection of human health.

9.2.4 To-be-Considered Guidance

Table 10 also lists other requirements, procedures, and guidance documents. The DOE Orders stem from DOE's policy for implementing legally applicable protection standards and to consider and adopt, as appropriate, recommendations by authoritative organizations. Since the identified DOE Orders cover areas (i.e., low-level radioactive waste management, radiation protection) that may be relevant for the selected remedy, these Orders will be considered and adopted as appropriate. Since lead has been detected at one of the sites of concern, the EPA guidance document will be useful in providing guidance for the selected remedy.

9.3 Cost Effectiveness

The selected remedial action (Limited Excavation, Disposal, and Containment) for the nine sites of concern is cost effective because it is protective of human health and the environment, achieves ARARs, and the costs are proportional to the effectiveness in meeting remedial action objectives. Although the selected remedy costs more than a limited action remedy, it protects ecological receptors, reduces the area footprint of soil requiring monitoring, and provides more efficient control measures (i.e., engineered cover) to prevent direct contact by receptors with contaminated soils. The selected remedy costs significantly less than the excavation and off-site (away from NRF) disposal option. Although the excavation and off-site disposal option completely removes the source from NRF, costs for packaging, transportation, disposal fees, and excavating over seven times more contaminated soil are considerably higher than the selected remedy. In addition, the short-term effectiveness for excavating and off-site disposal is considerably less since a much larger amount of contaminated soil would be handled for a longer period of time causing an increased risk for construction workers.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy will result in the permanent removal of contaminated soil from six of the nine sites of concern. For the sites contaminated with radionuclides, effective treatment technologies are currently unavailable; therefore, the preference for permanent solutions cannot be met except through natural radioactive decay processes over time. Treatment technologies were determined not to be practicable because they were ineffective, difficult to implement, and/or very costly. Since contaminated soils will remain on site, the selected remedy will not result in a permanent solution for the three sites where contaminated soil will be covered with an engineered cover. The selected remedy is a permanent solution for the six sites where contaminants are permanently removed through soil excavation.

9.5 Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element will not be met. The treatment technologies considered during remedial action development were not considered to be a technically or cost effective means for reducing risks to human health and the environment. Natural radioactive decay will result in the reduction of contaminant

concentrations.

10.0 Documentation of Significant Changes

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD. A few changes have been made in the ROD that are different than presented in the Proposed Plan. Although the changes may not be considered significant, they are included in this section of the ROD to accurately reflect modifications made to the Proposed Plan.

Two new sites have been identified in this ROD. One of the two sites, NRF-82, was identified as a CERCLA site immediately after issuing the Final Comprehensive RI/FS; a description and recommendation were included in the Proposed Plan. The other site, NRF-83, was identified as a CERCLA site after the Proposed Plan and is included in this ROD.

NRF-83, ECF Hot Cells Release Area, is an area where cobalt-60 and cesium-137 were discovered in the soil bellow a concrete trench at ECF during a construction project. All accessible contaminated soils adjacent to the trench were removed during the construction project and replaced with clean soil. Contaminated soils below the trench were not removed to preserve the integrity of the trench structure. The trench was not removed and, therefore, an exposure pathway to a potential receptor does not exist making the estimated risk low. A Track 1 investigation has been issued for the site and is available in the Administrative Record for NRF. The remaining risk at NRF-83 is estimated to be low because the presence of the trench prevents exposure to remaining constituents. Therefore, this site has been designated as a No Further Action site. Because an exposure route does not exist for NRF-83, this site would not impact the comprehensive assessment performed for NRF.

Site NRF-18, S1W Spray Ponds, was identified in the Proposed Plan as a single site. NRF-18 was proposed to be a No Further Action site because the concrete spray ponds would eliminate any exposure pathway to contaminants below the basin. In addition, sampling data from around the spray pond indicated an acceptable risk at the spray pond, but uncertainty existed in the assessment because sample data below the spray ponds was not available. Since the issuance of the Proposed Plan, additional samples have been collected, analyzed, and evaluated from the soil below and around Spray Pond #2 (north spray pond) in preparation for demolition of Spray Pond #2. The additional information for Spray Pond #2 allowed a more detailed assessment of Spray Pond #2. Therefore, NRF-18 was split into two sites: NRF-18A (S1W Spray Pond #1) and NRF-18B (S1W Spray Pond #2 and A1W Cooling Tower). NRF-18B includes the A1W Cooling Tower, which, unlike the spray ponds, did not have a groundwater concern because of leakage. The risk at the A1W Cooling Tower through surface pathways was estimated to be low based on a Track 1 risk evaluation. The A1W Cooling Tower was demolished in 1995. NRF-18A includes portions of the fire protection system that was connected to the spray ponds and cooling tower and was suspected to have leaked on occasion.

Samples were collected from several boreholes drilled through and around Spray Pond #2. Sample data showed only slightly elevated levels of chromium, which was the primary contaminant of concern at Spray Pond #2. No elevated amounts of radionuclides were detected. An updated assessment was issued for NRF-18B showing a low estimated risk associated with Spray Pond #2 and the A1W Cooling Tower, with much less uncertainty than the original assessment. The updated assessment indicates NRF-18B is a No Action site instead of a No Further Action site as stated for all the original NRF-18 in the Proposed Plan. NRF-18A will remain a No Further Action site until additional data are available to more

accurately assess it. The new data collected for Spray Pond #2 shows the cumulative risk assessment to be more conservative than originally indicated since actual contaminant concentrations were less than concentration terms used in the cumulative risk assessment.

The Proposed Plan indicated that there were nine sites of concern and 62 other identified release or potential release sites at NRF, for a total of 71 sites. Fifty-two of the 62 sites were
proposed as No Action or No Further Action sites and the other ten sites were associated with a previous ROD, thus requiring no recommendation in the Proposed Plan. The current ROD (this document) identifies all 87 sites at NRF, to more completely show the comprehensive nature of the NRF Comprehensive RI/FS. The 71 sites identified in the Proposed Plan did not include the 13 No Action COCA sites, the new site (NRF-83) discussed above, or the splitting of sites NRF-18 and NRF-52. NRF-52 was evaluated as NRF-52A and 52B during past Track 1 investigations, but the Proposed Plan failed to identify NRF-52 as two separate sites. Hence, 71 sites (Proposed Plan) plus 13 sites (COCA) plus a new site (NRF-83) plus two additional sites (splitting NRF-18 and NRF-52 into two sites each) equals 87 total sites.

The 13 COCA sites were included in the comprehensive assessment of NRF, but were initially screened out because they lacked a source. The Proposed Plan shows 41 No Action sites and 11 No Further Action sites (52 total). The ROD revises these to 43 No Action sites (includes NRF-18B and both NRF-52 sites) and 12 No Further Action sites (includes NRF-83), for a total of 55.

The Proposed Plan indicated that 316,470 cubic feet of contaminated soil would be excavated under Alternative 4. The actual estimate of soil to be excavated is now 1,170,890 cubic feet, of which 446,550 cubic feet would be contaminated soil. The volume given in the Proposed Plan failed to include additional contaminated soil (130,080 cubic feet) to be excavated near the S1W Leaching Beds (NRF-14) and S1W Leaching Pit (NRF-12B). Although the volume was not correct in the discussion of Alternative 4, the cost estimate provided in the Proposed Plan was based upon the correct volume of soil.

PART III
RESPONSIVENESS SUMMARY

A Summary of Comments Received During the Public Comment Period

OVERVIEW

The Naval Reactors Facility (NRF) constitutes Waste Area Group (WAG) 8 at the Idaho National Engineering and Environmental Laboratory (INEEL). There have been 87 release or potential release sites and nine operable units (OU) identified at NRF. OU 8-08 was the last OU to be investigated and represents the NRF Comprehensive Remedial Investigation/Feasibility Study (RI/FS) including 18 sites not previously assessed. Twenty-three of the 87 sites were included in previous decision documents. Selected remedies were chosen for the remaining 64 sites in this Record of Decision (ROD). Nine of the 64 sites have been identified as sites of concern that pose or potentially pose unacceptable risks to human health and the environment. The other 55 sites were determined to pose no risk or an acceptable risk to human health or the environment and were identified by the agencies to require no additional action. For the nine sites of concern, remedial action alternatives were evaluated, and a preferred alternative was

selected. A Proposed Plan that summarized the results of the NRF Comprehensive RI/FS and presented the preferred remedial alternative was released by the agencies for public review on January 6, 1998. Public comment on this document started on January 12, 1998, and was extended until March 12, 1998 due to a request from the public. Public meetings were held in Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively.

This Responsiveness Summary responds to both written and oral comments received during the public comment period and meetings. Generally, support for the preferred alternative was favorable with concerns from commentors over the mobility of contaminants and the construction design of the proposed covers.

BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §113(k)(2)(B)(i-v) and §117, a series of opportunities for public information and participation in the investigation and decision process for WAG 8 was provided to the public from September 1995 through March 1998. The opportunities to obtain information and provide input included INEEL Reporter newsletter articles (a publication on the INEEL's Environmental Restoration Program), Cifizens' Guide supplemental updates, a proposed plan, focus group interactions, which included teleconference calls, briefings and presentations to interest groups,
and public meetings.

Regular reports concerning the status of the project were included in bimonthly issues of the INEEL Reporter and were mailed to those on the mailing list. Reports also appeared in two issues of the Citizen's Guide to environmental restoration at the INEEL in early 1996 and 1997 and one issue of Progress a Status Report of Environmental Cleanup at INEEL in February 1998. Both of these reports are supplements to the INEEL Reporter.

On January 12, 1998, U.S. Department of Energy (DOE) issued a news release to more than 100 contacts concerning the beginning of a 30-day public comment period pertaining to the NRF Proposed Plan. This comment period began on January 12, 1998. In response to a request

from the public, the comment period was extended 30 days and ended on March 12, 1998. The news release gave notice to the public that NRF investigative documents would be available from the beginning of the comment period. These documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls and public libraries in Fort Hall and Moscow.

Copies of the proposed plan were mailed on January 6, 1998 to 700 members of the public on the INEEL Community Relations mailing list, urging citizens to comment on the proposed plan and to attend public meetings. Public meetings were held at Boise, Moscow, and Idaho Falls, on January 20, 21, and 22, 1998, respectively. Written comment forms were available at the meetings, and a court reporter was present at each meeting to record transcripts of discussions and public comments. A total of about 80 people not associated with the project attended the public meetings. Overall, 12 citizens provided formal comments; of these, three citizens provided oral comments and 11 provided written comments (two citizens provided oral and written comments). Comments were also received from the INEEL Citizens Advisory Board and are included in this Responsiveness Summary.

This Responsiveness Summary has been prepared as a part of the ROD. The ROD presents the preferred alternative for the nine sites of concern and the recommendation of No Action or

No Further Action for 55 other sites. The preferred alternative was selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan). The decisions presented in the ROD are based on information contained in the Administrative Record. All formal oral comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the ROD.

LISTING OF COMMENTORS, COMMENT NUMBERS, AND PAGE NUMBERS

All of the formal comments submitted by the public in either written or oral form were tabulated and assigned a comment number. Where applicable, the commentors are listed alphabetically in the first column; the affiliation of the commentor is given in the second column (if no known affiliation, identified as "concerned citizen"); the comment number appears in the third columm and the page the comment and response begins can be found in the last column.

NAME	AFFILIATION	COMMENT #	PAGE #
Beatrice Brailsford	Snake River Alliance	27	103
Beatrice Brailsford	Snake River Alliance	28	104
Beatrice Brailsford	Snake River Alliance	29	104
Chuck Broscious	Environmental Defense Institute	6	90
Chuck Broscious	Environmental Defense Institute	7	91
Chuck Broscious	Environmental Defense Institute	8	91
Chuck Broscious	Environmental Defense Institute	9	92
Chuck Broscious	Environmental Defense Institute	10	92
Chuck Broscious	Environmental Defense Institute	11	93
Chuck Broscious	Environmental Defense Institute	12	93
Chuck Broscious	Environmental Defense Institute	13	94
Chuck Broscious	Environmental Defense Institute	14	95
Chuck Broscious	Environmental Defense Institute	15	95
Chuck Broscious	Environmental Defense Institute	16	96
Chuck Broscious	Environmental Defense Institute	17	97
Chuck Broscious	Environmental Defense Institute	18	98
Chuck Broscious	Environmental Defense Institute	19	98
Chuck Broscious	Environmental Defense Institute	20	99
Chuck Broscious	Environmental Defense Institute	21	99
Chuck Broscious	Environmental Defense Institute	22	100
Charles B. Greer	concerned citizen	1	88
Walt Hampton	concerned citizen	25	102
Martin Huebner	Coalition 21	36	106
KayLin Loveland	Envirocare of Utah, INC.	31	105
KayLin Loveland	Envirocare of Utah, INC.	32	105
KayLin Loveland	Envirocare of Utah, INC.	33	105
KayLin Loveland	Envirocare of Utah, INC.	34	106
KayLin Loveland	Envirocare of Utah, INC.	35	106
Swen Magnuson	concerned citizen	23	101
Swen Magnuson	concerned citizen	24	102
Joe Merted	concerned citizen	42	109
Charles M. Rice	Citizens Advisory Board	39	107
Charles M. Rice	Citizens Advisory Board	40	108
Buck Sisson	concerned citizen	2	88

Buck Sisson	concerned citizen	3	89
Buck Sisson	concerned citizen	4	90
Buck Sisson	concerned citizen	5	90
Buck Sisson	concerned citizen	41	108
Dianne Thompson	concerned citizen	30	104
Thomas D. Van Liew	concerned citizen	37	107
Thomas D. Van Liew	concerned citizen	38	107
Unknown	concerned citizen	26	102

SUMMARY OF COMMENTS WITH RESPONSES

Comments presented during the public comment period on the Proposed Plan for the NRF Comprehensive RI/FS are given below. The public meetings were divided into a brief presentation, an informal question-and-answer session, and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginning of the meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal period of the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meetings and written comments received during the public comment period are addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, orally during the public meetings, or by recording a message using INEEL's toll-free number. The comments below are printed in their entirety and were not summarized. The only edits made were to correct minor spelling and editorial errors. In those cases where written comments were received that were difficult to read, a best attempt to interpret the comment is provided. Copies of the originally written comments are provided in the Administrative Record file for NRF.

Comment 1

Agree that Alternative 3 is the best option.

Response: The agencies appreciate the time and effort made to read and comment on the Proposed Plan.

Comment 2

The proposed "Alternative 3: Limited Excavation, Disposal, and Containment" for Waste Area Group 8 - Naval Reactors Facility needs to be modified to better protect the groundwater, reduce costs, and reduce health risks to construction workers. The contaminated soils should be left in place and capped with capillary barriers. The capillary barrier will result in reduced
health risk, reduced costs, and improved groundwater protection. There is an ongoing effort at the INEEL as well as the Hanford Area and Sandia National Laboratories to design capillary barriers that greatly reduce the movement of water through buried waste and thereby minimize contaminant transport. As a steward of the environment, the INEEL needs to minimize the leaching and contaminant transport at all sites, within reasonable economic constraints.

Response: The riprap cover shown in the Proposed Plan for Alternative 3 was only a preliminary design consideration and will be more fully evaluated during the remedial design phase. To eliminate any additional confusion about the cover design, the figure shown in the Proposed Plan was eliminated from the ROD text. The design of the covers for Alternative 3 at the consolidated areas will include an evaluation of contaminant migration and the value of capillary barriers, although sampling performed during the NRF Comprehensive Remedial Investigation (RI) showed very little migration of contaminants of concern from the discharge point (i.e., pipe, concrete basin).

Leaving the soil in place at all sites and constructing caps over each site was not considered a feasible option. Some sites are below a concrete basin (NRF-17) or asphalt roadway (NRF-12A

and NRF-80). Portions of three sites (NRF-11, NRF-12A, and NRF-21A) exist in the subsurface between the NRF security fences, which makes covering in place not possible. In addition, some of the sites involve underground piping, Covering the entire length of the pipe was not considered feasible and could permanently disrupt the use of site areas.

Comment 3

The excavation and capping with riprap proposed under Alternative 3 is not a good alternative.
The excavation process is not a simple process in itself and the details are important. Several details that come to mind include: (1) The cleanup level is specified as a concenration for each species in pCi/g, is the number a mean over the whole area? Or is it the maximum concentration on the remaining solids? (2) During excavation and transport of the contaminated soils how will spills and over filling of trucks be handled? (3) What dust suppression method will be used? (4) Moving soil is a very dirty operation and even though dust is controllable there is always dirt. The risk analysis presented in the Public Meetings/Briefings brochure dated January 1998 is not complete. I could not find any mention of the risk to construction workers arising from physical activities. This risk estimate needs to include the physical risk as well as the inhalation, ingestion, and physical contact exposure effects. Thus, the total risk of the alternatives appears to not have been assessed. I realize this meeting was not put together to deal with this level of detail, but the moving of contaminated soil at the INEEL will cost time and cost money. Any idea that does not require moving contaminated soils should be moved up the list of preferred alternatives.

Response:

(1) The cleanup levels established in the Proposed Plan correspond to maximum allowable values for each confirmatory sample. Any material above these values will be removed.

(2) The work will be engineered with detailed work, safety, and training procedures to minimize the potential for spills and to prevent overfilling trucks during excavation work. Many of these procedures are currently in place and workers are continuously trained on proper radiological controls, including spill response situations.

(3) The excavation of contaminated soil has been successfully performed during past remedial work. Also, NRF gained experience in dust suppression during the prior construction of three landfill covers at NRF Possible dust suppression techniques include keeping the soil wetted during excavation activities, performing excavation in tented enclosures, halting excavation work during windy conditions, and keeping man-made covers over contaminated soils. All these techniques will be evaluated when planning the work addressed by this ROD.

(4) The comparison of alternatives required a qualitative evaluation of risk to workers and the public during remedial activities. A quantitative, or numeric, risk assessment for the workers performing the remedial actions is outside the scope of the NRF Comprehensive RI/FS. Exposure limits are established that workers cannot exceed and exposure is monitored. Long standing, proven Naval Nuclear Propulsion Program radiation and contamination controls will be applied to this work.

Regarding physical (e.g., construction safety-related) work risk, NRF requires many safety provisions in work procedures and requires following applicable Occupational Safety and Health Act requirements. However, as stated above, a quantitative risk assessment in this regard is outside the scope of the RI/FS. The quantitative risk assessments performed during the RI/FS are intended to show the risks associated with a site in the absence of any remedial action, which in turn will provide the basis for determining whether or not a remedial action is necessary and the justification for performing specific remedial actions. The chosen Alternative 3 appears to minimize the movement of contaminated soils, which in turn will minimize physical work-related risks.

Comment 4

Actual performance of the riprap for controlling biologic processes over time has not been demonstrated. The riprap covers in place on the INEEL do not appear to me to be effective in control of small mammals. In fact riprap appears to be excellent habitat for pack rats, mice, and rock chucks. They provide high elevations for the rock chucks to sun themselves, the network

of large voids serve as ready made burrows, and as a whole appear to be excellent protection from predators. The riprap will trap snow and further increase infiltration of water. Also, the riprap will reduce water losses from evaporation and evapotranspiration processes and thereby increase the total volume of water available for the leaching of contaminants. The overall effect of Alternative 3 will be to increase leaching rates and long term contaminant transport to the Snake River Plain Aquifer. The fact that Alternative 3 may meet regulations of today is no indication that the design will meet future regulations. Future regulations will include monitoring above the aquifer, at which time the rapid infiltration and possibility of contaminant transport wil! become front-page news.

Response: The cover design shown in the Proposed Plan was only a preliminary design consideration, and all comments received on the cover design will be considered dudng the design evaluation. It should be noted that migration of contaminants of concern to the aquifer is not considered likely because the contaminants of concern tend to adsorb to site soils, and because the low precipitation in this area provides only minimal driving head to move contaminants deeper into soils. The sites of concern were typically pond or leaching areas that received large quantities effluent, yet sampling has shown that the contaminants of concern are still primarily retained in the soil within a few feet from the discharge point. The entrapment of future precipitation would not likely after this condition.

Comment 5

One way to further reduce risk is to minimize the construction effort. Since the capillary barriers can be constructed using gravels and soils that are close to the actual site the efforts of construction and overall cost will be reduced, I recommend that the contaminated soils be left undisturbed and that capillary barriers be added to the land surface, to control health risks associated with removal, transport, and repositioning of contaminated soils.

I want the capillary barriers to be considered as an Alternative Action and see the comparison to the alternatives presented in the Proposed Plan for Waste Area Group 8 - Naval Reactors Facility. I also want to see the risk to construction workers accounted for in the risk assessments of the alternatives.

Response: The agencies agree that minimizing construction efforts in general reduces short-term risks. That is one reason the limited excavation alternative (Alternative 3) was selected over the complete excavation alternative (Alternative 4). However, as stated in the response to Comment 2, several sites are located in areas where a cover is not practical. Capillary barriers

will be considered as part of the covers during the design phase. Health risks during construction activities were discussed in Comment 3 above.

Comment 6

The Environmental Defense Institute (EDI) received the Department of Energy (DOE) proposed plan (Plan) on Friday January 16 th. Since Monday was a national holiday, it meant that EDI received the Plan one working day prior to the public meeting in Moscow Wednesday

January 21. The public meetings are the only opportunity an individual has to get oral testimony into the public record. Inadequate preparation time literally translates into inadequate opportunity to be engaged in the decision making process. Additionally, there are two comprehensive waste area group plans presented, one for the Naval Reactors Facility and one for Argonne National Laboratory - West, covering a total of over 28 individual waste release sites. The volume of information needed to review two comprehensive plans is orders of magnitude over one or two subgroup (operable unit) waste release sites. Therefore, the public participation process is fatally flawed and unacceptable. EDI appreciates that the agencies responded to our preliminary comments by extending the comment period.

Response: As stated in the comment, the public comment period was extended for 30 days to allow additional time for public review and comment on the Proposed Plan.

Comment 7

The apparent absence of lessons learned between the Hanford Environmental Restoration (ER) process and the INEEL ER process is regrettable and a serious threat to Idaho. DOE is taking advantage of its position as the single largest employer in Idaho to float ER actions at INEEL that it was not allowed to do at Hanford because public and regulatory pressure blocked shortcuts. Specifically, at Hanford DOE was required to build the Environmental Restoration Disposal Facility (ERDF) which is a fully compliant Resource Conservation Recovery Act (RCRA)/Nuclear Regulatory Commission (NRC) mixed hazardous/radioactive dump with double liner, leachate, collection and monitoring wells and an impermeable cap. ERDF was completed in the Spring of 1996 at the farthest location on Hanford away from the Columbia River and will receive contaminated soil and decontamination/decommissioning (D&D) waste. At INEEL, DOE refuses to build such a repository because the Department is not being pressured by the state and EPA regulators to comply with the law.

Response: Sampling performed at NRF has not shown any RCRA characteristic waste in the soil. If any RCRA characteristic waste is encountered while excavating, the applicable RCRA regulations will be met. Disposal will be accomplished per the applicable or relevant and appropriate requirements (ARARs) given in the Record of Decision. NRF has always complied with applicable regulations and will continue to do so in the future.

Comment 8

The Plan (January 1998 publication) assumes that the DOE and the Naval Reactors Facility

(NRF) enjoy credibility in the public's eye. This is an invalid assumption. These agencies have broken the law and are being forced via a Federal Facility Agreement and Consent Order to correct their illegal activities. As illegal polluters, no credibility can be assumed and therefore full and complete disclosure is demanded in all Plan publications. The Plan does not provide the reader with full disclosure or provide the essential information the reader needs in order to evaluate the appropriateness of the preferred remedial alternative. For instance, maximum contaminate levels for all contaminates of concern must be stated for each Operational Unit as well as the effective standard for that contaminate so that the reader can make up their own mind whether the cleanup actions or no actions are appropriate. Stating conclusions without providing definitive data to support the finding assumes credibility that the agencies do not have.

Response: Maximum soil concentrations detected at OU 8-08 during RI/FS or pre-RI/FS sampling were provided in Table 2 of the Proposed Plan. The Proposed Plan is a summary of the Comprehensive RI/FS performed at NRF. As stated in the plan, supporting documents are available at Information Repositories at various locations identified in the Plan. The supporting documents contain much more detailed information on the investigations performed at NRF, including sample results. As previously stated in the response to Comment 7, NRF has always complied with applicable regulations and will continue to do so in the future.

Comment 9

Another major assumption that is extensively evoked in the Plan is 100 years of DOE monitoring and institutional control of the contaminated sites. In real life, when entities break the law, and are required to do major corrective actions in the future, they are generally required to establish a trust fund so that if they again decide to disregard their legal requirements, or are no longer in existence, the funding will be there for the state or local government to do the job. The state of Idaho should therefore, require DOE to establish a monitoring/institutional control trust fund to cover those costs at INEEL. An example of where this issue is important is the current designation that NRF is not in the Big Lost River (one mile away) 100 year flood plain. This current designation is due to Big Lost River dams that divert flood waters south into spreading areas. These dams and their related water channels require regular maintenance in order to provide that flood protection to NRF and other INEEL facilities. Spring 1997 runoff nearly topped the dams. Prior to construction of the diversion dam, NRF was in the Big Lost River 100 year flood piain[RVFS@5]. Nuclear Regulatory Commission (NRC) radioactive waste disposal requirements state, "waste disposal shall not take place in a 100 year flood plain." [10CFR § 61.50] Stipulated institutional control in the Record of Decision must include diversion dam and

water channel maintenance as well as an explicit monitoring regime and maintained fencing of waste sites. The NRF Plan proposes consolidation of contaminated soil into one of the leach pits. The cesium alone will take over 420 years to decay to acceptable risk levels, or considerably longer than the planned 100 year institutional control. Indeed, institutional control must extend as long as the contaminates are hazardous.

Response: (1) Trust funds are not applicable to the Federal Government. (2) NRF is not located on the 100-year flood plain (even in the absence of the dam), although parts of the INEEL are on the flood plain. Nevertheless, the scenarios evaluated for the human health risk assessment conservatively included flood-type conditions even though flood-type conditions are very unlikely at NRF. (3) The monitoring and institutional controls are an integral part of the selected remedial action. CERCLA requires that a review be conducted every five years when contaminants are left onsite above risk-based levels to ensure the selected remedy remains protective of human health and the environment. This continues after the 100-year period, which refers to the earliest reasonable time that residential use could be envisioned for any portion of the NRF site. The remedial action does not allow an entity to "walk away" from the sites of concern. Institutional controls are established such that fencing, border markers, and legal land use restrictions will control access to the sites even if a DOE presence is no longer established at the site. The design of the engineered cover will include a design criterion that the integrity of the cover remains protective for as long as the radionuclides are present above risk-based concentrations, which, based on the highest cesium-137 detected during remedial investigation sampling (7,323 pCi/g), would be approximately 365 years.

Comment 10

The Environmental Protection Agency (EPA) and the Idaho Division of Environmental Quality (DEQ) also incorrectly assume credibility with the public. The presence of their logos on the Plan, their review of the document, and their endorsement of the preferred alternative make these agencies complicitous in the Plan's inadequacies and flaws as well as a history of INEEL "cleanup" Plans that were more coverup than cleanup.

Response: EPA and DEQ have reviewed the Proposed Plan and have determined that it adequately describes all essential elements of a Proposed Plan including site characteristics, the nature and extent of contamination, site risks, remedial action objectives, description of

remedial alternatives, and comparative analysis of alternatives. The presence of the agencies' logos on the Proposed Plan does not mean that the agencies have selected a remedy for NRF The agencies will consider public comments received on the Proposed Plan prior to selecting a final remedy in the Record of Decision.

Comment 11

The Plan states: "The Comprehensive RI/FS Waste Area Group 8 represents the last extensive Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) investigation for the Naval Reactors Facility." This Plan is not "comprehensive" because it excludes the Retention Basin (one of the most contaminated waste sites at NRF) from the CERCLA cleanup process. The Retention Basin (OU-8-08-17) is a large concrete tank that temporarily holds liquid radioactive and chemical wastes (presumably to allow short-lived isotopes to burn off) prior to discharge to the various leach pits. The Plan fails to state that the sludge in the basin contains cesium-137 at 192,700 pico curies per gram (pCi/g)(risk-based action level is 16.7 pCi/g) and Cobalt-60 at 20,410 PCi/g-[RI/FS@H8-8] A long history of Basin leaks assures significant soil contamination under the basin and therefore must be included in the Comprehensive Plan.

Response: The retention basins were included in the Proposed Plan (e.g., see pages 9 and 10) with a remedial action that includes removing the concrete basins and cleaning up that soil below the basins which contains radioactivity above remediation goals. The sludge in the basin will be removed under decontamination and dispositioning activities at NRF. The basins and underlying soil will be remediated under CERCLA actions. The cesium-137 and cobalt-60 radioactivity results stated in the comment are from the sludge contained in the basins and do not accurately represent the potential radioactivity in the soil. The basins are known to have leaked on only one occasion (33,000 gallons in 1971). Although other leaks may have occurred and gone undetected, they would have been small compared to the 1971 leak. The sludge in the basins is an accumulation of several years of particulate matter, there is no reason to believe that the radioactivity concentrations in the soil would be equal to the radioactivity in the sludge. Although the sludge sample data are not used in risk calculations, they do help to identify potential contaminants of concern that may be present in the soil.

Comment 12

The Plan's exclusion of the NRF Expended Core Facility (ECF) contaminated soil resulting from leaks additionally demonstrates the incompleteness of the so called ."comprehensive" Plan. The ECF, built in 1958, does not meet current spent reactor fuel storage standards that require stainless steel liner, leak containment, and leak detection systems. The ECF should be shutdown for exactly the same reasons the Idaho Chemical Processing Plant (CPP-603) Underwater Fuel Storage Facility and the Test Area North Pool were shut down - they are an unacceptable hazard and do not meet current standards. ECF has been leaking significantly

over the past decade and the soil contamination around and underneath the basins must be included in the CERCLA cleanup process [RI/FS@5-1] The Plan offers no soil sampling data to substantiate exclusion of the ECF from CERCLA action. A theoretical risk analysis assumed only one leak (>62,500 gallons) which does not reflect the actual ECF history and that is why the sampling data is essential.

Response: There has been only one known leak from the ECF water pits, which was evaluated in the NRF Comprehensive RI/FS. The most significant pathway due to an ECF leak would be via groundwater. The risk assessment in the RI/FS used a very conservative assumption that the entire volume of water immediately migrated to the aquifer without dilution and was available for consumption. Even with this very conservative assumption, risks were not above the National Contingency Plan (NCP) target risk range. The operational aspects of ECF

with respect to accident analysis, earthquake scenarios, structural integrity, etc., have been evaluated and documented in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement. The Environmental Impact Statement concluded that present and future ECF operations have very small adverse environmental impact. In addition, this facility will continue to be operated in accordance with all applicable regulations and standards.

Comment 13

The Plan's exclusion of the Sewage Lagoon (NRF-23) from its so called "comprehensive" CERCLA cleanup, again, demonstrates the incompleteness of the Plan. Contaminate levels of arsenic, mercury, and cesium-137 would normally require remedial action. In fact, the Track 1 investigations recommended inclusion of the lagoons into the comprehensive RI/FS primarily due to radionuclides and the risk assessment results showed increased cancer rate of 1 in 10,000 from exposure to the site.[Plan@25] The Plan offers no data to substantiate the "risk management decision" to exclude the lagoons. NRF intends to continue to use these unlined leach pits despite the fact that every gallon of waste water that flows into the pit, leaches more of the contaminates toward the aquifer below. NRF should be required to close the Sewage Lagoons, clean them up, and build new lined ponds that meet current regulations. U.S. Geological Survey NRF well sample data confirm ground water inorganic contamination three orders of magnitude over the Maximum Contaminate Levels (MCL).[DOE/ID-22125@45] Clearly, the failed waste management practices of the past must end immediately.

Response: The sewage lagoons were evaluated as part of the NRF Comprehensive RI/FS. Arsenic and mercury were eliminated as contaminants of concern based upon risk management decisions that are detailed in Section 20 of the NRF Comprehensive RI/FS. In fact, the concentrations of arsenic and mercury at the sewage lagoons are below the allowable concentrations of these contaminants for direct land application of the sewage sludge to agricultural, forest, and home lawn lands (EPA 822/R-93-001 a - Technical Support Document for Land Application of Sewage Sludge, November 1992). Discharges to the lagoons remain in

compliance with existing regulations.

The data used to assess the presence of radionuclides in the lagoons were from the 1994-95 Environmental Monitoring Program. This data is the most reliable data available.

The sewage lagoons are clay lined. The clay liner acts to trap constituents present in the sewage effluent. A hydrogeologic study was performed for the NRF Comprehensive RI/FS and conservative assumptions were made during the study. The clay liner was assumed to leak, making all contaminants present in the sludge available for migration. Even with this conservative assumption, risks from the groundwater pathway were acceptable.

The 1 in 10,000 (1E-04) chance of increased cancer represents a very conservative estimate of the cancer risk associated with chemical and radiological constituents present in the sewage lagoon. There are uncertainties associated with the calculated risk. For instance, adding the increased cancer risk from a chemical constituent, such as arsenic, to an increased risk from a radiological constituent, such as cesium-137, likely overestimates the risk since each constituent affects humans differently. For this and other reasons, regulatory agencies have not historically attempted to sum chemical and radiological risks. In any event, the 1E-04 increased risk falls within the allowable risk range established by the NCP and, considering the conservative assumptions used in the risk assessment, a decision was made by the agencies that the risk present at the sewage lagoons is acceptable. The sewage lagoons have been delineated as a No Further Action site, which requires the decision to be reviewed every five years to ensure this decision remains effective. This review will include newly acquired data from sampling performed at the lagoons and groundwater sampling.

Wells at NRF have exceeded secondary MCLs for iron. Secondary MCLs are non-mandatory guidelines that are intended to control the aesthetic quality of drinking water. As discussed in the hydrogeologic study in the RI/FS, the iron concentrations are highly variable. For example, the concentration of iron in a USGS well upgradient of NRF varies from 10 parts per billion (ppb) to 3,000 ppb, which is ten times the secondary MCLs. This phenomenon is observed often across the INEEL. A review of INEEL groundwater data for iron in conjunction with research associated with the 14RF Land Application Permit indicates that the presence of iron is related to the unfiltered nature of the samples, the iron being contained in the naturally occurring sediment extracted during the pumping of well water. The amount of sediment observed from well samples is a property of well construction and geology, and does not appear to be related to their proximity to NRF facilities.

Comment 14

The preferred alternative 3 that DOE, the State, and EPA want the public to accept cannot be justifiably called a cleanup plan. A shell coverup game, yes, but not a cleanup plan. Alternative 3 is a rerun of the misguided actions at the INEEL Test Reactor Area Warm Waste Pond. The NRF Plan calls for the consolidation of the contaminated soil from numerous sites into the bottom of one of the old leach pits (S1W Leach Pit), then cap it with rocks and gravel.

It's quick, dirty and comparatively cheap; and that's why DOE likes it. With a slight of hand DOE wants to create a dump without calling it a dump because if they called it a dump then they would have to comply with hazardous and radioactive disposal regulations. If it looks like a duck, walks like a duck, and quacks like a duck then it is a duck. The very moment contaminated soil is moved from one site to another, a dump is created, and therefore, the regulations apply regardless what DOE wants to call it.

Response: Consolidation of contaminated soil at NRF (Alternative 3) was compared to various alternatives for soil disposal including complete excavation and disposal at facilities away from NRF (Alternative 4). Consolidation of soil at NRF rated favorably when compared to the complete excavation option (Alternative 4) for short-term effectiveness (more protective of workers during remedial actions), implementability (much less soil to excavate, package, and transport), and cost (estimated at $10 million dollars less). Alternatives 3 and 4 rated equivalent in overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). It is important to note that consolidation of soil at NRF will meet all ARARs. None of the excavated soil is expected to be hazardous. Also, strictly speaking, consolidation of existing contamination as part of a CERCLA remedial action does not constitute formation of a "dump."

Comment 15

The Plan offers inaccurate data to support the preferred alternative. The Plan states that the maximum soil concentration at all of the 8-08 Operable Units for cesium-137 is 7,323 PCi/g[Plan@14]. Appendix H of the RI/FS however credits the S1W Leach Pit with a maximum detected cesium-137 concentration of 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." [RI/FS@H4-22] This contaminate concentration discrepancy is significant because the undisclosed higher amount qualifies under NRC radioactive waste Class B criteria in 10CFR § 61.55 and the "technical requirements for land disposal facilities," in § 61.50. The preferred alternative does not meet NRC requirements. Actually, DOE's preferred alternative does not even meet municipal garbage landfill requirements under RCRA Subtitle D which require liner, leachate monitoring wells, impermeable cap, and location restrictions over sole source aquifers.

The NRF Plan contains none of these essential features. This Plan effectively shifts the risks,

hazards, and ultimate cleanup costs to future generations. The high levels of hazardous materials in the NRF waste qualify it as a mixed hazardous and radioactive waste under the 1992 Federal Facility Compliance and RCRA Land Disposal Restrictions. Hazardous contaminates in the soil include chromium at 2,090 mg/kg, lead at 1,140 mg/kg and mercury at 56.1 mg/kg. EPA's interim lead soil cleanup level is 400 mg/kg. The Plan offers no Toxic Concentration Leach Procedure (TCLP) data to support exclusion of this hazardous waste from regulatory disposal compliance. The transuranic contaminates (americium-241 and plutonium-238) at 20 pCi/g have half-lives of 432 and 87 years respectively guarantee the waste will be hazardous for a long time. Under the circumstances, it is difficult to see how the Plan's preferred alternative can claim to meet all the "Applicable or Relevant and Appropriate Requirements" (ARAR).

Response: The cesium-137 concentration of 149,759 pCi/g identified in the comment was detected at NRF-128 (S1W Leaching Pit) in 1972. As stated in the RI/FS Work Plan, this concentration was suspected to be a particle and not representative of actual soil concentrations; 69 other samples collected from the area between 1972 and 1978 showed a maximum cesium-137 activity of 2,600 pCi/g (decay corrected to 1,759 pCi/g in 1995) and a second highest value of 620 pCi/g (decay corrected to 410 pCi/g in 1995). The sampling performed in the 1970's was used to determine contaminants of potential concern, but was not used for risk assessment calculations. Data collected between 1990 and 1996 were used for the risk assessment.

Further, the comment states that the 149,759 pCi/g would qualify the soil as NRC radioactive waste Class B as defined in 10CFR § 61.55. This is incorrect. Even if the 149,759 pCi/g were representative of the soil contamination, and even if no credit were taken for radioactive decay since 1972, the contaminated soil would still fall below Class A criteria, which the proposed cover will meet. (it is also appropriate to note that meeting Class A criteria is not a requirement for CERCLA actions.)

None of the contaminated soil at the nine sites of concern is expected to be RCRA hazardous. The Proposed Plan, which is a summary document of proposed remedial action alternatives, did not include all past sample results; however, none of the soil at NRF has been shown to be RCRA hazardous. The concentrations of metals cited in the comment are total metal results and do not represent TCLP results. Past TCLP sample results from areas with the highest metal concentrations did not show levels above RCRA limits. (TCLP sample results were presented in the NRF Comprehensive RI/FS Work Plan.) Therefore, no hazardous or mixed waste is expected to be generated during remedial actions.

The sample result showing 20 pCi/g of americium-241 and plutonium-238 did not distinguish between the two radionuclides. A conservative approach was taken that considered both americium-241 and plutonium-238 to be present at a maximum concentration of 20 pCi/g. As shown in the Proposed Plan, the 20 pCi/g for either americum-241 or plutonium-238 is still well below the risk-based concentration representing an increased cancer risk of 1E-04, The lowest risk-based concentration was 283 pCi/g for americium-241 and 590 pCi/g for plutonium-238 through the soil ingestion pathway. Americium-241 at 20 pCi/g represents an increased risk to

a future resident through all exposure pathways of 2E-05. Plutonium-238 at 20 pCi/g represents an increased risk to a future resident through all exposure pathways of 5E-06. These risks fall within the target risk range as defined in the NCP.

Comment 16

The INEEL Oversight Program's Kathleen Trever claims that the S1W data set containing the 149,759 pCi/g cesium-137 was not considered reliable by DOE and therefore it was not used in the Risk Assessment. When asked about this data-set discrepancy, EPA's Wayne Pierre said that DOE could not arbitrarily ignore a data-set unless they had more than 10 data-sets, and then they could choose the most reliable 10 sets. Since DOE only had three data-sets, Pierre thought it unacceptable to rely completely on the 1991 and 1992 samples. It is possible that the earlier sampling grid identified hot spots that the later sampling grids could be planned to avoid.

Response: The cesium-137 activity of 149,759 pCi/g that was detected in one of 70 samples collected between 1972 and 1978 from the S1W Leaching Pit area was not ignored, Each site's maximum concentration was used throughout the initial evaluation to identify potential contaminants of concern in the RI/FS work plan for that site, even though average concentrations would have shown a more likely contaminant concentration at each site. The average concentration for data collected at the S1W Leaching Pit between 1972 and 1978 was less than 3,000 pCi/g when including the single 149,759 pCi/g sample, or near 100 pCi/g when not including the 149,759 pCi/g sample. Sample data collected in the 1970's did not have the appropriate data quality (e.g., no quality control samples were run, or exact sample location is unknown) to allow its use in risk assessment calculations, and therefore data collected from recent sampling events as described in the RI/FS Work Plan were used for risk assessments. For the S1W Leaching Flit, a concentration term of 2,040 pCi/g for cesium-137 was used, which was the highest detected cesium-137 activity from either the S1W Leaching Pit or the adjacent S1W Leaching Beds cluring recent sampling. This was very conservative, relative to using the 95% upper confidence limit of the mean concentration, which would have been more realistic.

EPA does not provide guidance concerning the number of data sets necessary for risk assessment. EPA does provide information recommending the use of at least ten data points when calculating a mean and 95% upper confidence limit used for establishing a reasonable maximum exposure (RME) level for risk assessment (EPA/540/1-89/002, Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A)). When there are fewer than ten data points in a data set, EPA recommends to use the maximum value of the data set. Although most data sets consisted of more than ten samples, NRF conservatively elected, in most cases, to use the maximum value found at each site when performing the individual site risk assessments.

Finally, later sampling did not avoid the location of the 1972 highest level sample. Rather, sampling has been performed all around this area, but the levels found were much less than the

highest 1972 level found.

Comment 17

1971 sampling data buried in the RI/FS show long-term waste mismanagement at the S1W Leach Pit with cesium-137 at 310,000 pCi/g, cesium-134 at 4,200 pCi/g, hafnium-181 at 20,000 pCi/g, and cobalt-60 at 1,300,000 pCi/g[RI/FS@1-59] Algae (accessible to ducks using the pond) sampling shows 667,447 PCi/g-(RI/FS@pg H6-13] By comparison, the risk based soil concentration for cesium-137 applied to this Plan is 16.7 pCi/g. These high contamination levels were due primarily to once through reactor cooling water dumped in the leach pits which was discontinued by 19130. No explanation is offered why the remediation goal applied to Waste Area Group 3 of 0.02 pCi/g for cesium-137 was changed.

Response: As stated in the RI/FS Work Plan, the 1971 samples were collected from the mud of the active S1W Leaching Beds. The location and circumstances of the sample collection were not recorded. The contaminants detected during historic sampling were only used to determine potential contaminants of concern, not risk; historic sampling does not represent current conditions of the leaching bed soil. Recent sampling evolutions better represent site conditions.

The comment also states that a remediation goal of 0.02 pCi/g for cesium-137 was used at Waste Area Group (WAG) 3. WAG 3 does not have a remediation goal of 0.02 pCi/g for cesium-137, but did use that as a screening level for considering cesium-137 as a potential contaminant of concern. WAG 3 cleanup goals are similar to WAG 8 (NRF) cleanup goals.

Comment 18

Alternative 4, Complete Excavation and "Off-site Disposal" is equally unacceptable because "Off-site" is defined as hauling the contaminated soil from NRF to another INEEL leach pit consolidation site at the Idaho Chemical Processing Plant, Test Reactor Area, or the Radioactive Waste Management Complex, none of which would qualify even as a garbage dump. Interestingly, DOE calls these "INEEL soil repositories." Therefore, alternative 4 does not meet legal requirements in the ARAR's.

Response: Alternative 4 would meet the legal requirements in the ARARs. Off-site, as defined in Alternative 4, means: (1) disposal to a potential soil repository at the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)) that would be established through a public input process; (2) disposal to the warm waste pond at the Test Reactor Area that is currently being used for soil consolidation of other CERCLA sites; (3) disposal to the Radioactive Waste Management Complex that currently accepts low-level radioactive waste; or (4) disposal away from the INEEL to a location licensed to receive the soil and debris from NRF

Comment 19

The cumulative risk assumptions that determine the exposures to future 100 year residential and occupational scenarios are not conservative (most protective of human health) and not supportable. The Plan states: "The ingestion of soil, the ingestion of food crop, and direct contact with soil through the dermal pathway are not included in the cumulative assessment because these involve exposures routes that are not likely to occur at more than one release site at a time." [Plan@11] A possible future scenario of a pasture over the leach pit, a well over the Retention Basin, and dermal exposure from digging around the ECF is reasonable. Therefore, all these pathways must be considered to be cumulative. The risk assessment must also be recalculated using the above cited maximum cesium-137 contaminate level of 149,759 pCi/g which will produce radically different results from the 7,323 pCi/g used by DOE as the maximum contaminate level at NRF

Response: The purpose of the cumulative risk assessment was not to add worst case risks from various pathways across many sites (i.e., soil ingestion risk from one site added to groundwater ingestion risk at another site). The cumulative risk assessment evaluated the additive effects of several sites for each cumulative pathway of concern (i.e., dust from one site intermingles with dust from another site causing an accumulation or higher contaminant concentration in the dust). The ingestion of soil, the ingestion of food crop, and direct contact with soil through the dermal pathway are not considered cumulative because the worst case scenario for these exposure pathways would be a person residing directly at the site in question The individual site risk assessments calculated the worst case scenario risks for these pathways. Risks via these pathways cannot be any higher through accumulation than the risk calculated for the individual site with the highest contamination. As an example, a person eating the maximum expected quantity of site-grown food, all from within the most contaminated area, cannot also be expected to eat food grown in a less contaminated area. If an individual were to ingest a mixture of plant material grown at two sites (one with the highest contamination and one with less), the cumulative effect (risk) to that individual would be less than ingesting all plant food from the site with the highest contamination. This illustrates why ingestion of soil, ingestion of food crop, and direct dermal contact are not considered cumulative across different sites.

However, the inhalation of dust, groundwater ingestion, and direct exposure to radionuclide pathways are spatially cumulative. A receptor located at one site breathes air containing particulates which may have come from multiple sites. In the case of groundwater ingestion, it is not possible to determine the location of a hypothetical future well. It must be assumed that a well could be in a location in which it would receive contamination from multiple sites. The direct exposure to radionuclides may also be additive if a receptor is located between two sites

and receives exposure from both sites.

The cesium-137 activity used for risk assessments was explained in the response to comment #15. Regardless of the cesium-137 activity used for the risk assessment, the results would be the same: based upon either 7,323 pCi/g or 149,759 pCi/g, an unacceptable risk would be present that requires some type of remedial action. The 16.7 pCi/g remediation goal for cesium-137 was established to prevent effects from any amount of cesium-137 above this level. Its selection is independent of the cesium-137 levels at each site.

Comment 20

NRF and DOE representatives stated at a public meeting in Moscow that the groundwater and aquifer are not at risk because contaminates are absorbed by the soil column. Review of the historical deep well sampling data at NRF does not support the Navy's conclusion. The NRF October 1995 Remedial Investigation/Feasibility Study (RI/FS) Appendix K shows Table III Deep Well Sample Results for Wells #1, #2, and #3 at 60, 69, and 44 pico Curies per liter respectively for gross beta. The federal drinking water standard (MCL) for gross beta is 8 pico curies per liter. This deep well sample data confirm that the contaminates do migrate, contrary to the Navy's claims. The USGS well sample data previously cited additionally confirm contaminate migration.

Response: The data from groundwater wells in October 1976 were described in the 1976 Environmental Monitoring Report as being an abnormality. The laboratory performing the analysis confirmed that all INEEL wells showed elevated beta activity levels above minimum detectable levels. The laboratory concluded that the likely cause was cross-contamination at the laboratory and not contamination of well water. This is supported by the data collected during the months prior to and after the October data.

In any event, for risk calculation purposes, some absorption by the soil column is considered. The absorption is a property of the soil matrix and chemical being absorbed. No chemical was assumed to be completely absorbed.

Comment 21

The Plan's "remediation goals" that set risk-based soil concentrations for contaminates of concern (cleanup goals) fail to include inhalation as an exposure pathway. This exclusion represents a major flaw in the Plan. Inhalation is the most biologically hazardous for alpha emitting contaminates of concern listed as americium-241, neptunium-237, plutonium-238, plutonium-244, and uranilum-235, yet inhalation is not considered for these isotopes, nor for lead. The wide difference between ingestion of beta/gamma contaminated soil also appears out of balance. For instance cleanup goals for cesium-137 external exposure is set at 16.7 pico curies per gram (pCi/g) while ingestion of soil is set at 24,860 pCi/g. Additionally, the beta emitter strontium-90 is not considered for external or inhalation exposure but is considered for soil ingestion at 15,416 pCi/g and food crop ingestion at 45 pCi/g.

Response: The inhalation exposure pathway was evaluated in the risk assessment presented in the NRF Comprehensive RUFS, which was the primary referenced document of the Proposed

Plan. The inhalation pathway did not show an increased cancer risk greater than 1E-06 for any of the contaminants of concern. it was therefore not necessary to calculate a risk-based cleanup target concentration for any contaminants through this pathway. Although inhalation of alpha-emitting radionuclides was a concern and was evaluated during the risk assessment, the soil concentration would have to be relatively high in order for enough alpha-emitting radionuclides to become airborne and become a risk driver. The same logic applies to the inhalation pathway for other contaminants.

The wide variability in acceptable concentrations of radionuclides, depending on both radionuclide and pathway, is based on how they can affect people. Radionuclides that emit gamma radioactivity can cause a larger direct exposure dose than those that only emit beta or alpha types of radioactivity (which do not penetrate more than a few inches of air); hence a relatively low cleanup concentration for gamma emitters may be required to keep direct exposure doses low, whereas much higher concentrations of non-gamma emitters (e.g., beta or alpha only) may be acceptable since the doses they can give people are much less. For cesium-137, the relatively high risk-based concentration through the soil ingestion pathway compared to the external exposure pathway is a result of the limited bioaccumulation of cesium-137 in human tissue during the ingestion process. In other words, a large percentage of cesium-137 passes through the body, limiting exposure to the radionuclide. The external exposure pathway assessment assumes a constant source of gamma emitting radioactivity being present in the soil and assumes the receptor is exposed to the source continually throughout the exposure duration period, which is more conservative than the assumptions in some standard computer programs modeling exposures.

Similarly, some radionuclides such as strontium-90, due to their chemical nature, may be readily taken up into the food chain, which would result in the need for lower concentrations as cleanup goals for this pathway (to keep the doses low). Other chemicals such as cobalt (and hence any cobalt radionuclides like cobalt-60) may not be readily taken up by plants, and hence even high concentrations would still be of low risk for this pathway.

The RI/FS essentially picks the lowest acceptable concentration for each radionuclide, from among the various pathways, and uses that for the risk-based cleanup goal for that radionuclide.

Comment 22

An integral factor in the Plan's establishing a "remediation goal" is the maximum concentration of contaminates of concern. The Plan acknowledges (pg 14) that the maximum cesium-137 soil contamination detected at the NRF is 7,323 pCi/g which generated a risk based cleanup goal of 16.7 pCi/g. Again, as previously discussed, this must be recalculated using the above cited

maximum detected cesium-137 at 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." This significant discrepancy begs the question as to the quality of regulatory review the State and EPA are bringing to the process and whether the remediation goals" are supportable.

Response: The remediation goals are based on risk levels associated with specific post-remediation concentration limits. The goals are not related to any specific sample results. Regardless of the activity of cesium-137 used for the existing site-specific risk assessments, the remediation goal of 16.7 pCi/g would not change. The 16.7 pCi/g represents a current present-day activity level which corresponds to an increased risk of cancer of 1 in 10,000 for a future 100-year resident via the external exposure pathway, which is the exposure route of concern. Hence, areas below 16.7 pCi/g cesium-137 at the present time would be acceptable for unrestricted release in 100 years.

Comment 23

These comments actuall, apply to both the proposed plans for WAGS 8 and 9, but especially WAG 8 since containment is part of the preferred alternative for WAG 8.

I am concerned that DOE-ID appears to be using the engineered barrier or rock cover that was emplaced at the SL1 burial grounds and at the BORAX facility as the prototype barrier for any subsequent proposed disposal facilities on the INEEL. This SL1-style rock cover or "barrier" is part of the containment alternative presented in the proposed plans for both WAG 8 and WAG 9. It is well documented that the effect of this rock cover would be to increase infiltration and minimize evaporation thereby increasing the amount of water available to leach contaminants from the disposed soil the cover is supposed to protect. I have read the proposed plan for WAG 8 and pertinent portions of the WAG 8 Comprehensive RI/FS and see no acknowledgment that this rock cover will increase infiltration. The fact that this rock cover will increase infiltration and leaching should be plainly stated in the proposed plan for the information of members of the public. If anything, the wrong impression is given in the Overall Protection of Human Health and Environment section of the proposed plan for WAG 8 (page 161 where it is stated that Alternative 3 will "minimize infiltration." This last statement is miserably incorrect and needs to be changed.

While the groundwater pathway may not have been a risk in the baseline risk assessment for either WAGS 8 or 9, even with infiltration rates as high as 1 m/yr, it still seems wrong from an environmental stewardship viewpoint to needlessly install a rock cover that will undoubtedly increase leaching from the contaminated soil and increase concentrations of leached contaminants in the Snake River Plain aquifer. I feel this statement is true even if the

increased
infiltration caused by the rock cover only incrementally increases contaminant concentration in
the aquifer because there are better cover alternatives. True engineered barriers that provide
the necessary shielding and biotic protection have been designed and are being tested on the
INEEL. These barriers are resistant to erosion and minimize infiltration, These barrier designs
should be given a thorough comparative evaluation to an SL1 -style barrier for use in the
preferred alternative. This comparison should include analysis of even incremental risk
increases in the groundwater pathway from increased infiltration due to the rock cover.
Hopefully, this comparison will occur since there are words in the Comprehensive RI/FS for
WAG 8 that the proposed rock cover in Alternative 3b is a "conceptual design" and that the final
design will be developed during the remedial design process.

The WAG 8 Comprehensive RI/FS cites Reith and Caldwell (1990) as stating the proposed
barrier is appropriate for containment in an and area. I have read the article by Reith and
Caldwell and, although the article admits that several of these rock covers have been built at
UMTRA sites, the main point presented in the article is that since vegetated soil covers are
more effective for reducing infiltration and subsequent leaching from contaminated soil,
vegetative covers should be used in semiarid climates to protect the environment from
contaminated soils rather than simple rock covers. This gives the appearance that the Reith
and Caldwell article is incorrectly cited out of context for purposes of justifying the choice of
engineered barriers.

Response: As stated in the WAG 8 Proposed Plan and the NRF Comprehensive RI/FS, the
cover shown in the Proposed Plan and RI/FS is only one possible design. All comments
received on the cover design will be considered during the remedial action design phase. One
of the purposes of Alternative 3 will be to minimize infiltration to prevent contaminant migration.
Presently, the leaching beds are a depressed pond area with large cobblestone along the
bottom, making an ideal infiltration situation, yet sampling has shown very little migration to date
of contaminants of concern. The consolidation of soil in the pond area and the construction of
any type of cover would actually decrease infiltration compared to what currently exists. The

cover layers may include a low permeability layer or layers of soil with sufficient thickness to
enhance evapotranspiration. A top layer for a vegetation cover will certainly be considered.
The experience gained at NRF during the construction of three landfill caps with vegetation
covers was also valuable. NRF was successful at designing covers which resist erosion and
minimize surface infiltration. This experience will be put to use during the design of the covers
proposed by Alternative 3.

The purpose for citing the Reith and Caldwell reference was to show that a rock-type cover is a

potential cover in an and climate, but possibly not an appropriate cover in a humid climate. It was not intended to justify any cover design.

Comment 24

If the preferred alternative is actually selected and implemented through a ROD, I would hope that shallow monitoring within the vadose zone beneath the consolidated soil disposal would occur to verify the assumptions and results that were used in the subsurface pathway flow and transport modeling that was performed to demonstrate the acceptability of the chosen remedy.

Response: Vadose zone monitoring will be considered during the remedial design phase as well as various other monitoring methodologies (i.e., radiation surveys, soil sampling, and groundwater monitoring).

Comment 25

Analyses seem conservative and thorough. I favor Alternative #3. If more excavation than that is considered, extreme care/caution would be needed to insure that close to zero plutonium compounds are airborne and subject to human ingestion. No amount of plutonium ingestion Is considered safe. Various isotopes are probably present in minute quantities.

Response: The highest amounts of plutonium detected were in the leaching bed areas that are not planned for excavation. Even the maximum amount of plutonium detected in the soil at NRF, including in the leaching beds, showed risks to a 100-year future resident at 6E-06 for soil ingestion and 2E-06 for food crop ingestion (the only significant pathways for plutonium). Current risks to occupational workers showed a maximum risk of 2E-06 through the soil ingestion pathway. Each of these risk values are within the NCP target risk range.

Comment 26

Why do we (you) keep moving and shuffling this radioactive so called hazardous waste around to contaminate more and more area? We might as well just eat the stuff and be done with it or sell it to the fertilizer and petroleum industry and let them spread it around. It would be less money than INEEL spent fooling around. Or are you waiting for your retirement plan to kick in then you can move far away from ground zero. No more of your worry!

I think maybe you people are missing something which is filtering into water aquifers and killing and sterilizing fishes and other living, now dead things. Why keep stirring the pot to make dust and fumes fly around to contaminate more! Is this just a job, or do you really care?

Either INEEL or U.S. Postal Service - Thank You - Your mailings didn't get to North Idaho until the day of the Public Meetings or after not much time to schedule. After the fact. Guess our highways are slow traffic only. Thank You. The goat trail to North Idaho.

Response: The contaminated soil to be excavated will not be RCRA hazardous waste (see response to Comment #7). The option chosen will decrease the total area of contamination.

Controls would be used during soil consolidation to minimize the spread of dust. The sampling of groundwater monitoring wells around the perimeter of NRF currently measures the quality of groundwater and helps ensure past operations have not adversely impacted the aquifer.

We apologize for the late notification and, as a result, the comment period was extended for 30 days.

Comment 27

The scope of the proposed cleanup at the Naval Reactors Facility and the discussion at the Idaho Falls public meeting point once again to a fundamental dilemma facing Department of Energy cleanup. That dilemma is ongoing uncertainty, confusion, and disagreement about the magnitude of the DOE's long-term stewardship responsibilities. On the one hand, nuclear material should not be dinked with more than necessary, and handling, treating, and transporting it should occur only when environmental and health protection demands any of those steps. On the other hand, any residual material presents a risk. The level of residual risk will obviously affect the level of stewardship required. Then there is the question of the future uses for any site--from nature preserve to industrial park to residential neighborhood--which will also affect stewardship requirements. Commentors in Idaho Falls raised both these questions.

There is a land use plan for INEEL, and it is our understanding that it is being used by the DOE and its regulators to guide cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act. But that plan was developed through a less than perfect process with very little public involvement.

Acceptable risk and future use are both topics that deserve and are amendable to wide, ongoing public discussion, and it is clear that discussion has not yet really begun. This is particularly unfortunate since, as the decades pass, it's quite likely that stewardship will become more and more the responsibility oflocal communities. Some decisions about long-term stewardship cannot be made for many years, and some we're working from now will no doubt be revisited. The Alliance encourages efforts to engage the public in broad, ongoing consideration of the long-term stewardship required at INEEL.

Specific to the cleanup of NRF, it is quite frankly a relief that, unlike its spent fuel, the nuclear navy does not propose to treat and transport to a fare-thee-well the soil it has contaminated at

INEEL. On the other hand, the environmental benefits of consolidating contamination are not entirely clear. The nuclear footprint in Idaho will never fit in the glass slipper.

Response: If contaminaints are left on site above risk-based concentrations, CERCLA requires a review of the selected remedy every five years to evaluate the effectiveness of assumptions, remedies chosen, and decisions made during the CERCLA process. One assumption agreed with by the DOE, EPA, and IDHW was that a Government or institutional presence will be in place for 100 years. Although predicting the future land use scenarios has many uncertainties, the five year CERCLA review process helps accommodate these uncertainties, particularly in later years. Part of the consideration for the selected alternative was to include institutional controls that would prevent access to the sites of concern even if there is no longer a Government presence at NRF. These institutional controls include fencing or other barriers, permanent markers, and legal land use restrictions. Regarding land use, standard INEEL scenarios were used: on-site workers for near term exposure and residents for 100 years in the future. Actual future land use decisions were beyond the scope of this study.

The primary benefit to consolidating the soil in a few locations rather than covering each area is that it is not practical to individually cover or cap several of the sites-of concern. Most of the sites to be excavated areA under concrete basins, below asphalt roadways, or between security

fences. Therefore, the only feasible alternatives available for these sites were no action, additional monitoring, or excavation. Consolidating soil and placing an engineered cover over the consolidation area will prevent animal/erosion intrusion while also being designed to limit maintenance requirements, and reduces overall risk.

Comment 28

The 1995 nuclear waste deal included a commitment from the nuclear navy to spend $45 million on "discretionary" environmental remediation within five years. Activities carried forward under CERCLA are required by law and are not at the polluter's discretion. Without question, the funds promised in the nuclear waste deal cannot be used for any part of the proposed cleanup plan under review here. The $45 million raises other questions, though. What, if any, role will DOE-Idaho, the Environmental Protection Agency, and the State of Idaho have in determining expenditure of the promised $45 million? What criteria (e.g., downstream health protection) will be used? More to the point, as required environmental activities at INEEL grow increasingly problematic both through budget constraints and through the DOE's inability to meet technical and management challenges, is it appropriate to spend $45 million on discretionary remediation at all?

Response: The Navy does not intend to spend any of the committed $45 million in discretionary remediation funding to accomplish CERCLA-required actions discussed in this ROD. The $45 million in the "Idaho Agreement" documents the Navy's ongoing commitment to pro-actively remediate site facilities to minimize future environmental liabilities. Other decontamination and dispositioning tasks will be accomplished with this funding, with the objective of obtaining the greatest benefit in the most cost-effective manner. To a large extent, the Naval Nuclear Propulsion Program uses its discretionary authority to focus funding on remediation projects addressing the more significant near term risks. See also the discussion of costs and planned decontamination and dispositioning actions in the response to Comment 39 below,

Comment 29

How did you folks get silver in the parking lot runoff trenches? What are your tire studs made of?

Response: Silver was only detected above background levels in one sample at 1.25 parts per million (ppm), The risk-based concentration for silver as calculated in the NRF Comprehensive RI/FS is 39 ppm. Because there was such a low concentration of silver detected in only one sample, it is questionable that a source exists. If a source is present, the small fluid leaks and wear products from automobiles in the parking lot are the most likely source. Alternatively, a small spill of automotive battery acid contacting an old silver dime could account for such trace levels.

Comment 30

I have read Snake River Alliance's comment letter dated February 10, 1998, from Beatrice Brailsford and concur with the contents. I lived in Idaho from 1977 to 1991 and I have always been concerned about INEEL, nuclear pollution and contamination, the aquifer and the Snake River.

Response: Please see responses to Comments 27, 28, and 29.

Comment 31

Alternative 3 is not less costly than Alternative 4, Complete Excavation and Off-site Disposal. The Alternative 4 cost analysis was exaggerated by more than 400% of what is commercially available at a low-level radioactive facility off-site from INEEL through contracts to which the DOE and INEEL currently have access. As a result, Alternative 4 has less construction/capital

costs associated with it, and as indicated in the cost analysis, operation and maintenance costs for this option are minimal, since all material would be moved to an off-site commercial disposal facility.

Response: Alternative 4 is significantly more expensive than Alternative 3. The costs shown in the NRF Comprehensive Feasibility Study show a landfill disposal cost for each site that is excavated. This cost is estimated to be near $400 per cubic yard. This not only represents the disposal fee, but also the significant additional costs associated with handling, packaging, and transporting radioactively, contaminated soil. Once packaged and ready for shipment the actual disposal fees may only be $100 per cubic yard. This difference takes into account the additional requirements needed during handling, packaging, and transporting activities for radioactive soil.

For Alternative 3, once the soil is placed in the leaching beds and a base layer of clean soil is placed over the area, cover construction would not require stringent radiological controls. Alternative 4 would require much more construction activity, to excavate over seven times the amount of contaminated soil to a depth of over 30 feet (vice 14 feet).

Comment 32

It is arguable that complete excavation and disposal (Alternative 4) requires more construction activity than limited excavation and disposal (Alternative 3). Although less material may be moved, the construction of a cap and cover system requires significant construction activity and is potentially equivalent to the limited excavation option.

Response: See response to Comment 31 above.

Comment 33

Alternative 3 is not more implementable than Alternative 4. It is stated that Alternative 4 ranks lowest in implementability because of additional excavation, transportation concerns and the uncertainty of the availability of off-site disposal facilities. First, commercial implementation of projects of this scope are quite routine and have been proven successful. Commercial contractors have trained workforces, thus eliminating the training that Alternative 3 requires, Second, INEEL have successfully transported large quantities of waste from INEEL to Envirocare of Utah without mishap, thus reducing any transportation concerns. Third, off-site disposal capacity is prevalent. Envirocare of Utah maintains a future capacity for low-level waste in excess of 12 million cubic yards and is accessible through current government contracts.

Response: The first option for Alternative 4 is an on-INEEL soil repository that is being proposed by the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)), which would likely be the least expensive of the off-site (away from NRF) options. Uncertainty exists, since the repository has not been established, which makes the implementability of Alternative 4 using an INEEL soil repository questionable. Although projects of Alternative 4's scope have been performed in the past, there are aspects of Alternative 4 that make it more difficult to implement than Alternative 3. Alternative 4 would require excavating to a depth of 30 feet compared to an estimated maximum depth of 14 feet for Alternative 3. As previously stated, any work involving radiological controls

is less efficient and more difficult to implement. Regardless of the successful transportation of past INEEL shipments to Envirocare, the additional concerns, regulations, and public sentiment make transportation of radioactive material along public highways or railways a concern that is included in the assessment of alternatives. Hence, the agencies believe that Alternative 3 is easier to implement than Alternative 4.

Comment 34

Alternative 3 required unlimited future surveillance and maintenance, creating an unending mortgage cost for the government and citizens. Not only is the cost estimate for these, costs probably underestimated, but Alternative 4 eliminates these future costs.

Response: The agencies agree that Alternative 3 will require future monitoring and possibly maintenance; however, the 30 year costs show that Alternative 3 is less expensive than Alternative 4. The cover design will limit most maintenance needs. Institutional controls will be established to limit access and the need for continuous surveillance. Periodic reviews will evaluate future monitoring and maintenance requirements. Although future operations and maintenance (O&M) costs beyond 30 years can be assumed they are expected to be minimal based on proper cover design and established institutional controls. The future surveillance and maintenance costs would be similar for the Federal Government or an NRC regulated commercial disposal facility; the difference being Alternative 4 applies the cost upfront in the form of disposal fees. A commercial disposal facility also introduces potential future liabilities, if the company ceases to exist or fails to comply with all regulatory requirements.

Comment 35

Overall protection of human health and the environment is not equally served by alternatives 3 and 4. Placement of radioactive waste in an off-site facility licensed and selected for its suitability for radioactive material and maintained by a specialized staff trained specifically for this service is more protective than on-site capping.

Response: The overall protection of human health and the environment includes the evaluation of several criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Both alternatives comply with ARARs. Alternative 4 was judged better for long-term effectiveness and permanence based on the complete removal of the contaminant source and the reasons cited in the comment. However, Alternative 3 was judged to have a better short-term effectiveness because less contaminated soil is excavated and handled. Both alternatives satisfy the criteria of overall protection of human health and the environment, and were therefore given an equal rating. For Alternative 3, an appropriately trained staff will be employed at NRF for the remedial actions taken.

Comment 36

The presenters provided comprehensive discussions on the numerous sites assessed at the NRF during the Comprehensive Remedial Investigations. These investigations evaluated the potential for risk to human health from chemical and radiological sources at the NRF as well as looking into related ecological and hydrogeological issues.

The Coalition 21 has no criticisms or comments on the proposed Plan but reserves the right to comment at a further date should that be considered necessary by the Coalition's Board of Directors.

Response: The agencies appreciate the time and effort made to read and comment on the Proposed Plan.

Comment 37

I am interested in learning, can a "waterproof material" or"liquid rubber" be sprayed over the 4" gravel and under the contaminated soils to prevent water from permeating through the engineered covers? This water resistant material could be sprayed from a large vehicle or crane over the site and would "dry or shrink" after being exposed to the environment.

Response: Technologies that required a barrier to be placed beneath the contaminated soils were evaluated in the, NRF Comprehensive Feasibility Study and were determimd to be too difficult to implement, too costly, and therefore not practical. The inclusion of a rubber type

material, or impermeable layer, above the contaminated soil will be considered during the cover design phase of the project.

Comment 38

Can a "sponge like material" or "absorbent" be added to the contaminated soils and liquids that might help prevent migration of the contaminated water to a lower aquifer?

Response: There is no contaminated liquid present at the sites of concern. Infiltration of water from precipitation events will be minimized by the installation of the cover. See the response to Comment 4 that discusses the limited migration potential at the sites of concern.

Comment 39

The INEEL CAB recommends selection of Alternative 3 as the preferred alternative for cleanup at NRF. It is less costly than the other alternative which also achieve appropriate risk reduction objectives. It also reduces risks to a more acceptable level than the less costly alternatives. By consolidating materials at an existing site at the NRF, the preferred alternative also minimizes transportation, risks to site workers, and potential for airborne contamination.

Alternative 3 would involve limited excavation of an estimated 58,080 cubic feet of contaminated soil and placement of the soil in the S1W leaching beds; containment of on-site disposal areas with earthen covers; removal to an approved low level radioactive disposal area of contaminated underground piping and concrete structures; and implementation of monitoring, fencing, other barriers, and/or land use restrictions.

While the INEEL CAB supports the risk reduction measures that would be achieved through implementation of Alternative 3, we are concerned about the much higher costs compared to Alternative 2 and about the accuracy of cost estimates as presented. The Board recommends that the Record of Decision (ROD) provide documentation that no other, less-costly alternatives exist which could achieve the desired risk reduction objectives. In addition, the ROD should provide documentation of total lifecycle cost estimates for all alternatives to allow compadsons among them and to document the justification for selecting an alternative which will require long-term institutional controls and monitoring.

Alternative 2 would involve various institutional controls and additional monitoring. Long-term monitoring of the soils and groundwater would continue through the control period, Fencing or other barriers would be constructed around the sites of concern to inhibit access to the area. Land use restrictions would be obtained near the end of the control period to prevent

excavation
in areas where wastes are contained and would include the placement of permanent property markers with posted signs.

Response: Section 6.7 of the ROD includes a more detailed cost breakdown than was presented in the Proposed Plan. This includes the specific costs associated with each action associated with Alternatives 2, 3, and 4. Although Alternative 3 is more expensive than the limited action associated with Alternative 2, the agencies feel the costs are justified. One consideration which is not evident from the cost estimate or the comparison of alternatives is that all sites being excavated as part of Alternative 3 were previously identified as areas of planned decontamination and dispositioning removals. The piping and concrete structures at these sites were not originally part of the CERCLA investigations; only contaminated soils outside contained systems were the focus of CERCLA investigations. Therefore, some of the excavation costs associated with these areas were expenses that were part of NRF's planned future decontamination and dispositioning activities.

The only feasible alternative (as determined in the NRF Comprehensive Feasibility Study) other than Alternative 3 that could achieve the desired overall protection of human health and the environment was Alternative 4. Other technologies were screened out during the development of alternatives. The least costly option available in Alternative 4 is likely the disposal of excavated soil to a soil repository established at the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)). However, the costs associated with placing covers over the consolidated areas, which are part of Alternative 3, are small compared to the costs of excavating over seven times more radiologicaUy contaminated soil, which is necessary as part of Alternative 4. The actual disposal fees are small compared to the costs associated with excavating the contaminated soil and preparing the soil for shipment to a disposal facility away from NRF. For additional cost information see the response to Comment 31.

Comment 40

The INEEL CAB members understand that the assumptions used in the risk assessment process are conservative. The Proposed Plan does not describe the assumptions with enough detail to allow members of the general public to understand. The ROD should provide a better explanation of the risk assessment process and make it understandable to the general public (e.g., use quantities people can relate to).

The INEEL CAB also understands that the primary risk imposed by contamination at NRF is direct exposure. That fact is not well communicated in the Proposed Plan. It should be better communicated in the ROD so as to limit concerns among people living at a distance from the facility.

Response: Section 4.1.2.2.2 of the ROD specifically discusses the assumptions made in the risk assessment. Section 5.1 of the ROD also more clearly defines that direct exposure to cesium-137 is the primary risk associated with the sites of concern.

Comment 41

I'm concerned about the proposed engineering design. My name is Buck Sisson. I live in Idaho Falls. I'm concerned about the proposed engineered barrier over the top. It has a tendency - - it will maximize infiltration, probably collect snow and a lot of infiltration that is going on, really accelerating migration that should take place. I think that would be - - I'm worried about the engineered burial that is going to maximize infiltration and it will trap snow, and there won't be any plants growing, so it will maximize the infiltration and the leaching of the soluble waste.

There are much better alternatives than that. DOE spent quite a bit of money on developing cap or barrier designs that minimize that leaching effect, and it should be seriously considered,

Also the monitoring system should be in place in the vadose zone so you get an early warning if anything goes haywire. You'd have plenty of time to make remedies and fix it.

Response: See responses to Comments #2 through #5. Vadose monitoring as well as other monitoring methodologies will be considered during the cover design phase.

Comment 42

My name is Joe Merted. I would like to see a sharing of the technologies and the study data and the other ways that they have used to make decisions, and I'd like to see the modeling made available so that we can understand weather and understand groundwater phenomena and also deep water phenomena at the site and also in our areas. I've noticed in the previous studies that they've used models for weather forecasting that weren't based on our particular area. I would like to see a dynamic model of the Snake River Valley developed. I think it would help not only the site but agriculture and all this. These are probably some of the spinoffs that could happen from this wonderful science that we're seeing, and I would like to see more of that happen.

Response: The development of weather models was beyond the scope of the NRF Comprehensive RI/FS. No weather models were used; however, weather patterns, including average precipitation, temperature, and wind conditions, were assumed to remain the same during the scenarios evaluated. As identified in Appendix H of the RUFS, the models used for evaluating groundwater at NRF included GWSCREEN, MODFLOW, and MEMO. GWSCREEN

is a groundwater contaminant fate and transport model available to all Federal Governmental institutions and contractors. MODFLOW is a groundwater flow model that is a public domain program available to the public; a copy will be provided upon request. MEMO is a groundwater fate and transport dispensive flow model used to optimize placement of groundwater wells, and is available to Federal Governmental institutions and contractors.

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Appendix A

Adminstrative Record File Index

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IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
NO ACTION SITES FOR WASTE AREA GROUP (WAG) 8
01/25/95

FILE NUMBER

AR1.6 NO ACTION SITES

- Document #: 5837
  Title: NRF-4, SWMU Unit #4 - Top Soil Pit Area
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5838
  Title: NRF-5, SWMU Unit #5 - West Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5839
  Title: NRF-7, SWMU Unit #7 - East Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5840
  Title: NRF-24, SWMU Unit #24 - Demineralizer and Neutralization Facility
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5841
  Title: NRF-25, SWMU Unit #25 - Chemical Waste Storage Pad
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5842
  Title: NRF-27, SWMU Unit #27 - Main Transformer Yard
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

NO ACTION SITES FOR WASTE AREA GROUP (WAG) 8 01/25/95

FILE NUMBER

AR1.6 NO ACTION SITES (continued)

- Document #: 5843
  Title: NRF-30, SWMU Unit #30 - Gatehouse Transformer
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5844
  Title: NRF-34, SWMU Unit #34 - Old Parking Lot Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5845
  Title: NRF-39, SWMU Unit #39 - Old Radiography Area
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5846
  Title: NRF-46, SWMU Unit #46 - Kerosene Spill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5847
  Title: NRF-57, SWMU Unit #57 - SIW Gravel Pit
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5848
  Title: NRF-60, SWMU Unit #60 - Old Incinerator
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5849
  Title: NRF-67, SWMU Unit #67 - Old Transformer Yard
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

NO ACTION SITES FOR WASTE AREA GROUP (WAG) 8 01/25/95

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5446
  Title: NRF-4, SWMU Unit #4 - Top Soil Pit Area
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5447
  Title: NRF-5, SWMU Unit #5 - West Landfill
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5449
  Title: NRF-7, SWMU Unit #7 - East Landfill
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5466
  Title: NRF-24, SWNIU Unit #24 - Demineralizer and Neutralization Facility
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5467
  Title: NRF-25, SWMU Unit #25 - Chemical Waste Storage Pad
  Author: N/A
  Recipient: N/A
  Date: 09/26/86

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

  NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-01,

Volume I

NOTE: Sampling data are available upon request at NRF.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 1 INVESTIGATION OPERABLE UNIT 8-01
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5445
  Title: NRF-3, SWMU Unit #3 - ECF Gravel Pit# OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5448
  Title: NRF-6, SWMU Unit #6 - South East Landfill, OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5450
  Title: NRF-8, SWMU Unit #8 - North Landfill, OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5345
  Title: Track 1 Investigation for the ECF Gravel Pit Unit 8-01-3
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5346

Title: Track 1 Investigation for the Southeast Landfill Unit 8-01-6
Author: Westinghouse Electric Corporation - Naval Reactors Facility
Recipient: N/A
Date: 03/17/93

- Document #: 5347
  Tide: Track 1 Investigation for the South Landfill Unit 8-01-33
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5348
  Title: Track 1 Investigation for the Lagoon Construction Rubble Unit 8-01-40
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5349
  Title: Track 1 Investigation for the East Rubble Area Unit 8-01-41
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5350
  Title: Track 1 Investigation for the A1W Construction Debris Area Unit 8-01-63
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5645
  Title: Track 1 Investigation for the North Landfill Area Unit 8-01-8
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.

Date: 03/31/94

NOTE: Sampling data can be examined at the Woodruff Avenue Complex, 200 South Woodruff Avenue.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NAVAL REACTORS FACILITY
TRACK 1 INVESTIGATION OPERABLE UNIT 8-02
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5451
  Title: NRF-9, SWMU Unit #9 - Parking Log Run-Off Trenches, OU 8-02
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5351
  Title: Track 1 Investigation for the Expended Core Facility French Drain Unit 8-02-38
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5643
  Title: Track 1 Investigation for the South Gravel Pit Unit 8-02-64
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5646
  Title: Track 1 Investigation for the Old Sewage Effluent Ponds Unit 8-02-42
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5649
  Title: Track 1 Investigation for the Old Lead Shack Unit 8-02-52B
  Author: Westinghouse Electric Corporation - Naval Reactors Facility

Recipient: N/A
Date: 12/01/93

- Document 5650
  Title: Track 1 Investigation for the Old Boilerhouse Blowdown Pit Unit 8-02-54
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 09/24/93

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5651
  Title: Track 1 Investigation for the Parking Lot Run-Off Trenches Units 8-02-9
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5653
  Title: Track 1 Investigation for the Old Painting Booth Unit 8-02-37
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5656
  Title: Track 1 Investigation for the Site Lead Shack Unit 8-02-47
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5719
  Title: Track 1 Investigation of the Old Lead Shack Unit 8-02-52A
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5720
  Title: Track 1 Investigation of Miscellaneous NRF Sumps and French Drains Unit 8-
  02-55
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5721
  Title: Track 1 Investigation for the Old Radioactive Materials Storage and Laydown
  Area Unit 8-02-61
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

TRACK 1 INVESTIGATION OF OU 8-02 11/04/94

FILE NUMBER

AR3.5 TRACK I INVESTIGATIONS (continued)

- Document #: 5722
  Title: Track 1 Investigation of the Site Corrosive Area Behind Bulter Building 11 Unit
  8-02-68
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity Controls in Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in INEL OU 8-01 Administrative Record Binder.

Sampling data can be examined at the Woodruff Avenue Complex, 200 South Woodruff Avenue.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 1 INVESTIGATION OPERABLE UNIT 8-03
10/21/96

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5452
  Title: NRF-10, SWMU Unit #10 - Sand Blasting Slag Trench, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/23/86

- Document #: 5457
  Title: NRF-15, SWMU Unit #15 - S1W Acid Spill Area, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5460
  Title: NRF-18, SWMU Unit #18 - S1W Spray Ponds, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5462
  Title: NRF-20, SWMU Unit #20 - A1W Acid Spill Area, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5464
  Title: NRF-22, SWMU Unit #22 - A1W Paint Locker French Drain, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 06/23/95

- Document #: 5465
  Title: NRF-23, SWMU Unit #23 - Sewage Lagoons, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/26/86

FILE NUMBER

AR2.4 EE/CA

- Document #: NRFEM-RR-1149
  Title: Submittal Of Engineering Cost Estimates For Track 1 Removal Actions For Information And Transmittal To The Administrative Record, Naval Reactors Facility
  Author: Nieslanik, R. W.
  Recipient: Manager, Operations
  Date: 04/12/94

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: NR:IBO-93/046
  Title: Transmittal Letter and Track 1 Investigation for Unit 8-03-20
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/09/94

- Document #: 10183
  Title: Track 1 Investigations for Unit 8-03-22
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/09/94

- Document #: 5652
  Title: Track 1 Investigation of the S1W Acid Spill Area Unit 8-03-15
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5723
  Title: Track 1 Investigation of the Spray Ponds Unit 8-03-18
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5724
  Title: Track 1 Investigation of the Sewage Lagoons Unit 8-03-23
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

TRACK 1 INVESTIGATION OPERABLE UNIT 8-03 10/21/96

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5725
  Title: Track 1 Investigation of the Site Incinerator Unit 8-03-45
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5726
  Title: Track 1 Investigation of the Degreasing Facility Unit 8-03-56
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5816
  Title: Track 1 Investigation of the Sand Blasting Slag Trench Unit 8-03-10
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 10048
  Title: No Further Action Determination of A1W Paint Locker French Drain, NRF-22
  Author: Rhodes, S.E.
  Recipient: Idaho Branch Office of Pittsburgh Naval Reactors Office
  Date: 06/23/95

- Document #: NR-IBO-95/003
  Title: Disposition of NRF Operable Unit 8-03-22, A1W Paint Locker French Drain
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/09/95

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF Operable Units 8-03, -20 and 22 (Track 1 Investigations), 8-05 and 06 (Landfill Site Track 2 Investigations, and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

FILE NUMBER

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 *TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity Controls in Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

AR12.1 EPA COMMENTS

- Document #: 10265
  Title: EPA Comments on Removal Action at Operable Unit 8-03-22 Finalization
  Author: Pierre, W.
  Recipient: Newbry, R.D.E.
  Date: 03/08/95

AR12.2 IDHW COMMENTS

- Document #: 10266
  Title: IDHW Review of the Remedial Action Recommendations for the A1W Paint Locker French Drain (OU 8-03-22)
  Author: Nygard, D.
  Recipient: Newbry, R.D.E.
  Date: 04/10/95

*NOTE: This document can be found in the INEL OU 8-01 Administrative Record Binder.

NOTE: Sampling data are available upon request at NRF.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 1 INVESTIGATION OPERABLE UNIT 8-04
08/18/95

ADMINISTRATIVE RFC0RD BINDER I
FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5644
  Title: Track 1 Investigation for the A1W Oily Waste Spill Unit 8-04-31
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5648
  Title: Track 1 Investigation for the A1W Transformer Yard Unit 8-04-28
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5655
  Title: Track 1 Investigation for the ECF Acid Spill Unit 8-04-62
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5727
  Title: Track 1 Investigation for the S5G Oily Waste Spill Unit 8-04-29
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5728
  Title: Track 1 Investigation for the Plant Service UST Diesel Spill Unit 8-04-69
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5729
  Title: Track 1 Investigation for the Plant Service UST Gasoline Spill Unit 8-04-71
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5828
  Title: Track 1 Investigation for the S1W Industrial Wastewater Spill Area 8-04-44
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 5829
  Title: Track 1 Investigation for the S1W Fuel Oil Tank Spill Unit 8-04-58
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/25/94

- Document #: 5830
  Title: Track 1 Investigation for the Southeast Corner Oil Spill 8-04-65
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

ADMINISTRATIVE RECORD BINDER II

- Document #: 5831
  Title: Track 1 Investigation for the Boiler House Fuel Oil Release 8-04-70
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/27/94

- Document #: 5832
  Title: Track 1 Investigation for the NRF Waste Oil Tank 8-04-72
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 5833
  Title: Track 1 Investigation for the NRF Plant Services Varnish Tank 8-04-73
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

TRACK 1 INVESTIGATION OPERABLE UNIT 8-04 08/18/95

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5834
  Title: Track 1 Investigation for the Fuel Oil Revetment Oil Releases Unit 8-04-75
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 5835
  Title: Track 1 Investigation for the Vehicle Barrier Removal Unit 8-04-76
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 5836
  Title: Track 1 Investigation for the Fuel Oil Revetment Oil Releases 8-04-77
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 10049
  Title: No Further Action Determination for the Underground Storage Tanks Between the Perimeter Fences
  Author: Rhodes, S. E.
  Recipient: Idaho Branch Office of Pittsburgh Naval Reactors Office
  Date: 06/23/95

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in the INEL OU 8-01 Administrative Record.

NOTE: Sampling data are available upon request at NRF.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 2 INVESTIGATION OPERABLE UNIT 8-05
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5443
  Title: NRF-1, SWMU Unit #1, Field Area North of S1W, OU 8-05
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: NR:IBO-93/301
  Title: Track 2 Summary Report for NRF Operable Unit 8-05
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 11/15/93

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: NR:IBO-94/082
  Title: DOE Decision Statement and Feasibility Study for OU 8-05 and 8-06, and Summary Report for Operable Unit 8-06
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 04/11/94

- Document #: 5657
  Title: IDHW-DEQ Recommendations for Track-Two OUs 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/23/94

- Document #: 5636
  Title: Track 2 Summary Report for the NRF OU 8-05
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 12/20/93

FILE NUMBER

AR4.2 FEASIBILITY STUDY REPORTS

- Document #: NR-IBO-94-048
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 03/11/94

- Document #: 5668
  Title: Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 11/15/93

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter for NRF Operable Units 8-03,-20 and 22 (Track 1 Investigations), 8-05 and 06 (Landfill Site Track 2 Investigations, and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03, Sites 20 and 22 (Track 1), 8-05 and 8-06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781
  Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
  Author: Naval Reactors Facility
  Recipient: N/A
  Date: 09/28/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

TRACK 2 INVESTIGATION OF OU 8-05 11/04/94

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF Industrial Waste Ditch and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch and Landfills at the NRF
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioacfivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

AR12.1 EPA COMMENTS

- Document #: 5663
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units (OU) 8-05 and 8-06)
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/29/94

TRACK 2 INVESTIGATION OF OU 8.05 11/04/94

FILE NUMBER

AR12.2 IDHW COMMENTS

- Document #: 5664
  Title: Review of the Draft Proposed Plan for OU 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

- Document #: 5666
  Title: IDHW Comments - Review of the Draft Focused Feasibility Study for Operable Units (OU) 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

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ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 2 INVESTIGATION OPERABLE UNIT 8-06
11/04/94

ADMINISTRATIVE RECORD VOLUME 1
FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: 5669
  Title: Track 2 Summary Report for Naval Reactors Facility OU 8-06
  Author: Golder Associates, Inc.
  Recipient: N/A
  Date: 04/01/94

ADMINISTRATIVE RECORD VOLUME II
FILE NUMBER

AR3.21 SCHEDULES

- Document #: NR:IBO-94/018
  Title: Revised Schedules for OU 8-06 and 8-09 Track 2 Investigations
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/07/94

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: NR:IBO-94/082
  Title: DOE Decision Statement and Feasibility Study for Operable Units 8-05 and 8-06 and Summary Report for Operable Unit 8-06
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 04/11/94

- Document #: 5657
  Title: IDHW-DEQ Recommendations for Track-Two Operable Units 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/23/94

- Document #: 5667
  Title: EPA's Preliminary Draft Track 2 Summary Report Comments for the Naval Reactors Facility Operable Unit (OU) 8-06 and Position Statement for OU 8-06 Units
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/30/94

TRACK 2 INVESTIGATION OPERABLE UNIT 8-06 11/04/94

FILE NUMBER

AR4.2 FEASIBILITY STUDY REPORTS

- Document #: NR-IBO-94/048
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 03/11/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-05, Volume I

- Document #: 5668
  Title: Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 04/01/94

AR4.3 PROPOSED PLAN

- Document #: NR: IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781

Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
Author: Naval Reactors Facility
Recipient: N/A
Date: 09/28/94
NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

TRACK 2 INVESTIGATION OPERABLE UNIT 8-06 11/04/94

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF Industrial Waste Ditch and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

AR12.1 EPA COMMENTS

- Document #: 5663
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units (OU) 8-05 and 8-06)
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/29/94

TRACK 2 INVESTIGATION OPERABLE UNIT 8-06 11/04/94

FILE NUMBER

AR12.2 IDHW COMMENTS

- Document #: 5664
  Title: Review of the Draft Proposed Plan for Operable Units (OU) 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

- Document #: 5665
  Title: Review of the Preliminary Draft Track 2 Summary Report for Operable Unit (OU) 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

- Document #: 5666
  Title: IDHW Comments - Review of the Draft Focused Feasibility Study for Operable Units (OU) 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

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4/02/96

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5468
  Title: NRF-26, LDU #1 - Industrial Waste Ditch, OU 8-07
  Author: N/A
  Recipient: N/A
  Date: 09/26/96

AR3.3 RI/FS WORK PLAN

- Document #: 5195
  Title: RI/FS Final Work Plan For the Exterior Industrial Waste Ditch (IWD) OU 8-07, Naval Reactors Facility, Idaho Falls, Idaho
  Author: Westinghouse Electric Corporation
  Recipient: N/A
  Date: 09/24/92

- Document #: NR:IBO-92/328
  Title: DOE/IBO Transmittal of Final Work Plan for the RI/FS for the NRF IWD
  Author: Newbry, R.D.E., DOE-IBO
  Recipient: Nygard, D., EPA
  Date: 11/26/91

ADMINISTRATIVE RECORD VOLUME II

AR3.4 REMEDIAL INVESTIGATION REPORTS

- Document #: NR:IBO-93/198, VOL. I
  Title: Transmittal Letter and Draft Remedial Investigation Report for NRF Operable Unit 8-07
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 07/15/93

EXTERIOR INDUSTRIAL WASTE DITCH RI / FS OU 8-07 04/02/96

ADMINISTRATIVE RECORD VOLUME III
FILE NUMBER

AR3.4 REMEDIAL INVESTIGATION REPORTS (continued)

- Document #: NR:IBO-93/198, VOL. 2
  Title: Draft Remedial Investigation Report for NRF OU 8-07
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME IV

AR3.12 RI/FS REPORTS

- Document #: NR:IBO-93/296, VOL. I
  Title: Transmittal Letter and Draft Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME V

- Document #: NR:IBO-93/296, VOL. 2
  Title: Draft Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME VI

- Document #: 5626, VOL. I
  Title: Final Remedial Investigation/Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Lee, S.D.
  Recipient: N/A
  Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VII
FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

- Document #: 5626, VOL. 2
  Title: Final Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Lee, S.D.
  Recipient: N/A
  Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VIII

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781
  Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
  Author: Naval Reactors Facility
  Recipient: N/A
  Date: 09/28/94

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF IWD and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

AR12.0 EPA AND IDHW REVIEWS

- Document #: 5196
  Title: Correspondence between EPA, State of Idaho, and DOE-IBO
  Author: N/A
  Recipient: N/A
  Date: 09/24/92

AR12.1 EPA COMMENTS

- Document #: 5634
  Title: EPA Comments: Draft Remedial Investigation for the Exterior Industrial Waste Ditch Operable Unit 8-07
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 09/02/93

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

- Document #: 5638
  Title: EPA Comments: Draft Remedial Investigation/Feasibility Study for the Exterior Industrial Waste Ditch
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 12/23/93

AR12.2 IDHW C0MMENTS

- Document #: 5635
  Title: IDHW Comments: Technical Review of the Draft RI/FS
  Author: English, M.
  Recipient: Bradley, T.M.
  Date: 09/02/93

- Document #: 5637
  Title: IDHW Comments: Technical Review of the Draft RI/FS
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 12/21/93

- Document #: 5664
  Title: Review of the Draft Proposed Plan for Operable Units (OU) 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

AR12.3 DOE RESOLUTIONS TO COMMENTS

- Document #: NR-IBO-93/272
  Title: Response to EPA/IDHW Comments On IWD RI Report
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 10/04/93

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5444
  Title: NRF-2, SWMU Unit #2 - Old Ditch Surge Pond, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5453
  Title: NRF-11, SWMU Unit #11 - S1W SB#1: Tile Drain Field, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5454
  Title: NRF-12, SWMU Unit #12 - S1W SB#2: Leaching Pit, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5455
  Title: NRF-13, SWMU Unit #13 - S1W SB#3: Temporary Leaching Pit, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5456
  Title: NRF-14, SWMU Unit #14 - S1W SB#4: Industrial Waste Lagoons, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5458
  Title: NRF-16, SWMU Unit #16 - S1W Radiography Building Collection Tanks, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5459
  Title: NRF-17, SWMU Unit #17 - S1W Retention Basins, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5461

Title: NRF-19, SWMU Unit #19 - A1W Leaching Bed, OU 8-08
Author: N/A
Recipient: N/A
Date: 09/29/86

- Document #: 5463
  Title: NRF-21, SWMU Unit #21 - Old Sewage Treatment Plant, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

ADMINISTRATIVE RECORD VOLUME II

AR3.3 WORK PLAN

- Document #: 10150
  Title: Comprehensive Remedial Investigation and Feasibility Study Final Work Plan
  Author: N/A
  Recipient: N/A
  Date: 10/01/95

COMPREHENSIVE RI/FS, OPERABLE UNIT 8-08 01/12/98

FILE NUMBER

AR3.10 SCOPE OF WORK

- Document #: 10010
  Title: Scope of Work for the Comprehensive Remedial Investigation/Feasibility Study at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 03/01/95

ADMINISTRATIVE RECORD VOLUME III

AR3.12 RI/FS REPORTS

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Appendices A through E, Vol. 1
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 10/28/97

ADMINISTRATIVE RECORD VOLUME IV

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Appendices E through M, Vol. 2
  Author: Hutchison, M.E.

Recipient: Not specified
Date: 10/28/97

ADMINISTRATIVE RECORD VOLUME V

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Feasibility Study, Vol. 3
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 10/28/97

COMPREHENSIVE RI/FS, OPERABLE UNIT 8-08 08/25/98

FILE NUMBER

AR3.21 SCHEDULE

- Document #: NR-IBO-96/126
  Title: Revision to the NRF Comprehensive Remedial Investigation and Feasibility Study Schedule for Operable Unit 8-08
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 08/07/96

AR4.3 PROPOSED PLAN

- Document #: 10440
  Title: Proposed Plan for Waste Area Group 8 - Naval Reactors Facility Idaho National Engineering and Environmental Laboratory
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 01/01/98

AR5.4 RECORD OF DECISION REVIEW COMMENTS

- Document #: 10533
  Title: EPA Comments on Draft Record of Decision (ROD) for the Naval Reactors Facility, OU 8-08 at INEEL
  Author: Rose, K.A.
  Recipient: Richardson, A.N.
  Date: 07/06/98

- Document #: 10534
  Title: IDHW-DEQ Review of the Draft Record of Decision for the Naval Reactors Facility, Operable Unit (OU) 8-8
  Author: English, M.
  Recipient: Richardson, A.N.
  Date: 07/13/98

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 16084
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Boise, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/20/98

- Document #: 16085
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Moscow, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/21/98

- Document #: 16086
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Idaho Falls, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/22/98

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076*
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

*NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

COMPREHENSIVE RI/FS, OPERABLE UNIT 8-08 08/25/98

FILE NUMBER

AR12.1 EPA COMMENTS

- Document #: 10267
  Title: EPA Comments on Comprehensive Remedial Investigation and Feasibility Study Draft Work Plan Operable Unit 8-08
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.

Date: 08/28/95

AR12.2 IDHW COMMENTS

- Document #: 10268
  Title: IDHW Comments on Review of the Draft Comprehensive Work Plan for the Operable Unit 8-8 Remedial Investigation/Feasibility Study
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 08/28/95

AR12.3 DOE RESPONSE TO COMMENTS

- Document #: 10009*
  Title: DOE Response to Comments on Draft Scope of Work
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 03/24/95

*NOTE: This Document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I.

- Document #: NR: IBO-97/229
  Title: DOE Response to Comments from the Environmental Protection Agency and Idaho Department of Health and Welfare Concerning NRF Draft Proposed Plan
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 12/19/97

Note: Sampling data may be obtained at NRF.

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ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
COMPREHENSIVE RI/FS, OPERABLE UNIT 8-09
08/26/98

FILE NUMBER

AR3.10 SCOPE OF WORK

- Document #: NR:IBO-93/157
  Title: Scope of Work for NRF Operable Unit 8-09 Track 2 Investigation
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 06/04/93

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: NR:IBO-94/139

Title: Preliminary Draft Track 2 Summary Report for NRF Operable Unit 8-09
Author: Newbry, R.D.E.
Recipient: Nygard, D.; Pierre, W.
Date: 06/27/94

- Document #: NR:IBO-94/187
  Title: Transmittal Letter and Track 2 Summary Report for NRF Operable Unit 8-09 (Interior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 09/12/94

AR3.21 SCHEDULES

- Document #: NR:IBO-94-018
  Title: Revised Schedules for OU 8-06 and 8-09 Track 2 Investigations
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/07/94

FILE NUMBER

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: 10007
  Title: Action Determination for Operable Unit (OU) 8-09, Interior Industrial Waste Ditch
  Author: Newbry, R.D.E.; Nygard, D.; Pierre, W.
  Recipient: NOT SPECIFIED
  Date: 03/23/95

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076*
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

*NOTE: This Document can be found in INEL OU 8-01 Administrative Record Binder Volume I

AR12.1 EPA COMMENTS

- Document #: 10536
  Title: EPA Comments on the Draft Track 2 Summary Report for Naval Reactors Facility Operable Unit 8-09
  Author: Meyer, L.

Recipient: Newbry, R.D.E.
Date: 08/10/94

AR12.2 IDHW COMMENTS

- Document #: 10535
  Title: IDHW-DEQ Review of the Draft Track-2 Summary Report for Operable Unit (OU) 8-9: Interior Industrial Waste Ditch
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 08/11/94

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/29/1998
Operable Unit: 21
ROD ID: EPA/541/R-98/061

Media: Groundwater, Sludge, Soil

Contaminant: Base Neutral Acids, Inorganics, Metals, PAH, PCBs, Pesticides, Radioactive, VOC

Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The INEEL lands are within the aboriginal land area of the Shoshone-Bannock Tribes. These lands and waters provided the Tribes their home and sustained their way of life. DOE has documented an excess of 1,500 prehistoric and historic archaeological sites at the INEEL. Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing. In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government.

Public access to the INEEL is strictly controlled by fences and security personnel. State highways 22, 28, and 33 cross the northern portion of the INEEL. A total of 90 miles of paved highways pass through the INEEL and are used by the general public. The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. Most INEEL facilities are currently operated by one of three Government contractors. These contractors conduct various programs at the INEEL under the supervision of three DOE offices: DOE-Idaho (DOE-ID), Department of Defense (DoD)-Pittsburgh Naval Reactors Office, and DOE-Chicago (DOE-CH).

The INEEL was established in 1949 as the National Reactor Testing Station by the U.S. Atomic Energy Commission as a site for building, testing, and operating nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the area was designated as the Idaho National Engineering Laboratory to reflect the broad scope of engineering activities conducted there. The name was changed to the INEEL in 1997 to reflect the redirection of its mission to include environmental research. The U.S. Government occupied portions of the INEEL prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 square miles of the site as a gunnery range. The U.S. Army Air Corps once used an area southwest of the naval gunnery area as an aerial gunnery range. The present INEEL site includes all of the former military areas and a large adjacent shop withdrawn from the public domain for use by the DOE. The former Navy administration shop, warehouse, and housing area are presently the Central Facilities Area of the INEEL.

To better manage environmental investigations, the INEEL was subdivided into ten Waste Area Groups (WAGs). Identified contaminant release sites in each WAG were in turn divided into Operable Units (OUs) to expedite the investigations and any required remedial actions. The term "site" will herein refer to a named release site in one of the OUs. While "area" will herein be used to define all or a portion of an identified OU release site. In July 1989, the Environmental Protection Agency (EPA) proposed listing the INEEL on the National Priorities List (NPL). The EPA issued a final ruling that listed the INEEL as an NPL site in November 1989.

OU1:
The Test Area North (TAN) complex is located approximately 80 km (50 miles) northwest of Idaho Falls in the northern portion of the INEEL and extends over an area of approximately 30 square km (12

square miles). The Technical Support Facility (TSF) is centrally located within TAN and consists of several experimental and support facilities that are for conducting research and development activities on reactor performance. The TSF-05 Injection Well islocated in the southwest corner of TSF. Three other major test facilities are located near TSF and are considered part of TAN. These facilities are the Specific Manufacturing Capability/Containment Test Facility, the Initial Engine Test Facility, and the Water Reactor Research Test Facility. The Big Lost River and Birch Creek are the only natural surface water features present near TAN. Surface water can occur at TAN during and following periods of heavy rainfall and snowmelt. However, the presence of diversion systems, and playas located at the terminal points of the Big Lost River and Birch Creek, typically prevent surface water from reaching TAN.

Operations at TAN were initiated in the early 1950s to support the U.S. Air Force aircraft nuclear propulsion (ANP) project. The objectives of the ANP project were to develop and test various designs for nuclear-powered engines and fuels for use on aircraft. The principal source of groundwater contamination at TAN is the TSF-05 Injection Well, which was used from 1953 to 1972 to dispose of TAN liquid wastes into the fractured basalt of the Snake River Plain Aquifer. Releases to TAN groundwater were first identified in August 1987, in the production wells that supply drinking water to TSF. To mitigate potential risks to personnel at TAN, an air sparging system was installed on the drinking water supply system. A Record of Decision (ROD) was completed in August 1995, addressing the groundwater in the immediate vicinity of TAN as OU 1070B.

OU2:
OU2 is the 1-07A TAN Injection Well OU. The TSF-05 Injection Well is the principal source of groundwater contamination at TAN. In 1990, an initial effort removed process sludge from the bottom 17 m (55 feet) of the TSF-05 Injection Well. An Interim Action ROD was completed in September1992, addressing the groundwater contaminants near the injection well to prevent further degradation of groundwater while the OU 1-07B RI/FS was being completed.

OU4:
OU4 is the 2-12 Test Reactor Area (TRA) Perched Water OU. The TRA is located in the southwestern portion of the INEEL approximately 47 miles west of Idaho Falls. The TRA covers an area of approximately 1,700 by 1,900 feet and is surrounded by a double security fence. Located inside the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, laboratories and

offices. The facility contains three high neutron flux nuclear test reactors: the Materials Test Reactor, the Engineering Test Reactor, and the Advanced Test Reactor. Only the Advanced Test Reactor is currently operational. WAG 2 covers the TRA.

The TRA was established in the early 1950s to operate and test high neutron flux nuclear test reactors. Wastewater generated during operations is disposed of in the wastewater ponds at the TRA. Six disposal units have been used that have contributed to the formation and contamination of the Perched Water System; four of which are currently active. The active units include the warm waste pond, which receives radiologically contaminated wastewater; the cold waste pond, which receives primarily reactor cooling water with no radiological activity; the chemical waste pond, which is used for disposal of wastewater from ion exchange units and water softeners; and the sanitary waste ponds, which are used for sanitary wastes. A number of groundwater investigations have been conducted since 1949 in the vicinity of the TRA to characterize the quality of the Snake River Plain Aquifer. The Perched Water System RI was conducted in 1992, and a ROD for no remedial action was completed in December 1992.

OU5:
OU5, also designated as OU 2-10, addresses the Warm Waste Pond sediments. The Warm Waste Pond consists of three wastewater infiltration cells excavated in 1952, 1957, and 1964, for the disposal of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange.

The release of radioactive and/or hazardous contaminant to the Warm Waste Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action requirements of the July 1987 DOE, State, and EPA Consent Order/Compliance Agreement. Additional sampling was conducted in 1990 in accordance with Superfund protocol. The Warm Waste Pond was proposed for an interim action under the Consent Order, and a ROD for the interim action was completed in December 1991.

OU6:
OU6, also designated as OU2-13, addresses the 55 known or suspected contaminant release sites that have been identified within WAG 2. Groundwater monitoring has been conducted at a network of Snake River Plain Aquifer wells in the vicinity of TRA and for selected deep perched water zone wells. Localized areas of radionuclide-contaminated soil were located in and north of the

North Storage Area. The soil contamination was removed in the summer of 1995 and 1996 as part of an INEEL-wide cleanup of radioactively contaminated surface soil. The OU 2-13 comprehensive RI/FS conducted at the TRA was completed in February 1997 and resulted in the identification of eight sites with potential risk to human health and requiring some type of remedial action. A ROD was completed in December 1997, providing for remedial action at the eight sites and no action for the remaining 47 sites.

OU8:
OU8, which is also known as the OU 4-12, consists of the Central Facilities Area (CFA) Landfills. The CFA is located in Butte County in the south-central portion of the INEEL. CFA Landfills I, II, and III are located approximately 0.5 miles north of the CFA proper. The Snake River Aquifer beneath the CFA is at about 480 feet. Flow of the aquifer in this region is generally to the south-southwest. The only naturally occurring surface water at CFA results from heavy rainfall or snowmelt, usually during the period from January to April.

The original facilities at the CFA were built in the 1940s and 1950s to house personnel. The facilities have been modified over the years to fit the changing needs of the INEEL and now provide craft, office, service, and laboratory space. The CFA landfills were operated as municipal-type landfills for the INEEL. CFA Landfill I was operated as a disposal facility from the early 1950s until the mid-1980s. The landfill covers a total surface area of approximately 8.25 acres. The landfill is composed of three major units, commonly referred to as the rubble landfill, the western waste trench, and the northern waste trench. CFA Landfill II, in use from 1970 until 1982, was a fill operation encompassing 15 acres in the southwestern portion of an abandoned gravel pit. CFA Landfill III, encompassing 12 acres, was opened in October of 1982, when operations at CFA Landfill II were terminated, and continued as a cut-and-fill operation until December 1984, when it also was terminated. An expansion to Landfill III was opened west of the original Landfill III and continued to handle the same type of waste. It was operational until 1993 and is no longer in use. This expansion is not considered part of OU 4-12. A ROD was completed in September 1995, documenting the results of the OU 4-12 RI/FS and the selected remedy for CFA Landfills I, II, and III.

OU9:
OU9, also referred to as OU 4-11, addresses the CFA Motor Pool Pond, that is located in an abandoned gravel pit approximately 366 m (1,200 feet) east of the CFA Equipment Yard. A small pond, approximately 36 by 18 meters (120 by 60 feet), formed in the low spot when wastes were being discharged. Currently, the pond is

typically dry; however, runoff may temporarily accumulate in the pond after storm events and during spring thaws. Wastewater discharged to the pond originated at the CFA Service Station. A 20-cm (8-inch) diameter concrete pipe extends southeast from the Service station and discharges to a ditch.

From 1951 until 1985, the CFA Motor Pool Pond received wastes from two sumps located at the CFA Service Station. One of the sumps collected wastes from bus washes and floor drains in the adjacent Service Bay, and the second sump collected wastes from the Steam Cleaning Bay. In late 1985, the wastes were diverted through an oil/water separator to a sanitary sewer line connected to the Sewage Treatment Plant, and discharge to the Motor Pool Pond ceased. The CFA Motor Pool Pond was sampled as part of an INEEL-wide preliminary assessment of waste streams conducted in 1982 and 1983. The pond was sampled again in 1988 as part of a DOE Environmental survey, and in 1989 in support of RCRA closure activities. Radiation surveys of the CFA Motor Pool Pond were conducted during periods when the pond contained water and when the pond was dry. The survey performed in September 1991 indicated only background levels of radiation. An RI risk assessment of the excavated sediments along the ditch and the sediments at the discharge pipe outlet, in the ditch, and in the pond, indicated that the contaminated sediments within these areas do not present an acceptable risk to human health and the environment. A ROD was completed in December 1992, for no further action at the CFA Motor Pool Pond.

OU12:
OU12 is the Auxiliary Reactor Area (ARA)-I Chemical Evaporation Pond, which is designated as OU 5-10 of WAG 5. The ARA is located in Butte County on the southern portion of INEEL, and consists of four separate facilities; ARA-I is the southernmost and oldest facility. The ARA facilities have been used for research reactor operations and support activities. All ARA reactors have been removed, and each facility has undergone partial decontamination and decommissioning. ARA-I was a support facility and has not been used for operations since 1988.

The ARA-I Chemical Evaporation Pond is an unlined surface impoundment that was previously used to dispose of laboratory wastewater from building ARA-627. The pond was constructed in 1970 by excavating native soil to create a topographic depression. Discharges to the pond ceased in 1988. The pond is now typically dry except after precipitation events. A sampling effort was conducted in 1990 to better characterize the ARA-I Chemical

Evaporation Pond. Results of the sampling were documented in a RI Report. A ROD was completed in December 1992, for no remedial action for pond sediments and sediments under the discharge pipe.

OU14:
OU14 addresses Pad A within the Radioactive Waste Management Complex (RWMC) of WAG 7. The RWMC encompasses 144 acres in the southwestern portion of INEEL and consists of two main disposal and storage areas: Transuranic (TRU) Storage Area and Subsurface Disposal Area (SDA). Pad A is located in the north-central portion of the SDA. Surface water is present at the RWMC only during periods of heavy rainfall and snowmelt. To minimize the potential for surface water to flow onto the RWMC during periods of high surface water runoff at the INEL, water is diverted from the RWMC via spreading areas and associated dikes, located to the west and south of the RWMC. To further enhance surface water diversion from the pits and trenches, berms have also been constructed immediately around the SDA.

The RWMC was established in the early 1950s as a disposal site for solid, low-level waste generated by INEEL operations. Within the RWMC, is the SDA where hazardous substances have been disposed in underground pits, trenches, soil vault rows, and Pad A (an aboveground pad). TRU waste was disposed in the SDA from 1952 to 1970. Approximately 13,341 cubic yards of containerized solid wastes were placed on Pad A from September 1972 to August 1978. Pad A was closed in 1978 and presently has a soil cover. A ROD was completed in January 1994, documenting the results of the RI/FS and the remedy selected for Pad A.

OU15:
OU15, which is designated as OU 7-08, addresses the organic contamination in the vadose zone (OCVZ) beneath and within the immediate vicinity of the RWMC (WAG 7). The presence of organic contaminants in the vadose zone is a result of the burial, and breach, at the SDA of containerized organic wastes from the Rocky Flats Plant, a DOE facility located west of Denver Colorado. The OCVZ OU only includes organic compounds that have migrated from the wastes, and does not address the waste materials disposed of in the pits of the SDA. Organic contaminants that are part of the OCVZ are present in the subsurface fractured basalt and sedimentary interbeds beneath and within the immediate vicinity of the RWMC, above the Snake River Plain Aquifer. The highest contaminant concentrations are found immediately beneath the SDA. Data from shipping records, along with process knowledge, written correspondence, and existing monitoring data, were available to allow OCVZ, OU 7-08, to be

evaluated in an expeditious manner. A ROD was completed in December 1994, addressing this OU.

OU18:
OU18, which is designated OU 7-10, addresses Pit 9 in the SDA of RWMC. Waste was placed in Pit 9 from November 1967 to June 1969. It presently has an overburden that averages about 1.8 m (6 feet) thick. Approximately 7,079.2 cubic meters of overburden, 4,247.5 cubic meters of packaged waste, and 9,910.9 cubic meters of soil were between and below the buried waste at the time of Pit 9 closure. No waste disposal has occurred in Pit 9 at the SDA since its closure in 1969. Pit 9 was identified for an interim action under the1987 Consent Order, and a ROD was completed in September 1993, documenting this interim action.

OU19:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to 3,300 people. NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

The NRF is designated as WAG 8, and consists of nine OUs. OU19 applies only to that portion of the Industrial Waste Ditch (IWD)outside the NRF perimeter (OU 8-07, the IWD), and the Landfill Units (OUs 8-06 and 8-05), which include nine separate locations situated on the west and northeast sides of the facility. Different landfill units were used at various times from 1951 through 1971. NRF discontinued use of the last landfill unit in 1971. Non-radioactive non-hazardous industrial waste water from water treatment operations and storm water runoff has been discharged to the IWD since 1953. In 1980, the NRF ceased the discharge of all wastes to the IWD except the acidic and basic ion exchange regenerant solutions, which were self-neutralizing. A ROD addressing ten sites in OUs 8-05 and 8-06, Landfill Areas, and OU 8-07, Exterior IWD, was issued in September 1994.

OU20:
The Naval Reactors Facility (NRF) is located on the west-central side of the INEEL, approximately 50 miles west of Idaho Falls. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. NRF covers seven square miles of which 80 acres are developed and, at various times, was occupied by up to

3,300 people. NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings.

NRF is designated as WAG 8. A total of 87 known or suspected contaminant release sites, of which 71 were classified in nine OUs, were identified at NRF as requiring further study under the CERCLA process. Thirteen of the 87 sites were evaluated prior to the FFA/CO under the COCA and were not part of an OU. These 13 sites were identified as no action sites in the FFA/CO. A previous ROD addressed ten sites in OUs 8-05, 8-06, and 8-07. Eight of the nine OUs had been investigated prior to the NRF Comprehensive RI/FS. OU 8-08 represented the last OU to be investigated.

A total of 44 sites are associated with OUs 8-01, 02, 02, 04, and 09. OU 8-08 includes 18 sites that were not previously investigated under other OUs. The two new sites were not associated with any OU. OU 8-08 sites were grouped together because of similar constituents, release mechanisms, and migration paths. The OU 8-08 sites represent areas where past controlled releases of low-level radioactive water were discharged and areas where inadvertent releases to the environment occurred because of leaks from corroded piping, leaks in underground concrete basins, surface releases, and cross-contamination of non-radiological systems with radiological systems. A ROD addressing these 64 sites at NRF was completed in September 1998.

OU21:
OU21, which is designated OU 9-04, addresses the Argonne National Laboratory-West (ANL-W), which is part of WAG 9 and located in the southeastern portion of the INEEL. ANL-W houses extensive support facilities for three major nuclear reactors: Transient Reactor Test Facility (TREAT) Experimental Breeder Reactor II (EBR-II), and the Zero Power Physics Reactor (ZPPR). Drinking water for employees at ANL-W is obtained from two production wells located in the west-central portion of the ANL-W facility. Within the ANL-W site is a number of research and support facilities that contribute to the total volume of waste generated at ANL-W. These facilities currently generate radioactive low-level waste, radioactive TRU, hazardous waste, mixed waste, sanitary waste, and industrial waste. Approximately 750 people are employed at ANL-W facility.

The ANL-W was established in the mid1950s. The first reactor to operate at the ANL-W site was TREAT, which was built in 1959, and was designed for overpower transient tests of fuel. TREAT is now used mainly for safety tests for various fuel types as well as for

non-reactor experiments. The EBR-II, a 62.5-megawatt thermal reactor, went into operation in 1964 capable of producing 19.5 megawatts of electrical power in the liquid metal reactor plant. The ZPPR was put into operation at ANL-W in 1969 and is large enough to enable core-physics studies of full-scale breeder reactors that will produce up to 1,000 megawatts. ANL-W began a redirected nuclear research and development program in FY 1995. ANL-W is also currently in the process of conducting shutdown and termination activities for the EBR-II. ZPPR was placed in programmatic standby in fiscal year 1989.

Various chemical and radioactive wastes were generated from these three reactors and the support facilities at ANL-W. The operation of these facilities and the corresponding waste streams have been evaluated and documented in the Facility Assessment and Screening document of 1973. A total of 37 WAG 9 sites were evaluated during the OU 9-04 Comprehensive RI/FS completed in October 1997. A ROD was completed in September 1998.

OU22:
OU22, which is designated OU 5-13, addresses the Power Burst Facility (PBF) Evaporation Pond, Corrosive Waste Sump, and discharge pipe. The PBF, which operated from 1972 to 1985, is located in the south-central portion of the INEL. The reactor was built to support the Thermal Fuel Behavior Program's testing of pressurized-water reactor fuel rods under hypothetical reactor accidents. The PBF Evaporation Pond is a 140 by 140-foot lined surface impoundment enclosed by a cyclone fence, that was constructed in 1978 by borrowing native soil from a source located east of the pond. The Evaporation Pond is used to receive reactor secondary cooling water from the PBF reactor following neutralization in the Corrosive Waste Sump, an unlined concrete structure. The discharge pipe that leads from the Corrosive Waste Sump to the Evaporation Pond may also be contaminated.

The release of radioactive or hazardous contaminants to the Evaporation Pond was identified and evaluated during RCRA investigations. The PBF Evaporation Pond sediments have been sampled several times (1988 and 1989). A ROD was completed in September 1992, for an interim action at OU 5-13.

OU23:
OU23, which is designated as OU 10-05, addresses six ordnance areas in or near areas frequented by INEEL site personnel and therefore pose an immediate unacceptable risk to human health from the threat of uncontrolled detonation of unexploded ordnance. The

ordnance are primarily a result of past activities associated with the former Naval Proving Ground (NPG), which is an area of approximately 270 square miles within the INEEL. These activities included naval artillery testing, explosives storage bunker testing, and ordnance disposal. The NPG was used primarily during World War II. In addition, there are three suspected ordnance areas outside of the NPG that have been identified at the INEEL. A ROD was completed for an interim action at OU 10-05 in June 1992.

OU24:
The Stationary Low-Power Reactor-1 (SL-1) and Boiling Water Reactor Experiment-I (BORAX-I) burial grounds are approximately 38 and 52 miles west of Idaho Falls. The Sl-1 site is located about 1,600 feet northeast of the Auxiliary Reactor Area II and includes the surface-soil contamination area surrounding a 600 by 300-foot fenced burial ground. Approximately 99,000 cubic feet of radionuclide-contaminated debris, soil, and gravel are disposed of in the burial ground, with an estimated 2 feet of soil with a thick grass cover over the waste. The BORAX-I burial ground is located about 2,730 feet northwest of the Experimental Breeder Reactor-1, a national monument. The BORAX-I site includes a 200 by 420-foot surface-soil contamination area surrounding the 100 by 100-foot fenced burial ground. The volume of buried radionuclide-contaminated soil and debris is approximately 6,336 cubic feet. The 84,00 square foot area was covered with 6 inches of gravel in 1954, but grass, sagebrush, and other plants have reseeded the area since then. The SL-1 and BORAX-I burial grounds are historical disposal areas and do not host any current programs.

The SL-1 and BORAX-I burial grounds were constructed to dispose of contaminated debris, soils, and gravel generated by the destruction of a small nuclear reactor at each location. The BORAX-I burial ground was established in 1954; the SL-1 burial ground was established in 1961. Existing data were available to expedite evaluation of these sites. Therefore, the scope of the RI for the SL-1 and BORAX-I burial grounds did not include any sampling or acquisition of new data, and a focused FS was performed. A ROD was completed in December 1995.

Remedy: The selected remedy for the eight Waste Area Group (WAG) 9 areas with unacceptable risks to human health and/or the environment is phytoremediation. Monitoring of the soil, groundwater and vegetation will continue for 20 years (2018), approximately 15 years after the remediation goals (RGs) are met for each site in accordance with Department of Energy (DOE) orders and the Argonne National Laboratory-West (ANL-W) Environmental Monitoring Plan. The soil, groundwater, and vegetation monitoring results collected semi-annually will determine trends of low level radionuclide and inorganic contaminant levels around the ANL-W facility. After the RGs are met, Comprehensive Environmental Response Compensation and Liability Act (CERCLA) five-year reviews would be required to ensure that the assumption of DOE control of the Idaho National Engineering and Environmental Laboratory (INEEL) lands is still applicable. Phytoremediation would not be initiated on the Sanitary Sewage Lagoons because they will remain in service until approximately the year 2003 when the facility is scheduled for closure. Likewise, the Industrial Waste Pond phytoremediation will not be initiated until the cooling water discharges from the Sodium Processing Facility are completed. The final sodium cooling water discharges are currently planned for 2002.

The major components of the selected remedy for ANL-W are: completion of the phytoremediation workplan for the bench-scale testing; conducting a bench-scale phytoremediation test of selected plant species at the sites that pose unacceptable risks; determine effectiveness and implementability of phytoremediation based on results of bench-scale testing; collecting and analyzing of soil and plant samples from the two-year field season to determine the effectiveness of phytoremediation on the ANL-W soils insitu; harvesting, compacting, incinerating, and disposing of the above and below ground plant matter in a permitted landfill; continue planting/harvesting process until remedial action objectives (RAOs) are attained if the two-year field-scale testing is successful; installing access restrictions consisting of fences, bird netting, and posting of warning signs; review of the selected remedy no less than every five years until the RAOs have been met; and implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

Engineering controls will be used to reduce the short-term exposures to the human workers, while fencing, covering, and harvesting methods will be optimized to reduce the short-term exposure to the ecological receptors. The results of the bench-scale greenhouse testing will determine if the selected remedy will be replaced with the more conventional contingent alternative.

No action is the appropriate remedy for 35 areas, 33 areas from WAG 9 and two sites from WAG 10. These 35 areas are: ANL-10, ANL-11, ANL-12, ANL-14, ANL-15, ANL-16, ANL-17, ANL-18, ANL-20, ANL-21, ANL-22, ANL-23, ANL-24, ANL-25, ANL-26, ANL-32, ANL-33, and ANL-27; from Operable Unit (OU) 9-01: ANL-19, ANL-28, ANL-29, ANL-30, ANL-36, ANL-60, ANL-61, ANL-62, and ANL-63; from OU 9-02: ANL-08; from OU 9-03: ANL-05, ANL-31, and ANL-34.; from OU 9-04: ANL-01 and ANL-53; from OU 10-06: ANL-W Stockpile site and ANL-W Windblown Area.

Estimated Capital Costs: $2,289,000
Estimated Annual O & M Costs: not provided
Estimated Present Worth Costs: $2,824,000
Estimated O & M Costs: $535,000

Text: Full-text ROD document follows on next page.

EPA 541-R98-061

<IMG SRC 980610>

<IMG SRC 98061A>

Final Record of Decision

Argonne National Laboratory - West

September 25, 1998

Prepared by:

The Department of Energy
The Idaho Department of Health and Welfare-Division of Environmental Quality
and
the Environmental Protection Agency-Region 10

Operable Unit 9-04
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Argonne National Laboratory - West, Waste Area Group 9
Operable Unit 9-04
Idaho National Encgineering and Environmental Laboratory

Idaho Falls, Idaho

Statement of Basis and Purpose

The Argonne National Laboratory - West (ANL-W) Waste Area Group 9 (WAG 9) is one of the ten Idaho National Engineering and Environmental Laboratory (INEEL) WAGs identified in the Federal Facility Agreement and Consent Order (FFA/CO). The FFA/CO was signed by the U.S. Environmental Protection Agency (EPA) Region 10, the Idaho Department of Health and Welfare (IDHW, and the U.S Department of Energy (DOE). Operable Unit (OU) 9-04 is listed as the "WAG 9 Comprehensive Remedial Investigation (RI)/Feasibility Study (FS)", in the FFA/CO. The RI/FS task was to assemble the investigations previously conducted for WAG 9, to thoroughly investigate the sites not previously evaluated, and to determine the overall risk posed by the WAG. This resulting comprehensive Record of Decision CROD) document identifies eight areas for remedial action and an additional 33 release areas for "No Action" based on the risk to human health and the environment. The remedial actions have been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), of 1986, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practical with the National Oil and Hazardous Substances Pollution Contingency Plan. It is also designed to satisfy the requirements of the FFA/CO. This decision is based on information contained in the Administrative Record for the investigation for the ANL-W facility (WAG 9).

The DOE is the lead agency for this decision. The EPA and IDHW have participated in the evaluation of the alternatives. The EPA and IDHW both concur with the selected and contingent remedy for the clean-up of the eight ANL-W areas of concern and with the No Action determinations the 33 remaining areas.

Assessment of the Site

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to human health or the environment. These eight areas include the, Sanitary Sewage Lagoons (ANL-04), Industrial Waste Pond, Ditches A, Ditch B, (all from ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Interceptor Canal-Canal and-Mound (sub-portions Of ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The response actions selected in this ROD are designed to reduce the potential threats to human health and the

environment to
acceptable levels. The remaining 33 areas were determined to have acceptable risk to human health or
the environment, and therefore require no action.

Description of the Remedial Action Objectives

The Remedial Action Objectives (RAOs) are based on those specified in the National Contingency Plan. For the ANL-W site, the RAO for human health is to prevent direct exposure to radionuclide contaminants of concern (COCs) that would result in a total excess cancer risk of greater than 1 in 10,000 (1E-04) to current and future workers and future residents. The RAOs for the protection of the environment is to prevent exposure to COCs in soils which may have potential adverse effects to resident populations of flora and fauna, as determined by a Hazard Quotient (HQ) = 10 times the HQ calculated from INEEL background soil concentrations.

To meet these RAOs, the risk-based calculation of the concentrations that meet these RAOS were calculated. These concentrations are called the remediation goals (RGs) and establish the quantitative cleanup levels for the contaminated sites. The RGs for the cesium-137 for human health was determined by using a calculation of the concentration needed to produce a risk of 1E-04 for a future resident 100 years from now. As shown in Table A-1, the RG for the cesium-137 is 23.3 pCi/g for the three sites with unacceptable human health risks (the Interceptor Canal-Canal, the Interceptor Canal-Mound, and the Industrial Waste Pond). Likewise, the RGs for the ecological receptors were also risk determined by back calculating the concentrations which cause a hazard quotient equal to 10 times the hazard quotient caused by INEEL natural background soil concentrations. The RGs for the six sites that will undergo remediation for the ecological receptors are shown in Table A-1.

Table A-1. Final Remediation Goals for the WAG 9 Sites.

Receptor	Site	Contaminant	95% UCL Concentration 1	RG* Concentration 1
Human Health	Interceptor Canal-Mound (ANL-09)	cesium-137	30.53	23 3

Human Health	Interceptor Canal-Canal (ANL-09)	cesium-137	18	23 3
Human Health	Industrial Waste Pond (ANL-01)	cesium-137	29.2	23 3
Ecological	Industrial Waste Pond (ANL-01)	chromium III	1,030	500
Ecological	Industrial Waste Pond (ANL-01)	mercury	2.62	0 -4
Ecological	Industrial Waste Pond (ANL-01)	selenium	8.41	3 4
Ecological	Industrial Waste Pond (ANL-01)	zinc	5,012	2,200
Ecological	Ditch A (ANL-01)	mercury	3.94	0 -4
Ecological	Ditch B (ANL-01)	chromium III	1,306	500
Ecological	Ditch B (ANL-01)	zinc	3,020	2,200
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	chromium III	709	500
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	mercury	8.33	0 -4
Ecological	Sewage Lagoons (ANL-04)	mercury	3.2	0 -4
Ecological	Industrial Lift Station Discharge Ditch (ANL-35)	silver	352	112

1 - Concentrations in mg/kg or pCi/g
* - Backward calculate risk-based concentration at the 1E-04 level for humans and ten times background for ecological receptors.

Description of the Selected Remedy

The selected remedy for these sites; Industrial Waste Pond and asiociated Ditches (ANL-01) Main Cooling Tower Blowdown Ditch (ANL-01A), Sanitary Sewage Lagoons (ANL-04), Interceptor Canal (ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANl-35) is phytoremediation.

Phytoremediation is the generic term for "phytoextraction" an innovative/emerging technology that utilizes plants to extract the contaminants from the soil. Phytoremediation would be conducted insitu to remove the metals and the radionuclides from the soils via normal uptake mechanisms of the plants. The plant vegetation is then harvested, sampled, and shipped to an incinerator on the INEEL for volume reduction. The resultant ash will then be sampled and sent to a permitted disposal facility. Phytoremediation would not be initiated on the Sanitary Sewage Lagoons (ANL-04) until approximately 2033 when the ANL-W facility is scheduled for closure. The start of the phytoremediation for the Industrial Waste Pond (ANL-01) will not be initiated until the cooling water discharges from the sodium processing facility are completed. The final sodium cooling water discharges are planned for 2002. This delay in phytoremediation startup for either site dose not pose any increase in the risks to human health and or the environment.

The effectiveness and technical implementability of phytoremediation are very site-specific. DOE estimates that five growing seasons would be required to meet the established Remedial Action Objectives. This estimate assumes natural decay of the cesium-137 along with five percent uptake by the plants. Sample results of the ANL-W sites show the contaminants are predominantly bound in the upper foot of soils. Thus, most of the contaminants are already within the plant root zone and no major movement of soil is necessary. The plants would require additional irrigation and soil amendments. The plant stalks along with the wetted soil condition would help control the spread of windblown contaminants. DOE has conducted a bench-scale testing of soils in 1998 to determine applicability of this remedial alternative. DOE has tested native and non-native INEEL plant species for their applicability for phytoremediation. Where non-native plant species are planted, the plants will be harvested before they go to seed.

It is anticipated that phytoremediation will remove contaminants, to acceptable levels after five field seasons. These acceptable levels are defined by the Remedial Action Objectives (RAOs) for the contaminated soils at ANL-W. Phytoremediation will eliminate the need for long-term monitoring and maintenance activities, surface water diversions, land use and access restrictions after 100 years, and long term environmental monitoring (air, sediment, and groundwater). The major components of the selected remedy for ANL-W are:

- Comptetion of phytoremediation workplan for the field-scale testing

- Conducting a field-scale phytoremediation test of selected plant species at the sites that pose unacceptable risks

- Determining the effectiveness and implementability of phytoremediation based on results of field-scale testing

- Collecting soil and plant samples after a two-year field season to be used to determine the effectiveness of phytoremediation on the ANL-W soils

- Harvesting, compacting, incinerating, and disposing of the above- and below-ground plant matter that will be sent to a permitted landfill

- Continuing the planting/harvesting process for phytoremediation only if completion of the two-year field-scale testing is successful. This process should continue until RAOs are attained

- Installing access restrictions consisting of fences, bird netting, and posting warning signs

- Review of he remedy no less than every five years after the RAOs have been met until the year 2098

- Implementing DOE controls which limit residential land use for at least 100 years from now (2098).

Description of Contingent Remedy

If it is determined that the selected remedy of phytoremediation does not adequately reduce the principle risks to human health and the environment after completion of the two-year field season, a contingent alternative of excavation and disposal has been selected. The contingent remedy of excavation and disposal would be used to remove contaminated soils from the Industrial Waste Pond and associated Ditches A, B, and C (ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Sanitary Sewage Lagoons (ANL-04), Interceptor Canal-Mound (ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The on-INEEL site disposal location for these contaminated soils could consist of a yet to be built Soils Repository at the Idaho Chemical Processing Plant or the Radioactive Waste Management Complex (RWMC). The final on-INEEL site location would be determined during the Remedial Design/Remedial Action phase for WAG 9. Excavation and disposal activities would

not be initiated on the Sanitary Sewage Lagoons (ANL-04) until approximately 2033 when the AL-W facility is scheduled for closure. The start of the phytoremediation for the Industrial Waste Pond (ANL-01) will not be initiated until the cooling water discharges from the sodium processing facility are completed. The final sodium cooling water discharges are planned for 2002. This delay in excavation and disposal startup for either site dose not pose any increase in the risks to human health and or the environment. The major components of the contingent remedy for ANL-W are:

- Contaminants in the waste areas will be excavated and transported to either the RWMC or the INEEL Soils Repository for on-INEEL disposal

- Verification sampling would be used to validate that the remaining soil concentrations are below the Remedial Action Objectives

- Review of the remedy no less than every five years after the RAOs have been met until the year 2098

- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

The no action alternative is reaffirmed and selected as the appropriate alternative for the remaining 33 areas at the ANL-W facility. These 33 areas have risks that are at acceptable levels based on the information gathered during the remedial investigation.

The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dismantlement activities at ANL-W. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and appropriate response action taken in accordance with the FFA/CO.

Statutory Determination

The selected remedy and the contingent remedy for the five sites at ANL-W have been determined to be protective of human health and the environment, to comply with federal and state requirements that are legally applicable or relevant and appropriate (applicable or relevant

and
appropriate requirements to the remedial actions), and to be cost effective.

The selected remedy of phytoremediation utilizes permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because the selected remedy of phytoremediation will result in hazardous substances remaining on-site above levels for unlimited use, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The agencies agree that No Action be taken at 33 additional areas.

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Signature Sheet

Signature sheet for the Record of-Decision for the Waste Area Group 9 Operable Unit 9-04, at Argonne National Laboratory- West, part of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Healthand Welfare.

<IMG SRC 98061B>

Signature Sheet

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<IMG SRC 98061C>

Signature Sheet

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ACRONYMS

ANL-W	Argonne National Laboratory - West
ARARs	Applicable or Relevant and Appropriate Requirements
BLS	below land surface
CFA	Central Facilities Area
COC	Contaminant of Concern
COCA	Consent Order and Compliance Agreement
COPC	Contaminant of Potential Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
DOE-CH	Deparment of Energy-Chicago Operations Office
DOE-ID	Department of Energy-Idaho Operations Office
ERA	ecological risk assessment
EBR-II	Experimental Breeder Reactor II
FS	Feasibility Study
FFA/CO	Federal Facility Agreement and Consent Order
FCF	Fuel Cycle Facility
HQs	hazard quotients
HFEF/S	Hot Fuel Examination Facility South
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
LMITCO	Lockheed Martin Idaho Technologies Company
MSL	mean sea level
NOAA	National Oceanic and Atmospheric Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance

OU	Operable Unit
PCBs	polycholorinated biphenyls
RAOs	remedial action objectives
RGs	remediation goals
RME	reasonable maximum exposure
ROD	Record of Decision
RI	Remedial Investigation
RCRA	Resource Conservation and Recovery Act
RWMC	Radioactive Waste Management Complex
SRP	Snake River Plain
SRPA	Snake River Plain Aquifer
TBC	to-be-considered
TREAT	Transient Reactor Test Facility
EPA	Environmental Protection Agency - Region 10
UMTRA	Uranium Mill Tailings Remedial Action
UCL	upper confidence limit
WAG 9	Waste Area Group 9
ZPPR	Zero Power Physics Reactor

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Waste Area Group 9

Record of Decision

1 DECISION SUMMARY

1.1 Site Name

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles (51 km) west of Idaho Falls Idaho, and occupies 890 square miles (2,305 km) of the northeastern portion of the Eastern Snake River Plain. The Argonne National Laboratory-West (ANL-W) is located in the southeastern portion of the INEEL, as shown in Figure 1-1. To better manage environmental investigations, the INEEL was subdivided into ten Waste Area Groups (WAGs). Identified contaminant releases sites in each WAG were in turn divided into operable units (OUs) to expedite the investigations and any required remedial actions. Waste Area Group 9 covers the ANL-W and contains four OUs that were investigated for contaminant releases to the environment. Within these four OUs, 37 known or suspected contaminant release sites have been identified. Two of the identified 37 release sites have been further subdivided into smaller areas based on their waste discharges and physical modeling parameter variations within a release site. Thus, the term "site" will herein refer to a named release site in one of the OUs. While "area" will herein be used to define all or a portion of an identified OU release site. This Record of

Decision (ROD) applies to these 37 sites at WAG 9 and two sites from WAG 10, which, on the basis of the comprehensive remedial investigation (RI)/feasibility study (FS) for WAG 9, were identified as posing a potential risk to human health and/or the environment. Of these 39 sites, 33 are being recommended for "No Action." Figure l-2 shows the locations of the eight areas where remedial action is proposed.

The INEEL lands are within the aboriginal land area of the Shoshone-Bannock Tribes. The Tribes have used the land and waters within and surrounding the INEEL for fishing, hunting, plant gathering, medicinal, religious, ceremonial, and other cultural uses since time immemorial. These lands and waters provided the Tribes their home and sustained their way of life. The record of the Tribes aboriginal presence at the INEEL is considerable, and DOE has documented an excess of 1,500 prehistoric and historic archeological sites at the INEEL.

Facilities at the INEEL are primarily dedicated to nuclear research, development and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use The developed area within the INEEL is surrounded by a 500 square mile (1,295 km -2) buffer zone used for cattle and sheep grazing. Communities nearest to ANL-W are Atomic City (southwest), Arco west Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban Sheep, cattle, hogs, poultry, and dairy cattle are produced; and potatoes, alfalfa, sugar beets, wheat, barley, oats, canola, sunflower, forage, and seed crops are cultivated. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government, as shown in Figure 1-3.

Public access to the INEEL is strictly controlled by fences and security personnel. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL approximately 20 miles (32.2 km).

and U.S, Highways 20 and 26 cross the southern portion approximately 5 miles (8 km) away from ANL-W, respectively. A total of 90 miles (145 km) of paved highways pass through the INEEL and are used by the general public.

The Snake River Plain Aquifer (SRPA), the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. The aquifer is approximately 200 miles (322 km) long, 20 to 60 miles (322 to 96.5 km) wide, and covers an area of approximately 9,600 square miles (24,853 km 2) The depth to the SRPA varies from approximately 200 feet (61 m) in the northeastern corner of the INEEL to approximately 900 feet (274 m) in the southeastern corner. This change in groundwater

depth
in the northeastern corner to the southeastern corner occurs over a horizontal distance of 42 miles (67.6
km). Depth to groundwater is approximately 640 feet (195 m) below ANL-W and the groundwater flow direction is south-southwest. Drinking water for employees at ANL-W is obtained from two production
wells located in the west-central portion of the ANL-W facility.

Most INEEL facilities are currently operated by one of three Government contractors: Lockheed
Martin Idaho Technologies Company (LMTCO), Westinghouse Electric Corporation, and Argonne National Laboratory-West. These contractors conduct various programs at the INEEL under the supervision of three DOE offices: DOE-Idaho (DOE-ID), Department of Defense-Pittsburgh Naval Reactors Office, and DOE-Chicago (DOE-CH).

ANL-W, a prime operating contractor to DOE-CH, began a redirected nuclear research and development program in FY 1995. The redirected program involves research to help solve near-term high priority missions including the treatment of DOE spent nuclear fuel and reactor decontamination
and decommissioning technologies. ANL-W is also currently in the process of conducting shutdown and
termination activities for the Experimental Breeder Reactor II (EBR-II). Within the ANL-W site are a
number of research and support facilities that contribute to the total volume of waste generated at
ANL-W. These facilities currently generate radioactive low-level waste, radioactive transuranic waste,
hazardous waste, mixed waste, sanitary waste, and industrial waste. Approximately 750 people are employed at the ANL-W facility.

The ANL-W facility does not have any identified wetlands, is not in the 100-year floodplain, and
has been screened as to it's potential for habitat to rare and endangered species. One facility at ANL-W,
the EBR-II reactor may be listed as a historic building eligible for listing on the National Register in the
future. The selected and contingent remedial alternatives would not impact the EBR-II facility.

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2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 INEEL Site Description

The INEEL site occupies approximately 890 square miles (2,300 km 2) of the northwestern portion of the eastern Snake River Plain (SRP) in southeast Idaho. The INEEL site is nearly 39 miles (63 km) long from north to south and about 36 miles wide (east-west) in its broadest southern portion. The INEEL includes portions of five Idaho counties (Bingham, Bonneville, Butte, Clark, and Jefferson) and lies within Townships 2 to 8 N and Ranges 28 to 34 E, Boise baseline and meridian. Figure 2-1 shows the location of the INEEL with respect to the counties and State.

The surface of the INEEL is a relatively flat, semiarid, sagebrush desert, with predominant relief being manifested either as volcanic buttes jutting up from the desert floor or as unevenly surfaced basalt flows or flow vents and fissures. Elevations on the INEEL range ftom 5,200 ft in the northeast to 4,750 ft in the central lowlands, with an average elevation of 4,975 ft. Figure 2-2 shows the shaded relief map of the WAG 9 and the rest of the INEEL.

2.2 ANL-W Site History

The ANL-W was established in the mid 1950s and is located approximately 50 miles west of Idaho Falls. ANL-W houses extensive support facilities for three major nuclear reactors: Transient Reactor Test Facility (TREAT), EBR-II, and the Zero Power Physics Reactor (ZPPR). The location of the main facilities at ANL-W are shown in Figure 2-3.

The first reactor to operate at the ANL-W site was TREAT, which was built in 1959. As its name implies, TREAT was designed for overpower transient tests of fuel. Its driver fuel, consisting of finely divided uranium oxide in a graphite matrix, has a high heat capacity that enables it to withstand tests in which experimental fuel may be melted. Used extensively at first for safety tests of water-reactor fuels, TREAT is now used mainly for safety tests for various fuel types as well as for non reactor experiments. It has periodically undergone modifications as part of the TREAT upgrade project.

The EBR-II a 62.5 megawatt thermal reactor went into operation in 1964 capable of producing 19.5-megawatts of electrical power in the liquid metal reactor power plant. It is a pool-type sodium-cooled reactor, designed, to operate with metallic fuel. It was provided with its own Fuel Cycle Facility (FCF) adjacent to the reactor building for remote pyrometallurgical reprocessing and refabrification of reactor fuel. The Fuel Cycle Facility operated from 1964 providing five complete core loadings

of
recycled fuel for EBR-II.

Over the years, the mission of the EBR-II has been redirected from that of a power-plant demonstration with integral fuel cycle to that of an irradiation test facility for mixed uranium-plutonium fuels for future liquid metal reactors. The pyromerallurgical process used in the Fuel Cycle Facility was not suitable for ceramic fuels so the Fuel Cycle Facility was converted to a Hot Fuel Examination Facility South (HFEF/S).

EBR-II continued to be fueled with metallic uranium driver fuel for operating convenience. This fuel was gradually improved to greatly increase its burnup, thus contributing to a high plant factor for irradiation tests. Over the years of operation, much valuable operating experience has been gained on sodium systems, including the removal and maintenance of primary sodium pumps and other components. In the 1970s, the mission of the EBR-II was again shifted in emphasis, this time to the Operational Reliability Testing Program. This program was aimed at studying the milder but more probable types of fuel and reactor malfunctions that could lead to accident sequence. In addition to preventing accidents, its aim was to better define the operating limits and tolerable faults in reactor operation, thus leading to both safer and more economical plants. The components of this program in EBR-II included tests of fuel to and beyond cladding breach, loss-of-coolant flow tests, mild power transients, and studies of man-machine interfaces.

In the early 1980s, ANL-W reexamined the basic design of liquid-metal-cooled fast reactors The results of this study led to the Integral Fast Reactor (IFR) concept. The IFR incorporates four basic elements: sodium cooling; a pool configuration; a compact, integral fuel cycle facility; and a ternary metal alloy fuel. Modifications to the EBR-II and the HFEF/S facilities have been made to support the pyroprocessing and fuel manufacturing for the IFR demonstration project. Since 1994, ANL-W has been conducting shutdown and termination activities for the EBR-II. These shutdown activities include defueling and draining the primary and secondary sodium loops and placing the reactor in a radiologically safe shutdown condition. The Fuel Cycle Facility has been converted to a Fuel Conditioning Facility. The mission of the Fuel conditioning Facility is to electrochemically treat EBR-II fuel to create radioactive waste forms which are acceptable for disposal in a national geologic repository.

The ZPPR was put into operation at ANL-W in 1969. The ZPPR is large enough to enable core-physics studies of full-scale breeder reactors that will produce up to 1,000 megawatts. ZPPR has also

been used for mockups of metallic cores and space-reactor cores. ZPPR was placed in programmatic standby in fiscal year 1989.

Various chemical and radioactive wastes were generated from these three reactors and the support facilities at ANL-W. The operation of these facilities and the corresponding waste streams have been evaluated and documented in the Facility Assessment and Screening document of 1973. This document, which is based on process knowledge, has been used as an initial starting point for ANL-W cleanup activities.

2.3 Identification of Release Sites

Potential release sites identified at ANL-W facilities in the Federal Facility Agreement and Consent Order (FFA/CO) include wastewater structures and leaching ponds, underground storage tanks, rubble piles, cooling towers, an injection well, french drains, and assorted spills. Possible COPCs at the various ANL-W sites include primarily petroleum products, acids, bases, PCBs, radionuclides, and heavy metals. These are the chemical and radioactive wastes generated from the scientific and engineering research at ANL-W.

2.4 Enforcement Activities

In July 1989, the Environmental Protection Agency proposed listing the INEEL on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

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<IMG SRC 98061I>

<IMG SRC 98061J>

The EPA issued a final ruling that listed the INEEL as an NPL site in November 1989. The FFA/CO was developed to establish the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA, the Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act. The DOE, EPA and IDHW have determined that hazardous waste release sites at ANL-W would be remediated through the CERCLA process, as defined in the FFA/CO, which superseded the existing RCRA-driven Consent Order and Compliance Agreement requirements. The FFA/CO identified 4 OUs consisting of 19 sites within Waste Area Group 9 that required additional activities under the

CERCLA
process. An additional 18 sites were determined to need no further action at the time the FFA/CO was
signed. Thus, a total of 37 WAG 9 sites were evaluated during the OU 9-04 Comprehensive RI/FS process and the results are summarized in this ROD.

One unit in OU 9-04 [Main Cooling Tower Blowdown Ditch (ANL-01A)] was originally included as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement (COCA) on the basis that corrosive liquid wastes were discharged after 1980, DOE, along with the EPA and
IDHW WAG 9 managers, have determined that the Main Cooling Tower Blowdown Ditch is a RCRA Land Disposal Unit and will be remediated under the CERCLA process in accordance with the applicable substantive requirements of RCRA/Hazardous Waste Management Act (HWMA), if an unacceptable risk to human health or the environment. However, the FFA/CO has only adopted RCRA corrective action (3004 (u) & (v)), and not RCRA/HWMA closure. Therefore, upon completion of the remedial action, the DOE must receive approval from the IDHW Department of Environmental Quality director that the Main Cooling Tower Blowdown Ditch has been closed pursuant to RCRA/HWMA closure requirements.

The OU 9-04 comprehensive RI/FS conducted ANL-W resulted in the identification of eight areas with potential risk to human health and/or the environment that would require some type of remedial action (W7500-000-ES-02, October 1997). The Proposed Plan (January 1998) identified the agencies' preferred alternative for the eight areas of concern at ANL-W.

3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA § 113(k)(2)(B)(I-v) and § 117, a series of opportunities for public
information and participation in the RI and decision process for the WAG 9, ANL-W, was provided to
the public from March 1994 through March 1998. The opportunities to obtain information and provide
input include "kickoff" fact sheets, which briefly discussed the status of the comprehensive investigation.
articles in the INEEL Reporter (a publication of the INEEL's Environmental Restoration Program), three
Citizens' Guide supplemental updates, presentations to members of the Citizens Advisory Board, a proposed plan January 1998, and public meetings. Specific details on how each of the opportunities for
the citizens to obtain additional information on WAG 9 are presented below.

Articles in the March 1994 and November/December 1997 issues of the INEEL Reporter were distributed to approximately 6,700 members of the INEEL Community Relations Plan mailing list. The
articles contained status reports on activities conducted at WAG 9 in addition to information on how, to
get additional information in the INEEL Information Repositories.

Three Citizens' Guide supplemental updates in March/April 1996, April/May 1996, and 1997 annual guide were also mailed to about 6,700 members of the public on the INEEL Community Relations Plan mailing list. These Citizen's Guide supplemental updates had specific sections on cleanup activities in WAG 9. Each of the Citizens' Guide supplemental updates also included

information on how to get more information about WAG 9 via the internet, toll-free phone number, Administrative Record/Information Repositories, videos, and the INEEL Regional Office in Boise.

The kickoff fact sheet was mailed in September 1996 to members of the public on the INEEL Community Relations Plan mailing list to encourage participation prior to the initiation of work on the Comprehensive RI/FS. The information on how to request a briefing, or to get more information on OU 9-04 documents was printed on the back of the kickoff fact sheet.

On January 20, 1998, a brief presentation on the proposed plan was presented to the Citizens Advisory Board. The advisory board consists of a group of 15 individuals, representing the citizens of Idaho, who make recommendations to DOE, EPA, and the State of Idaho regarding environmental restoration activities at the INEEL. The Citizens Advisory Board meetings are open to the general public.

Copies of the proposed plan were mailed to approximately 6,700 members of the public on the INEEL Community Relations Plan mailing list on January 6, 1998, urging citizens to comment of the proposed plan and to attend public meetings. Display advertisements announcing the same information concerning the availability of the proposed plan and the locations of public meetings, and the comment period extension, appeared in six regional newspapers during the weeks of January 12 and 19, and February 9 in Idaho Falls, Boise, Moscow, Fort Hall, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Post Register (Idaho Falls);the Sho-Ban News (Fort Hall); the Idaho State Journal (Pocatello); the Times News (Twin Falls); the Idaho Statesman (Boise); and the Daily News (Moscow).

In January 1998, DOE issued a news release to more than 100 media contacts informing them of the beginning of a 30-day public comment period pertaining to the WAG 9 ANL-W proposed plan. This comment period began January 12, and ended on March 12, 1998 in response to a request from the public, for a 30 day extension. Most of the news releases resulted in a short note in community calendar sections of the newspapers and in public service announcements on radio stations. The fact sheets INEEL Reporter, and the proposed plan all identified that additional documentation on WAG 9 is available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls, in the INEEL Boise Office, and in public libraries in Fort Hall, Pocatello, and Moscow.

For the general public, the activities associated with participating in the decision-making process included receiving the proposed plan, receiving telephone calls, attending the availabllity sessions one-half hour before the public meetings to informally discuss the issues, and submitting verbal and written comments to the agencies, during the 60-day public comment period. At the request of the Shoshone-Bannock Tribes, a informal presentation of the proposed plan was given to Tribal members and their technical staff on January 7, 1998.

Postage-paid business-reply comment forms were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. In addition, the reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to keep transcripts of discussions and public comments. The meeting transcripts were placed in the Administrative Record section for the WAG 9, OU 9-04 in the five INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

A Responsiveness Summary has been prepared and is included as Appendix A to this ROD. All formal verbal comments presented at the public meetings and all written comments are included in Appendix A and in the Administrative Record for the ROD. Those comments are annotated to indicate who made the comment and the page number where the DOE response can be found in the Responsiveness Summary.

A total of about 75 people not associated with the project attended the public meetings. Overall, nine citizens or groups provided formal comments. All comments received on the proposed plan were considered during the development of this ROD. The decision document presents the selected remedial action for the WAG 9, OU 9-04, chosen in accordance with CERCLA, as amended by Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the information in the Administrative Record for OU 9-04.

4 SCOPE OF OPERABLE UNITS AND RESPONSE ACTIONS

Under the FFA/CO, the INEEL is divided into 10 WAGs, of which ANL-W is included as WAG 9. WAG 9 is further subdivided into four OUs that included a total of 37 release sites. The four OUs are classified as: Remedial Investigation Sites, Track 2 Sites, Track 1 Sites, "No Action" Sites. In addition to the WAG 9 sites, two sites from WAG 10 are included in the evaluation of WAG 9. The inclusion of

these two WAG 10 sites into the WAG 9 ROD was based on the close physical location of these Sites to other WAG 9 facilities. These WAG 10 sites did not have individual risks but may add to the cumulative risks of WAG 9. Table 4-1 shows the 39 sites that were evaluated as part of the OU 9-04 Comprehensive RI/FS, 7 sites from WAG 9, and two sites from WAG 10.

The task of the "comprehensive" RI/FS is to evaluate contamination of environmental media (soil, air, and groundwater) and the potential risks to human health and the environment from exposure via those pathways, Each of the retained sites has undergone a "comprehensive" evaluation because risks from all known and potential release sites within WAG 9 and the two sites from WAG 10 have been evaluated. In addition, it is also "cumulative" because the receptor may be exposed to contamination from multiple release pathways (e.g., air and groundwater exposure pathways), from multiple release sites. Analyzing the air and groundwater pathways in a cumulative manner is necessary because contamination from all release sites within a WAG are typically isolated from one another with respect to the soil pathway exposure routes. Therefore, the soil pathway exposure route is analyzed on a release site specific or "noncumulative" basis in the INEEL comprehensive risk assessments.

From the evaluation of the 39 sites that were evaluated as part of this ROD, eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are subunits of five CERCLA sites (ANL-01, ANL-01A, ANL-04, ANL-09, and ANL-35) identified in the FFA/CO. This includes one area with only unacceptable risks to human health, five areas with only unacceptable risks to the ecological receptors, and two sites with unacceptable risks to both human health and the ecological receptors. The screening, development, and detailed analysis of the remedial alternatives resulted in the selected alternative for each of the retained sites. These alternatives met the goals established for reducing or eliminating risks to human health and the environment and for complying with applicable or relevant and appropriate requirements (ARARs).

In addition to the eight areas that require some type of remedial action, this comprehensive ROD also addresses 33 WAG 9 areas that do not pose an unacceptable risk to human health or the environment, based on the evidence compiled during the OU 9-04 Comprehensive RI/FS. These 33 areas are being recommended for No Action and, with approval of this ROD, the No Action decision is formalized.

Table 4-1. Summary of data available for WAG 9 and WAG 10 release sites evaluated in the OU 9-04 comprehensive RI/FS.

OU	Site	Site description	COCS	Data available	Source of information
None	ANL-10	Dry Well between T-1 and ZPPR Mound	None	Interviews with facility personnel indicate that the dry well was hooked up to a septic tank which was removed in 1966. Therefore, no source exists.	Initial Assessment Report for ANLW (1986)
None	ANL-11	Waste Retention Tank 783	None	Interviews of former facility operators indicate that no hazardous constituents were ever disposed at the tank. Therefore, no source exists.	Initial Assessment Report for ANL-W (1986). Summary Assessment Report (1990a)
None	ANL-12	Suspect Waste Retention Tank by 793	None	Interviews of former facility operators indicate that the tank was removed in 1979 and that no source exists.	Initial Assessment Report for ANL-W (1986). Summary Assessment Report (1990a)
None	ANL-14	Septic Tank and Drain Fields (2) by 753	None	Process knowledge and interviews with plant services personnel indicate that the only materials disposed were trace quantities of cleaning supplies. The tank was removed in 1979 and no source exists.	Initial Assessment Report for ANL-W (1986), Summarv Assessment Report (1990a)
None	ANL-15	Dry Well by 768	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a)
None	ANL-16	Dry Well by 759 (2)	None	Process knowledge and interviews with facility personnel indicate that the only hazardous constituent disposed was hydrazine.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report (1990a)

None	ANL-17	Dry Well by 720	None	Process knowledge and interviews with facility personnel, no hazardous constituents were ever disposed and therefore no source exists.	Initial Assessment Report for ANL-W (1986), Summary Assessment Report, (1990a)
None	ANL-18	Septic Tank and Drain Field by 789	None	The septic tank and drain field were removed in 1979. Process knowledge and interviews with facility personnel indicate that no hazardous constituents were disposed at the site.	Initial Assessment Report for ANL-W (1986)
None	ANL-20	Septic Tank and Drain Field by 793	None	Engineering drawings, and interviews with employees indicate no hazardous constituents were disposed and therefore no source exists.	Initial Assessment Report for ANL-W (1986). Summary Assessment Report (1990a)

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5 SUMMARY OF SITE CHARACTERISTICS

The characteristics such as physiography, meteorology, hydrology, soils, and ecology specific to the ANL-W site are summarized in Sections 5.1 through 5.6. These characteristics are included to help the reader understand the specific details needed to assess the alternatives in the ROD. A complete discussion of each of these can be found in chapter 2 of the 9-04 Comprehensive RI/FS. Sections 5.7.3

through 5.7.13 identify the nature and extent of contamination at each of the eight areas that are retained for cleanup.

5.1 Physiography

The SRP, is the largest continuous physiographic feature in southern Idaho. This large topographic depression extends from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. Figure 2-1 shows the location of the Snake River Plain Aquifer with respect to the INEEL and the State of Idaho. The portion of the SRP occupied by the INEEL may be divided into three minor physical provinces: a central trough that extends to the northeast through the INEEL and two flanking slopes that descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast.

The ANL-W facility is found in the southeastern portion of the INEEL and is responsible for a roughly rectangular-shaped administrative area encompassing approximately 890 acres. A double security fence with largest east-west and north-south dimensions of 580 m and 765 m (1,902 ft and 2,512 ft), respectively, surrounds the major portion of ANL-W. Located inside the fenced area are more than 60 buildings and 13 temporary trailers. Located outside the security fence are six buildings/facilities that support the ANL-W facility. One building that support the Transient Reactor Test Facility, the three sanitary Sewage Lagoons, the Radioactive Scrap and Waste Facility, the security forces firing range, the parking lot, and the helicopter landing pad. Outside the perimeter of ANL-W are unpaved roads, groundwater monitoring wells, the interceptor canal, industrial waste pond, three old construction rubble burn areas, and borrow excavation pits used for construction at ANL-W facilities. All ANL-W facilities are within a local topographically closed basin. The surface of the facility slopes gradually from south to north, at approximately 30 ft per mile. Maximum topographic relief within the ANL-W administrative boundary is about 50 ft, ranging from 5,110 ft above mean sea level on the north boundary to 5,160 ft on a basalt ridge to the southeast.

The Twin Buttes are the most prominent topographic features within the INEEL and are found to the southwest of ANL-W. East and Middle Twin Buttes rise 1,100 and 800 ft, respectively, above the plain. Big Southern Butte, a composite acidic volcanic dome several miles south of the INEEL, is the most prominent single feature on the entire plain, rising approximately 2,500 ft above the level of the plain.

5.2 Meteorology

The U.S. Weather Bureau established a monitoring station at the Central Facilities Area (CFA) in 1949. A 250-ft tower is also located just outside the east security fence of the ANL-W area; however, this tower has not been in continuous operation for as long as the CFA station. The longest and most complete record of INEEL meteorological observations exists for the CFA weather station. Although meteorological conditions between the ANL-W and CFA facility are similar, the ANL-W site specific conditions were used.

5.2.1 Air Temperature

Data have been collected from both the two- and ten-meter above the ground surface at ANL-W. The two-meter data set is limited in time from August 1993 to the present. The record presented is considered typical of temperature conditions in the vicinity of the ANL-W facility. Although there is a much longer record available from the CFA station, the distance of ANL-W from that station precludes its use. Therefore, these data are presented here because they more accurately portray surface conditions at ANL-W. The maximum average monthly temperature during the time of record was 84.8ºF for July and the minimum average monthly temperature of 7.9ºF was recorded in December.

5.2.2 Precipitation

Precipitation is not measured at the ANL-W tower. However, the National Oceanic and Atmospheric Administration (NOAA) conducted an evaluation and the use of CFA data for these parameters is reasonable. Precipitation was measured as rainfall and snowfall for the period January 1950 to December 1988. During this period, most of the precipitation was received in May and June and averaged 1.2 inches, while the annual total average was 8.71 inches. As could be expected, most snowfall occurred during December and January. The monthly average snowfall event for December and January was 6.4 and 6.1 inches, respectively. Wet bulb temperature humidity measurements from CFA run from 1956 to 1961. The highest average occurred in the winter at 55%; a low average of 18% was recorded in the summer.

5.2.3 Evaporation and Infiltration

Although NOAA does not measure pan evaporation at the INEEL, adjusted Class A values have been made through regression analysis of other southeast Idaho sites. Data from 1950-51, 1958-

59,
1963-64, and 1969-70 yielded an adjusted range of 40 to 46 inches per year. Other estimates for the
INEEL have values of 36 inches per year from saturated ground, 32 to 36 inches per year from shallow
lakes, and 6 to 9 inches per year from native vegetation. Evaporation rates calculated from the drop in
level of the ANL-W Industrial Waste Pond (IWP) yield values between 0.85 and 0.14 inches per day for
summer and winter, respectively. Infiltration as calculated by using the hydrologic equation (Equation
5.1 of Water Supply and Pollution Control, Fourth Edition) and solving for the infiltration term. This
yields values for the IWP of between 0.48 to 0.004 inches per day for summer and winter, respectively.

5.2.4 Wind

Wind measurements at ANL-W are made at two and ten meters and the top of the tower (250 ft above the ground surface). From these data, ANL-W is clearly subject to the same southwest and northeast winds as the rest of the INEEL. Winds tend to be diurnal with up-slope winds (those out of the southwest) occurring during the day and down-slope winds (those out of the northeast) occurring at night. During the 5-year time of record at ANL-W from 1990 to 1994, winds blew from the southwest 14% of the time, from the south-southwest 11% of the time, and from the northeast 10% of the time.
Winds were calm during only 2.49% of the time on record.

5.2.5 Special Phenomena

A thunderstorm is defined by the National Weather Service as a day on which thunder is heard at a given station. According to the definition, lightning, rain and/or hail are not required during this time,
Following this strict definition, the ANL-W may experience two to three thunderstorm days from June to August. Thunderstorms have been observed during each month of the year, but only rarely from November to February. Thunderstorms on the INEEL tend to be less severe than in the surrounding mountains because of the high cloud base. In many instances, precipitation from a storm will evaporate before reaching the ground. Individual storms may, however, occasionally exceed long-term average rain amounts for a storm.

Local thunderstorms may also be accompanied by micro bursts. These micro bursts can produce dust storms and occasional wind damage. Thunderstorms may also be accompanied by both cloud-to-ground and cloud-to-cloud lightning.

Major range fires in the summer of 1995 and 1996 have burned most of the natural vegetation around the ANL-W facility. Reseeding efforts were conducted in the summer of 1996 to establish new growth in the areas upwind of the access road to ANL-W. It is not known at this time what long-range impacts these range fires have had with the flora and fauna around the ANL-W facility. Early indications have shown that the wet summer of 1997 has produced abundant small grasses that may decrease the heavy demand for food at other non-burned areas around ANL-W.

5.3 Geology

Much of the INEEL's surface is covered by Pleistocene and Holocene basalt flows. The second most prominent geologic feature is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the INEEL, where the Big Lost River enters a series of playa takes. Paleozoic sedimentary rocks make up a very small area of the INEEL along the northwest boundary. Three large silicic domes and a number of smaller basalt cinder cones occur on the INEEL and along the southern boundary.

5.3.1 Surface Geology

Surficial materials at ANL-W facilities are found within a topographically closed basin. Low ridges of basalt found east of the area rise as high as 100 feet above the level of the plain. Surficial sediments cover most of the underlying basalt, except where pressure ridges form basalt outcrops. Thickness of these surficial sediments ranges from zero to 20 feet (Northern Engineering and Testing, Inc. 1988).

Test borings at ANL-W have revealed two distinct layers in the surface sediments. The uppermost layer, from zero to several feet below land surface (BLS), consists of a light brown silty loam. The upper 1 to 2 feet of this silty loam layer contains plant roots. This silty loam layer may also contain basalt fragments in areas where it directly overlies basalt.

The lower layer is a sandy-silt (loess) that extends to the underlying basalt. The loess of this layer was probably transported by wind from other parts of the plain. The windblown loess is calcareous

and light buff to brown in color. Small discrete lenses of well-sorted sands that occur within the loess

are probably the result of reworking by surface runoff into local depressions. The lower portion of this loess layer often contains basalt fragments of gravel to boulder size. The surface of the underlying basalt, whether it is in contact with the upper or lower layer, is highly irregular, weathered, and often very fractured.

5.3.2 Subsurface Geology

The subsurface lithology presented in this section is based on information gathered from past and recent borings around the ANL-W facility. Information gathered from recent borings (i.e., those drilled after 1992) have lead to a better understanding of the subsurface geology around ANL-W. The deep geology around ANL-W is dominated by basaltic lava flows. Minor discontinuous sedimentary interbeds occur at various depths, overlying the tops of basalt flows.

The subsurface geology at ANL-W is similar to that on the rest of the INEEL. The most striking difference is the lack of continuous sedimentary interbeds beneath the facility. Those sedimentary interbeds intercepted during drilling appear to be discontinuous stringers, deposited in low areas on basalt surfaces. These interbeds are generally composed of calcareous silt, sand, or cinders. Rubble layers between individual basalt flows are composed of sand and gravel to boulder sized material. The interbeds range in thickness from less than 1 inch to 15 feet. In 1988, driffing near the IWP an interbed was encountered between 40 to 50 feet BLS. This interbed is not continuous across the ANL-W area and does not appear west of the IWP. More aerially extensive interbeds have been identified above the regional water table, at approximately 400, 550, and 600 feet. BLS (Northern Engineering and Testing, Inc. 1988). The depth to the SRPA below the ANL-W facility is approximately 640 feet BLS. The nature of these sedimentary interbeds and rubble zones does not appear to cause perching, but may retard the downward movement of water and produce preferred flow paths.

The thickness and texture of individual basalt lava flows are quite variable. Individual basalt flows range in thickness from 10 to 100 feet. The upper surfaces of the basalt flows are often irregular and contain many fractures and joints that may be filled with sediment. The existence of rubble zones at variable depths and extents are shown from caliper logs of hole diameter that reveal zones of blocky or loose basalt. Exposed fractures commonly have silt and clay infilling material. The outer portions of a flow (both top and bottom) tend to be highly vesicular. The middle portions of the flow typically have few vesicles and are dominated by vertical fractures formed during cooling.

The variability of basalt thickness and fracturing also plays an important role in well response to changes in the SRPA. This effect is most notable in well responses to barometric pressure changes. These responses to the barometric pressure changes result in groundwater elevation data that has to be corrected for barometric pressures in order to plot the contour of the water surface. Most of the wells at ANL-W act as water table wells with a rapid response to barometric fluctuations. However, wells ANL-MON-A-11 and the new well ANL-MON-A-14 are very slow to respond to barometric changes often taking many hours to re-equilibrate to barometric shifts. Review of the driller's log for these wells shows that a thick, apparently massive basalt, rests just above the water table. This thick flow acts as a confining layer and restricts free air exchange near the well bore. Discussions with the INEEL field office of USGS suggest this is common on the INEEL and that the local area of such effects tends to be on the order of hundreds of feet. Neither the USGS nor ANL-W believes that this effect influences the wells ability to intercept upgradient contaminants from the Leach Pit (ANL-08) and the Main Cooling Tower Blowdown Ditch (ANL-01A). Furthermore, placement of the well away from the immediate downgradient edge of the source area allows for any lateral spreading of contaminants that may occur above this dense basalt before entry into the aquifer.

The sequence of interbedded basalt and sediments, discussed above, continues to well below the regional water table. The regional water table is typically encountered at an elevation of about 4,483 feet above mean sea level (MSL) near the ANL-W facility. A deep corehole was drilled in 1994 in an attempt to locate the effective base of the aquifer. This base is a layer below which the hydraulic conductivities drop by orders of magnitude. A large sedimentary interbed (up to 100 feet thick) and a marked change in the alteration of the basalts characterize the contact of the effective base. This contact was encountered at a depth of 1,795 feet below land surface (BLS) in the deep corehole at ANL-W. The sedimentary layer was approximately 15 feet thick.

5.4 Soils

The ANL-W site is located on a small meadow within a local drainage. The thickness of the surficial sediment in the vicinity of the ANL-W site is shown in Figure 5-1. These depths range from outcroppings at the surface to depths of 14 feet. In general, the depths of the surface soils above the

basalt tend to increase from approximately 2 feet on the east side of the facility to a depth of 14 feet near the west side of the security fence.

The general soil types for the ANL-W facility are shown in Figure 5-2. The two types of soils shown in the figure for ANL-W are 425-Bondfarm-Rock outcrop-Grassy Butte complex and 432-Malm-Bondfarm-Matheson complex. As shown in the figure, the soil type 425-Bondfarm-Rock outcrop-Grassy Butte complex is found over all the sites in OU 9-04. This soil consists of 40% Bondfarm loamy sand, 30% rock outcrop, and 20% Grassy Butte loamy sand. The Bondfarm soil is found on the concave and convex side slopes and is surrounded by hummocky areas of the Grassy Butte soils. Rock outcrop is in the areas of slightly higher than areas of Bondfarm soils. Also included in this complex are about 10% Matheson loamy sand, a soil that is similar to the Grassy butte soils but that is less than 40 inches deep to bedrock, and Terreton loamy sand. The Bondfarm soil is shallow and well drained. It formed from eolian material. Typically, the surface layer is light brownish gray loamy sand about 4 inches thick. The subsoil and substratum are very pale brown sandy loam 14 inches thick. Basalt is at a depth of 18 inches. The soil is calcareous throughout and may have a layer of lime accumulation at depth. The permeability of the soil is moderately rapid. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The hazard of vegetated soil blowing is very slight.

Rock outcrop consists of exposed basalt rock. Crevices in the rock contain some soil material that supports a sparse stand of grasses, forbs, and shrubs. While, the Grassy Butte soil is very deep and somewhat excessively drained. It formed in sandy eolian material. The underlying material to the depth of 60 inches or more is grayish brown and gray loamy sand. The soil is calcareous throughout and has a layer of lime accumulation at a depth of 19 inches. The permeability of the soil is rapid. Effective rooting depth is 60 inches or more, and the available water capacity is low or moderate. Surface runoff is very slow or slow. The hazard of vegetated soil blowing is very high.

5.5 Hydrogeology

Recharge to the SRPA in the vicinity of ANL-W occurs as snowmelt or rain. During rapid snowmelt in the spring, moderate recharge to the aquifer can occur. However, high evapotranspiration rates during the summer and early fall prevents significant infiltration ftom rainfall during this period. Because of the distance from the surrounding mountains and permanent surface water features

(i.e., the Big Lost River), the SRPA beneath ANL-W is unaffected by underflow or recharge from these sources.

No permanent, natural surface water features exist near the ANL-W site. The existing surface water features (e.g., drainage ditches and discharge ponds) were constructed for ANL-W operations for the collection of intermittent surface runoff. A natural drainage channel has been altered to discharge to the Industrial Waste Pond via the Interceptor Canal. Under the unusual conditions when the air temperature has been warm enough to cause snow-melt, but the ground has remained frozen, precluding infiltration, surface runoff along this channel has discharged to the Industrial Waste Pond. This condition most recently occurred during the spring of 1995. During this time, flow was visible from the surrounding basin into the Industrial Waste Pond for approximately 4 days. However, at no time did any water discharge from the pond to the downstream channel. Before 1995, the most recent occurrence of this situation was in 1976.

Perched water is defined as a discontinuous saturated lens with unsaturated conditions existing both above and below the lens. Classical conceptualization of a perched water body implies a large, continuous zone of saturation capable of producing some amount of water. These perched zones can occur over dense basalts that exhibit low hydraulic conductivity in addition to sediment interbeds that have low permeability. It is unknown which conceptual model is more prevalent at the INEEL. However, in the subsurface basalts at ANL-W, the "perched water" appears as small, localized zones of saturated conditions above some interbeds and within basalt fractures, which are incapable of producing any significant amount of water.

5.5.1 Snake River Plain Aquifer

Estimates show that nearly 2x10 9 acre-feet of water exist in the SRPA with water usage within the boundaries of the INEEL being approximately 5.6x10 3 acre-feet per year. From 1979 to 1994, the ANL-W withdrew an average of 138 million gallons of water per year from the SRPA. Principal uses of the water are for plant cooling water operations, boiler water, and potable water. On average, 85% of the water is discharged to either the sanitary Sewage Lagoons (ANL-04) or Industrial Waste Pond (ANL-01), 13% is discharged to the air via cooling towers, and 2% is discharged to subsurface septic systems.

Regional flow in the SRPA is from northeast to southwest. Depth to the SRPA near ANL-W facility is approximately 640 feet BLS, based on 1995 water level measurements. Transmissivities

of the
SRPA range from 29,000 to 556,000 feet squared per day, based on aquifer test data from two production
wells at the ANL-W. Figure 5-3 shows the location of monitoring wells near the ANL-W facility, hydraulic gradient, and the groundwater flow direction.

5.5.2 Surface Water Hydrology

Most of the INEEL is located in a topographically closed drainage basin, commonly referred to
as the Pioneer Basin, into which the Big Lost River, Little Lost River, and Birch Creek may drain. As

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shown in Figure 2-1, these streams drain mountain watersheds to the north and west of the INEEL, including the Pioneer, Lost River, Lemhi, and Centennial mountain ranges. Land surface elevations rise
from 4,774 feet in the basin to 12,656 feet on Borah Peak in the Lost River Range (Bennett 1990).
Rainfall and snowmelt within the upper basin contribute to surface water, mainly during spring.

Most of the water in these streams is diverted upstream of the INEEL for irrigation or is lost to
the subsurface due to high infiltration rates in the channel bed. During periods of high flow, some
surface water may reach the INEEL. This water is approximately 15 miles west of the ANL-W facility.
Because there are no permanent, natural surface water features near ANL-W, flooding is not a major
concern. During rapid snowmelt events at ANL-W the Interceptor Canal and the Industrial Waste Pond
receive surface water runoff. There is a diversion dam constructed south of the facility to handle these
events. This dam has a headgate that, when closed, diverts water into the adjacent drainage ditch and
eventually to the Interceptor Canal (ANL-09), and from there directly into the Industrial Waste Pond
(ANL-01). No surface outflow leaves the INEEL, except for minor local slope runoff.

5.6 Ecology

The INEEL is located in a cool desert ecosystem characterized by shrub-steppe vegetation communities typical of the northern Great Basin and Columbia Plateau Region. The surface of the INEEL is relatively flat, with several prominent volcanic buttes and numerous basalt flows that provide important habitat for small and large mammals, reptiles, and some raptors. Juniper woodlands occur near the buttes and in the northwest portion of the INEEL; these woodlands provide important habitat for raptors and large mammals. Limited riparian communities exist along intermittently flowing waters of the Big Lost River and Birch Creek drainages.

Wildlife species present in and around ANL-W include birds, mammals, and reptiles that are associated with facilities, sagebrush-steppe, rock outcroppings, deciduous trees and shrubs, grasslands, and water (e.g., Industrial Waste Pond, Sewage Lagoons, and drainage ditches). Both terrestrial and aquatic species are potentially present. Sagebrush communities surrounding ANL-W typically support a number of species including sage grouse (Centrocercus urophasianus), sage sparrow (Amphispiza belli), and pronghorn (Antilocapra americana). Rock outcroppings associated with these communities also provide habitat for species such as bats, woodrats (Neotoma cinerea), and sensitive species such as the pygmy rabbit (Brachylagus idahoensis). Nearby grasslands serve as habitat for species including the western meadowlark (Sturnella neglecta) and mule deer (Odocoileus hemionus). ANL-W facility structures also provide important wildlife habitat. Buildings, lawns, ornamental vegetation, and ponds are utilized by a number of species such as waterfowl, raptors, rabbits, and bats. Lawns can be an important resource to species at WAG 9 (the source of the water for these lawns is from the ANL-W deep wells). No surface-hydrology has existed to support fish. Current and future aquatic invertebrates are, however, supported by habitat provided by the Sewage Lagoons and the Industrial Waste Pond while they are receiving wastewaters from the facility.

The WAG 9 screening-level ecological risk assessment (SLERA) has also been conducted. The plant oxytheca (Oxytheca dendroidea) typically supports a number of species including sage grouse which was listed as a sensitive species with the U.S. Bureau of Land Management and the Idaho Native Plant Society/Idaho Fish and Game Conservation Data Center. Recently, the Environmental Science and Research Foundation conducted and published a biological assessment for WAG 9, which was organized by species groups and published.

5.7 Nature and Extent of Contamination

The following sections describe the nature and extent of contamination for the WAG 9 sites that were retained for evaluation in the OU 9-04 Comprehensive RI/FS after completion of the Track 1 or Track 2 evaluation, and screening against the INEEL 95% upper confidence level (95% UCL) of background soil concentrations. The complete evaluation of the groundwater and the soils investigation is found in the OU 9-04 Comprehensive RI/FS. Only a brief summary of each is included in this ROD.

5.7.1 Nature and Extent of Groundwater Contamination

The GWSCREEN model (Rood 1994) was selected to perform the groundwater fate and transport calculations for contaminants at ANL-W. The model was designed to perform groundwater pathway screening calculations for the Track 1 and Track 2 process. It was also an appropriate model to use when site characterization data are lacking and little would be gained by the use of a more complex model.

A receptor grid was overlain on the source areas such that contributions to contaminant concentrations from all retained sites could be calculated at each receptor node. Each source area was modeled either as surface, buried sources, or pond as described in the GWSCREEN user's manual. Prior to modeling the groundwater exposure pathway, soil contamination data for each site was screened to eliminate low-risk contaminants and minimize the modeling input. Two inorganics, arsenic and chromium were retained as contaminants of potential concern. The groundwater concentrations for each of the retained sites were determined along with the cumulative effects of the overlapping plumes for similar contaminants from more than one release site. These groundwater concentrations for arsenic and chromium were then used to determine the associated human health risks of using the groundwater. Of all the potential contaminants of concern at the ANL-W facility, all of the contaminants including the arsenic and chromium were screened as contaminants of potential concern during the risk assessment. Thus, there is no nature and extent of groundwater contamination at ANL-W since no detrimental effects to the groundwater have occurred or are modeled to occur at the ANL-W facility from the contaminants identified during the evaluation of the CERCLA sites.

5.7.2 Nature and Extent of Soil Contamination

All of the 37 FFA/CO sites at WAG 9 were evaluated as part of the OU 9-04 Comprehensive RI/FS. The site screening was conducted using a four step process. The first step was to review all the information on a particular site to make sure no contaminant was overlooked. The second step was to identify any new sites or unevaluated sites. The third step was to eliminate sites that were

found to be
No Action based on the results of either the Track 1 or Track 2 assessment. The fourth step was to
eliminate sites that had no source (i.e., no contaminants above 95% UCL of INEEL background). The
result of the screening process resulted in thirty sites being screened from the detailed risk assessment
process. The seven sites that were retained are: the Sanitary Sewage Lagoons (ANL-04), the EBR-II
Leach Pit (ANL-08), the Industrial Waste Pond and Ditches A, B, and C (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Interceptor Canal (ANL-09), the Industrial Waste Discharge Ditch (ANL-35), and the Main Cooling Tower Riser Pits (ANL-53).

Two of these seven WAG 9 sites were subdivided into smaller areas to facilitate a more accurate
risk assessment based on actual physical characteristics, and water discharge rates. These two sites are

the Interceptor Canal and the Industrial Waste Pond and Ditches A, B, and C. The Interceptor Canal was
divided into two areas, the Interceptor Canal-Canal and -Mound areas. While the Industrial Waste Pond
and associated Ditches A, B, and C has been subdivided into four areas the Industrial Waste Pond, Ditch
A, Ditch B, and Ditch C. Thus, eleven areas were evaluated in the OU 9-04 Comprehensive RI/FS. The
nature and extent of contamination in these eleven areas is described in sections 5.7.2.1 through 5.7.2.11
These eleven sites that were retained for evaluation in the OU 9-04 Comrehensive RI/FS are shown in
Figure 5-4.

Appendix A of the Operable Unit 9-04 Comprehensive RI/FS contains all of the sampling information on these sites including: sample location maps, color concentration profiles, contaminant of
concern statistics including sample size, mean, maximum, and 95% upper confidence limit (UCL) concentrations. Table 5-1 shows a summary of the FFA/CO site, the subarea, extent of contamination,
contaminant of potential concern (COPC), and 95% UCL for the COPC for the eleven sites that were retained for evaluation in the OU 9-04 Comprehensive RI/FS.

Table 5-1. Extent of Contamination Soil in WAG 9 Sites Retained for Cleanup.

FFA/CO Site	Area Name	Width (ft)	Length (ft)	Depth (ft)	COPC	Conc. (mg/kg or pci/g)
ANL-01	Industrial Waste Pond	200	250	0.5	Cs-137	29.2
					Cr+3	10,260

					Hg	2.62
					Se	8.41
					Zn	5012
ANL-01	Ditch A	5	400	0.5	Hg	3.94
ANL-01	Ditch B	5	1,400	1.3	Cr+3	1,170
					Zn	3,020
ANL-01	Ditch C	5	500	2.5	Hg	0.29
ANL-01A	Main Cooling Tower Blowdown Ditch	6	700	2	Cr+3	709
					Hg	8.83
ANL-04	Sewage Lagoons	300	700	1	Hg	3.2
ANL-08	EBR-U Leach Pit					
ANL-09	Interceptor Canal-Canal	30	1,425	6	Cs-137	1.8
ANL-09	Intemeptor Canal-Mound	20	500	4	Cs-137	30.53
ANL-35	Industrial Waste Lift Station Discharge Ditch	4	500	1	Ag	352
ANL-53	Main Cooling Tower Riser Pits	6	10	1.5	As	76
					Cr+3	1,717
					Pb	4,725
					Hg	0.78

5.7.2.1 Industrial Waste Pond

The Industrial Waste Pond (ANL-01) is an unlined, approximately 1.2-ha (3-acre) evaporative seepage pond fed by the Interceptor Canal and site drainage ditches. The pond was excavated in 1959, obtained a maximum water depth of about 4 m (13 ft) in 1988, and is still in use today. During this time, the Cooling Tower Blowdown ditches have been rerouted several times. ANL-W auxiliary cooling tower blowdown ditches convey industrial wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. The Industrial Waste Pond was originally included with the Main Cooling Tower Blowdown Ditch (ANL-01A) as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement on the basis of potentially corrosive liquid wastes discharged with the cooling tower effluent. However, ANL-W conducted a field demonstration with the EPA and State of Idaho representatives in attendance in July 1988 that showed that any potentially corrosive wastes discharged to the Industrial Waste Pond were naturally neutralized in the Main Cooling Tower Blowdown Ditch before reaching the Industrial Waste Pond. On that basis, EPA removed the Industrial

Waste Pond as a Land Disposal Unit and re-designated it as a Solid Waste Management Unit. Therefore, this site is still under the regulatory authority of RCRA in addition to being on the FFA/CO and under the regulatory authority of CERCLA.

DOE anticipates that the Industrial Waste Pond will continue to be used for storm water disposal as well as future releases of liquid cooling water discharges from the Sodium Process Facility. The Sodium Process Facility cooling water discharges will average 100 gallons per minute and are anticipated to last for three years starting in the spring of 1998 and lasting until summer of 2002. These cooling water releases will be discharged to the surface drainage ditch on the North side of ANL-W and drain approximately 250 ft. west to the Industrial Waste Pond. The Sodium Process Facility is a permitted HWMA/RCRA facility and is scheduled for clean closure under RCRA.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map and the statistics for contaminant of concern (COC) by pathway for all samples collected from the Industrial Waste Pond. Soil and sediment samples were collected from the Industrial Waste Pond as part of four different investigations occurring from 1986 to 1994. Cesium-137 was retained as a COPC for humans while, four inorganic contaminants were retained as COPCs for the ecological receptors.

The cesium-137 and the four inorganics (trivalent chromium, mercury, selenium, and zinc) were present in the southern and eastern part of the Industrial Waste Pond with concentrations typically greatest for surface samples near the inlet pipe in the southern part of the Industrial Waste Pond. Samples were screened against the 95% UCL concentrations for grab samples at the INEEL and will be referred to as 95% UCL background. The highest number of metals above the 95% UCL background concentration were collected from location #101 with 11 metals exceeding background, then location # 97 with ten metals exceeding the 95% UCL background concentration. The maximum cesium-137 concentration was 57.91 pCi/g, while the 95% UCL concentration was 29.2 pCi/g. For the trivalent chromium, mercury, selenium, and zinc the maximum concentrations were 11,400, 6.8, 37.9, and 5,850

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mg/kg and the UCL values were 1, 30, 2.62, 84.1, and 8.41 mg/kg, respectively. Therefore, the horizontal extent of contamination is the dimensions of both the southern and eastern part of the Industrial Waste

Pond 200 feet wide and 250 feet long. While, the vertical extent of contamination is in the upper 0.5 feet of sediments in the Industrial Waste Pond.

5.7.2.2 Ditch A

Ditch A conveyed industrial wastewater from the EBR-II Power Plant auxillarv cooling tower to the Industrial Waste Pond. Ditch A is still being used today to transport storm water runoff as well as intermittent auxiliary cooling tower waters. Discharges to Ditch A flow into the Main Cooling Tower Blowdown Ditch and ultimately into the Industrial Waste Pond.

Soil samples were collected from Ditch A as part of two different investigations. These studies are the Chen Northern in 1988 and the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway. In the 1988 Chen Northern study, eight soil samples were collected from three locations in the western part of the ditch. In the 1994 ANL-W study, 30 soil samples were collected from 11 locations throughout the entire length of the ditch.

Mercury was retained as a COPC for ecological receptors and was detected in 74% (27/38) of the samples analyzed. All of the mercury detections exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg). The source of the mercury is most likely from mercuric chloride used as a wood preservative in the cooling tower or from a neutron absorber in the power plant which is being decommissioned. The maximum detected concentration of 4.1 mg/kg was detected at location #10W in the surface sample (0 to 6 inches). While, the UCL concentration for mercury in Ditch A was 3.94 mg/kg. In all but one instance, the surface samples at each location contained the highest concentrations of mercury with the exception of #26E. The mercury contamination in Ditch A is spread through the entire length with the highest concentrations near the intersection of the Main Cooling Tower Blowdown Ditch and Ditch A. The mercury concentrations also decrease with increasing depth with the highest concentrations in the surface 0 to 6 inch samples. Therefore, the extent of contamination is the dimensions of both the eastern and western part of Ditch A 5 feet wide and 400 feet long and the vertical extent contained to the surface soils 0 to 6 inches.

5.7.2.3 Ditch B

Ditch B was also used to transport storm water runoff as well as wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. Only a small

feet portion of Ditch B is still being used today since the majority 1,275 feet of Ditch B was backfilled with clean soil to grade approximately 5-feet during the installation of a secondary security fence.

Soil samples were collected from Ditch B as part of three different investigations. Six soil samples were collected from the 1988 DOE study, 15 samples collected from the 1988 Chen-Northern study, and 10 samples in the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for the 1994 samples collected from Ditch B. The contaminant screening resulted in COPCs for humans and only two inorganics being retained as COPCs for the ecological receptors. These two inorganics are trivalent chromium and zinc. The extent of the inorganic contaminants are discussed below.

The contaminants in the covered portion of Ditch B have been screened from the risk assessment since the pathway was eliminated when the area was backfilled with clean soils. The open portion of Ditch B has chromium and zinc at concentrations that could pose unacceptable human and ecological risks. The maximum concentration of trivalent chromium and zinc are 4,530 and 3,020 mg/kg and the UCL concentrations are 1,306 and 1,460 mg/kg, respectively. The extent of the inorganic contaminants span the entire length of the open portion of Ditch B is 5 feet wide and 125 feet long. No stratification of inorganics was determined from the results in that portion of Ditch B and thus the total depth of the alluvium to the basalt of 0 to 1.3 feet is used to define the extent of contamination.

5.7.2.4 Ditch C

The Ditch C portion of the Industrial Waste Pond and associated ditches (ANL-01) was created in 1978 when a portion of Ditch B was backfilled. The water in Ditch C is the same as that in Ditch B mentioned in previous section. The discharge water going to Ditch B is rerouted via culvert under the security fence to Ditch C which drains to the Main Cooling Tower Blowdown Ditch and ultimately the Industrial Waste Pond. Ditch C is dimensions are approximately 5 x 500 x 2.5 feet deep. The contaminant screening resulted in mercury being retained as a COPC for the ecological receptors. The maximum mercury concentration was 0.83 mg/kg and the 95% UCL concentration was determined to be 0.29 mg/kg. The extent of the contamination was spread throughout the entire length of the ditch (5 x 500 feet) and the vertical extent of contamination was 2.5 feet deep.

5.7.2.5 Main Cooling Tower Blowdown Ditch

The Main Cooling Tower Blowdown Ditch (ANL-01A) runs north on the westside of the Main Cooling Tower and then north between the security fences to the Industrial Waste Pond. It is an unlined channel approximately 700 feet in length and 3 to 15 feet wide. From 1962 to 1996, the ditch had been utilized to convey industrial wastewater from the Cooling Tower to the Industrial Waste Pond. The main source of impurities to the Industrial Waste Pond were water treatment chemicals used for the regeneration of backwash waters from the ion exchange resin beds and remove minerals from cooling tower water used in the EBR-II steam system. From 1962 to July 1980, a chromate-based corrosion inhibitor was added to the Cooling Tower water and the blowdown contained significant quantities of hexavalent chromium. Ion exchange column regeneration discharges have occurred from 1962 to March 1986. Regeneration of these column is accomplished with sulfuric acid for cation columns and sodium hydroxide for anion columns.

In January 1986, a pH measurement of 1.86 was measured in the effluent discharged to the Main Cooling Tower Blowdown Ditch. This classified the liquid wastes as corrosive according to 40 CFR 261.22. The site was then classified as a Land Disposal Unit under RCRA. A temporary neutralization system was installed in March, and a permanent neutralization tank was installed in October 1986. A few discharges of regeneration water occurred, but they were in small batches and were-monitored before discharge. Since October 1986, after the neutralization tank was installed, reagents are being neutralized in a tank prior to discharge to the ditch. DOE, along with EPA and IDHW WAG 9 managers, have determined that the Main Cooling Tower Blowdown Ditch is a RCRA Land Disposal Unit and will be remediated under the CERCLA process in accordance with the applicable substantive requirements of RCRA/Hazardous Waste Management Act (HWMA), if an unacceptable risk to human health or the environment. However, the FFA/CO has only adopted RCRA corrective action (3004(u) & (v)), and not RCRA/HWMA closure. Therefor, upon completion of the remedial action, the DOE must receive approval from the IDHW Department of Environmental Quality director that the Main Cooling Tower Blowdown Ditch has been closed pursuant to RCRA/HWMA closure requirements.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for samples collected firom the Main Cooling Tower Blowdown Ditch. Soil samples were collected from the Main Cooling Tower Blowdown Ditch as part of four different investigations occurring from 1987 to 1994. In 1987, one soil sample (EST-SED) was collected from the northern part of the ditch where a storm water discharge ditch flows into

it. In 1988, four soil samples were collected from the different parts of the ditch. Three soil samples were collected from the west part of the ditch (C103B-S, C100B-S,D, and C73A-S), one sample was collected in the eastern portion of the ditch at the discharge point (B6B-S,D). In 1989, two soil samples (M-8 and M-10) were collected in the 145-foot interbed along the western portion of the ditch. Finally, in 1994, 35 samples were collected along the entire length of the ditch. The contaminant screening resulted in two inorganics; trivalent chromium and mercury at levels high enough be retained as a COPC for the ecological receptors.

Chromium concentrations were the highest in the outfall from the Cooling Tower. But, the entire length of the Main Cooling Tower Blowdown Ditch has concentrations of chromium above the 95% UCL background concentration levels for the INEEL surface soils. The analysis performed on the chromium was for the total chromium analysis. The chromium was release was almost exclusively in the trivalent form rather than the more toxic hexavalent form. But, to be conservative, DOE assumed that ten percent of the total chromium would be in the more toxic hexavalent form. The chromium concentrations almost exclusively decreased with increasing depth, and also decreased with increasing distance downstream of the cooling tower outfall. The maximum chromium concentration was 2,200 mg/kg and the UCL concentration was 1,306 mg/kg for the Main Cooling Tower Blowdown Ditch.

Forty-eight percent (22/46) of the mercury concentrations exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg) ranging from 0.08-13.4 mg/kg. The highest detected concentration was from the surface sample at location 9E. Mercury concentrations were highest in the eastern part of the ditch and typically decreased to less than one mg/kg in the subsurface samples except for one location. At location 11E, mercury concentrations were 2.8 mg/kg in the surface and 2.3 mg/kg in the subsurface sample. The maximum mercury concentration was 13.4 mg/kg and the UCL concentration was 8.83 mg/kg for the surface soils in the Main Cooling Tower Blowdown Ditch.

The extent of the contamination is mainly concentrated in the southern portion of the ditch near the cooling tower outfall. However, there are some concentrations greater than the upper limit of the 95% UCL background concentration for some metals in the northwestern part of the ditch. Therefore, the horizontal extent of contamination is the dimensions of both the eastern and western part of the Main Cooling Tower Blowdown Ditch 3 to 15 feet wide and 700 feet long. Because the width of the ditch varies from 3 to 15 feet, an average width of 6 feet will be used. The majority of the inorganic contaminants were concentrated in the top 6 inches of soils. However, some detections greater than the upper limit of the 95% UCL background concentration were made in some subsurface samples. Therefore, the vertical extent of contamination is assumed to be one-half the average depth to

basalt 2
feet.

5.7.2.6 Sewage Lagoons

The sanitary Sewage Lagoons (ANL-04) are located at the Sanitary Sewage Treatment Facility, north of the ANL-W facility. Two lagoons were constructed in 1965, with a third built later in 1974. According to engineering drawings, the three sanitary sewage lagoons cover approximately two acres. Appendix B shows a figure of the three lagoons with dimensions of; (1) 150 x 150 x 7 feet, (2) 50 x 100 x7 feet, and (3) 125x400x7 feet. The lagoons receive all sanitary waste waters originating at ANL-W, with the exception of the Transient Reactor Test Facility, Sodium Process Facility, and the Sodium Components Maintenance Shop. Sanitary waste discharged is from rest rooms, change facilities, drinking fountains, and the Cafeteria. The three lagoon bottoms are sealed with a 0.125 to 0.25-inch layer of bentonite and are situated approximately 640 feet above the groundwater. The Sewage Lagoons are still in use and will continue to be used for disposal of sanitary wastes for the next 35 Years.

Between 1975 and 1981, photo processing solutions were discharged from the Fuel Assembly and Storage Building to the Sanitary Waste Lift Station, which discharges to the Sewage Lagoons. There has been no known radioactive or hazardous substances released into the Sewage Lagoons. Periodic sampling of the Sewage Lagoon and the radionuclide detector placed in the lift station (Sanitary Waste Lift Station-788) supplying the Sewage Lagoons document that no radioactive substances have been released.

The results of the contaminant screening indicated that one contaminant, mercury, should be retained as a COPC for the ecological receptors. The mercury concentrations were detected throughout all of the sludge 0 to 6 inch samples in the Sanitary Lagoons. The maximum mercury concentration in the Sewage Lagoons was 3.2 mg/kg and this value was used in place of the UCL concentration because of the small data set (eight samples).

5.7.2.7 EBR-II Leach Pit

The EBR-II Leach Pit is located between the inner and outer security fences in the southwest corner of the ANL-W facility. The Leach Pit was an irregularly shaped, unlined underground basin that was excavated with explosives into basalt bedrock in 1959. The Leach Pit was used to dispose of

ANL-W liquid industrial waste including cooling tower blowdown, sanitary effluent, cooling condensates, and radioactive effluent, until 1973. The average annual discharge to the Leach Pit was approximately 9 x 10 4 gallons from 1960 to October 1973 containing a total of 10.4 curies of radioactivity. The majority of the sludge was removed during an interim action in December 1993, after which the bottom of the Leach Pit was lined with 5 to 7 cm (2 to 3 in.) of bentonite clay and backfilled to grade. The contaminant screening resulted in various radionuclides being retained for evaluation of the groundwater pathways for the human health risk assessment and no COPCs being retained for the ecological receptors.

The extent of the radionuclide contamination was the physical dimensions of the EBR-II Leach Pit since it was blasted into the basalt. The extent of the EBR-II Leach Pit is 18 x 40 x 0.1 feet since the sludge was removed in 1993 and no horizontal or vertical migration has been detected in coring and drilling activities around and through the Leach Pit. The predominant radionuclides retained are cesium-137, strontium-90, cobalt-60, and uranium-238.

5.7.2.8 Interceptor Canal-Canal

The canal portion was utilized to transport industrial waste to the Industrial Waste Pond and to divert spring runoff and other natural waters around the ANL-W facility for flood control. Between 1962 and 1975, two 4-in. pipes transported liquid industrial wastes and cooling tower effluent, to the Interceptor Canal. One line transported cooling tower blowdown water and regeneration effluent while the other line originated at the Industrial Waste Lift Station (Bldg. 760) and transported industrial wastes. Liquid radioactive wastes were discharged through the same line as the industrial wastes, but they were diverted to the EBR-II Leach Pit. Discharge of industrial wastes was discontinued in 1973, and discharge of cooling tower blowdown water was discontinued in 1975.

During clean out operations at the Interceptor Canal in October 1969, abnormal background radioactivity was detected. Additional radiation surveys in 1969, 1973, and 1975 indicated that the entire length of the Interceptor Canal was contaminated. Approximatel 4,540 yd 3 of contaminated soil was identified and only 1,240 yd 3 was targeted for removal. Of this soil that was removed, approximately 182 yd 3 was disposed at the RWMC from 1975 to 1976, and remaining 1,058 yd 3 of contaminated soil was removed and stockpiled on site (this stockpiled soil was evaluated as part of the OU 10-06). The

remaining soil, 3,300 yd 3 was left in the ANL-09-Mound and was investigated as part of the RI/FS process. Another survey conducted in 1993 indicated that two small areas had elevated readings above background.

The contaninant screening resulted in only cesium-137 being retained as a COPC for humans and no COPCs for the ecological receptors. The 95% UCL concentration for cesium-137 is 18 pCi/g and is fairly uniform throughout the entire length of the ditch. Thus, the extent of contamination is 30 x 1,425 x 6 feet.

5.7.2.9 Interceptor Canal-Mound

This section summarizes the analytical results for soil samples collected at the Interceptor Canal Mound (ANL-09) area. The Interceptor Canal-Mound was formed when 1,384 m 3 (1,810 yd 3) of dredged material was placed on the bank of the Interceptor Canal. Soil samples from the Interceptor Canal Mound were only analyzed for radionuclides. Inorganic releases to the Interceptor Canal-Canal occurred after the canal was dredged and therefore would not be in the dredged piles. Surface soil samples 0 to 6 inches and a subsurface soil sample approximately 3 to 4 feet were collected at the ANL-09-Mound area. In addition, another subsurface soil sample was collected ftom approximately 5 to 6 feet at three sample locations (#356, #368, and #378). Subsurface soil samples were collected at a depth that corresponds to the bottom of the mound. The deeper subsurface samples were collected to determine if migration of contaminants has occurred. The contaminant screening resulted in only one radionuclide (cesium-137) being retained as a COPC for humans and no COPCs for ecological receptors.

The cesium-137 was detected at every sample location throughout the mound, with the highest detected concentration (52 pCi/g) at location M19. While the UCL concentration for the cesium-137 was 30.53 pCi/g. Therefore, the horizontal extent of the cesium-137 is defined as the entire length of the mound 500 x 20 feet. For the vertical extent of the cesium-137 contamination, there is a significant decrease in concentrations (approximately one order of magnitude) between the surface and subsurface samples, The maximum detected C-137 concentration in the subsurface sample was only 5.9 pCi/g.

Nevertheless, as this concentration is above the established background, the vertical extent of contamination will be 4 feet.

5.7.2.10 Industrial Waste Discharge Ditch

The Industrial Waste Lift Station Discharge Ditch (ANL-35), also known as the North Ditch, is located inside the ANL-W security fences. The ditch is approximately 500 feet in length with a bottom width of 3 to 4 feet. At any one time, there is approximately 2 to 3 inches of water in the ditch. The ditch receives industrial waste water, primarily cooling water and photo processing wastes (e.g., photo developers, fixers, and stabilizers, and acids), but also including several retention tank overflows that may contain ethanol, sodium hydroxide, and some radionuclides, from a variety of facilities at ANL-W The ongoing and future discharges of these processing wastes are regulated under other EPA laws such as RCRA. The cleanup action specified in this ROD address only those past releases of these processing wastes.

Soil samples were collected from this site on three separate occasions. Three soil samples were collected during the 1989, DOE Survey, 17 soil samples were collected during the 1988 Chen Norther sampling, and an additional 19 soil samples were collected in 1994 by ANL-W. Soil samples from all three sampling efforts were collected and analyzed for organics, inorganics, radionuclides, and dioxin/furans. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for all samples collected in 1994 from the Industrial Waste Lift Station Discharge Ditch. Sample collection depths for the 1994 study were 0 to 6 inches and 1.5 to 2 feet.

The results of the contaminant screening resulted in no COPCs for human and only one inorganic, silver being retained as a COPC for the ecological receptors. Silver was analyzed for in all three studies and was detected at 87% (33 of 39) of the sample locations with the highest detection (352 mg/kg) at #41. This sample location is located in the middle of the ditch. The maximum concentration was used in risk assessment as the UCL value because of the small data set and large standard deviation in the data. However, high concentrations were also detected at other locations grid 18, ND03, 15, 18, and 19. Therefore, the horizontal extent of contamination is defined as the entire length of the ditch. No

trends on the vertical extent of contamination were detected for silver. Thus, the average soil depth on top of the basalt 1.0 foot was used to define the vertical extent of contamination. Thus, the extent of contamination at the Industrial Waste Lift Station Discharge Ditch is defined as 15 x 500 x 1 foot.

5.7.2.11 Main Cooling Tower Riser Pits

The Cooling Tower Riser Pits consist of four pits located approximately 10 feet east of the Main Cooling Tower. Each of the four pits is approximately 12 feet deep with 9 to 15 inches of soil covering the rock bottom. During winter shutdown periods of the Main Cooling Tower, the riser pipes were drained to prevent damage caused by freezing and the riser pits are used to collect this discharge, The contaminant screening indicated that four inorganics be retained as COPCs for human health risk assessment. The four inorganics are arsenic, trivalent chromium, lead, and mercury. The maximum concentrations of each of these inorganics are 76, 1,717, 4,725, and 0.78 mg/kg, respectively. The extent of contamination is the entire inside dimension of each of the riser pits and the total depth of soil above the basalt (i.e., 6 x 10 x 1.5 feet).

5.8 No Action Sites

Based on the process used to conduct the OU 9-04 Comprehensive RI/FS, these sites were screened from the risk assessment. The screening process included review of the previous information. review of the risks presented in either a Track 1 or Track 2 type document, and evaluation of the contaminant source, and pathway to a receptor. These sites are considered to be no action sites even under an unrestricted land use scenario and hence will not require 5 year reviews. These sites are described in short detail below, additional details on these sites can be found in the OU 9-04 Comprehensive RI/FS.

5.8.1 Operable Unit 9-01 Sites

This OU consists of ten sites (ANL-04,-019,-28,-29,-30,-36,-60,-61,-62, and -63) that were identified in the FFA/CO. These ten sites consisted predominantly of low hazard miscellaneous sites with small discharges or construction wastes. Of the ten OU 9-01 sites, only two sites (ANL-04 and -61) were retained for further evaluation in the OU 9-04 Comprehensive RI/FS. The OU 9-04

Comprehensive RI/FS indicates that only ANL-04, the ANL-W sewage lagoons, pose unacceptable risks to the environment as discussed earlier in this ROD. A brief history of the other nine OU 9-01 sites that do not pose unacceptable risk follows:

Sludge Pit West of T-7 (Imhoff Tank) (ANL-19)-The Imhoff Tank and sludge pit collected sanitary waste from the power plant (Bldg. 768), the Fuel Conditioning Facility (Bldg. 765), the Laboratory and Office building (Bldg. 752), and the Fire House (Bldg. 759). The Imhoff Tank was used to settle out the sanitary wastes from 1963 to 1966. No potential source of hazardous maierials is known to be associated with this site.

EBR-II Sump (ANL-28)-The EBR-II Sump is a 660-gallons underground coated carbon steel tank, 5 feet in diameter by 4.5 feet in depth located off the southwest corner of the Power Plant (Bldg. 768). The Sump is believed to have been installed in the early 1970s and is currently in use. The tank is a centralized collection facility for auxiliary cooling tower blowdown, ion exchange regeneration effluent, and small quantities of laboratory chemicals from the water chemistry laboratory in the Power Plant before discharging via a pipe to the Main Cooling Tower Blowdown Ditch. Currently, the Power Plant is not operating, but minor volumes of water chemistry water are still being discharged to the Main Cooling Tower Blowdown Ditch. No potential source of hazardous materials is known to be associated with this site.

Industrial Waste Lift Station (ANL-29)-The Industrial Waste Lift Station receives wastes from three major facilities; the Lab and Office (Bldg.752), the Zero Power Physics Reactor (Bldg.774), and the Fuel Manufacturing Facility (Bldg.704). The only contaminant of potential concern identified from process knowledge of water released to the Industrial Waste Lift Station is silver. A Track 1 investigation was originally performed for this site and, based on the above information, it was determined that the potential health risks are less than the lower limit of the NCP target risk range.

Sanitary Waste Lift Station (ANL-30)-The Sanitary Waste Lift Station (Bldg. 778) was built in 1965. It receives all sanitary waste originating at ANL-W, with the exception of the Transient Reactor Test Faclities (Bldgs. 720, 721, 722, 724, and T-15), the Sodium Process Facility operations trailer, and the Sodium Components Maintenance Shop (Bldg. 793). The only waste discharged to the lift station

was silver from photographic Film development. The maximum detected silver concentration of 68 mg/kg was less than the cleanup goal across all exposure pathways of 1,350 mg/kg.

TREAT Photo Processing Discharge Ditch (ANL-36)-The Transient Reactor Test Photo Processing Discharge Ditch is located approximately 20 feet northeast of and parallel to the Photo Lab (Bldg. 724) and the TREAT Office Building (Bldg. 721). Approximately 400 gallons of photo processing solutions are estimated to have been discharged to the ditch over the 2-year period from 1977 to 1979. The maximum detected silver concentration of 17 mg/kg was less than the cleanup goal across all exposure pathways.

Knawa Butte (ANL-60)-The Knawa Butte is located due north of the Hot Fuel Examination Facility (Bldg. 785) near the securiry fence. The butte was used as a construction refuse pile until September 1972 when a service request was made to renovate the existing pile and convert it to a doughnut-shaped mound. The butte consists primarily of clean soil and rock excavated from ANL-W facility basement construction. No potential source of hazardous constituents is known to be associated with this site.

EBR-II Transformer Yard (ANL-61)-The EBR-II Transformer Yard located south of the EBR-II Power Plant (Bldg.768) is the site of PCB and diesel fuel contamination. The PCB contamination is due to historic (i.e., prior to 1978) leakage from four transformers. All four transformers were replaced and the majority of the contaminated soil was removed during a cleanup action from 1988 through 1992. An additional area of PCB contaminated soil adjacent to an underground diesel storage tank was identified for removal. The PCB contaminated soil and underground diesel storage tank were removed in the summer of 1997. Verification samples were collected after removal and show that the remaining PCB contamination was remediated to the cleanup goal levels

Sodium Boiler Building Hotwell (ANL-62)-The Sodium Boiler Building (Bldg. 766) condensate hotwell, was built in 1962, and is located north of the EBR-II Power Plant (Bldg. 768). This hotwell, which is identical to the EBR-II Power Plant condensate hotwell, receives water from the steam trap and condensate drains. Neither hazardous constituents (hydrazine and tritium) believed to have been present at the site were detected.

Septic Tank 789-A (ANL-63)-This septic tank is located approximately 60 feet northeast of the

Equipment Building (Bldg. 789-A) and was believed to have been installed in the late 1950s. No potential source of hazardous materials is known to be associated with this site.

5.8.2 Operable Unit 9-02 Site

OU 9-02 consists of one site (ANL-08, EBR-II Leach Pit) identified in the FFA/CO. The EBR-II Leach Pit is located between the inner and outer security fences in the southwest corner of the ANL-W facility. The Leach Pit was an irregularly shaped, unlined underground basin that was excavated with explosives into basalt bedrock in 1959. The Leach Pit was used to dispose of ANL-W liquid industrial waste including cooling tower blowdown, sanitary effluent cooling condensates, and radioactive effluent, until 1973. The average annual discharge to the Leach Pit was approximately 9 x 10 4 gallons from 1960 to October 1973 containing a total of 10.4 curies of radioactivity. The majority of the sludge was removed during an interim action in December 1993, after which the bottom of the Leach Pit was lined with 2 to 3 inches of bentonite clay and backfilled to grade. A risk assessment performed on the concentration of the contaminants in the basalt and in the remaining sludge indicates that the total

potential risk is 6E-06 from ingestion of groundwater contaminated with beryllium and neptunium-237, which is at the lower limit of the NCP target risk range (i.e.,1E-06). A Track 2 Summary Report was completed and signed by the RPMs that recommended additional evaluation of the vadose zone below the Leach Pit in the OU 9-04 Comprehensive RI/FS.

5.8.3 Operable Unit 9-03 Sites

OU 9-03 consists of three sites (ANL-05,-31,and -34) that were identified in the FFA CO. These three sites had all received potentially hazardous chemicals that required additional sampling in order to determine the risks to human health and the environment. Of the three OU 9-03 site, all three are recommended for No Action based on results in the Track 2 Summary Report.

ANL Open Burn Pits 1, 2, and 3 (ANL-05)-Three abandoned open burn pits are located at ANL-W. The pits were initially used to bum construction wastes, such as paper and wood in the early 1960's. In addition, approximately 150 gallons of organic wastes from analytical chemistry operations were disposed in the burn pits from 1965 to 1970. The organic wastes consisted primarily of toluene,

xylene, hexane, isopropyl alcohol, butyl cellosolve, tributylphosphate, and mineral oil. A risk assessment was performed on the results of sampling and indicates that the potential risk from exposure to all contaminants detected is less than the lower limit of the NCP target risk range.

Industrial/Sanitary Waste Lift Station (ANL-31)-The Industrial/Sanitary Waste Lift Station (Bldg. 760) consists of an industrial and a sanitary lift station separated by a similar sump wall. The sanitary side is still used to pump sanitary wastes to the Sanitary Lagoons while the industrial side is inactive and has been backfilled with clean sand. Based on samples collected in the industrial side in 1995, the risk assessment indicated that several radionuclides pose a potential risk at the lower limit of the NCP target risk range for the current occupational scenario. Therefore in 1995, under a best management practice, ANL-W backfilled the industrial waste side with clean sand to remove the exposure route and removed the piping and contaminated soil from the Lift Station to the Meter House. Also under a best management practice the remaining 90 feet of the piping and soil from the Meter House to the EBR-II Leach Pit was removed in the summer of 1996. After the removals the verification samples collected showed that the remaining contaminants were below the cleanup goal concentrations.

Fuel Oil Spill by Building 755 (ANL-34)-ANL-34 is the site of a 50-gal spill of #5 fuel oil from in above ground storage tank. The spilled fuel oil occupied an area approximately 5 x 20 feet and was confined within the bermed area. A risk assessment was performed on the most mobile (i.e., naphthalene) and the most hazardous (i.e., benzene) constituents of the fuel oil. The risk assessment indicates that the risk would be below the lower limit of the NCP target risk range.

5.8.4 Operable Unit 904 Sites

OU 9-04 consists of five sites (ANL-01,-01A,-09,-35, and -53) that were identified in the FFA/CO. All five sites had received potentially hazardous chemicals that required additional sampling in order to determine the risks to human health and the environment. All of these sites were retained for detailed evaluation in the QU 9-04 Comprehensive RI/FS because they contained contaminants above the screening levels for either humans or the ecological receptors.

5.8.5 Operable Unit 10-06 Sites

Two WAG 10 sites at or near ANL-W that contain radionuclide-contaminated soils have been investigated in the OU 10-06 RI/FS. The two sites are the ANL-W-Windblown area and ANL-W-Stockpile site. These two sites are located within a mile of WAG 9 and are now included in the OU 9-04 Comprehensive RI/FS because the wastes had originated at ANL-W. Additional information on these two sites can be found in the 10-06 administrative record under INEL-94/0037 and INEL-95/0259. These two OU 10-06 sites are being incorporated into the OU 9-04 record of decision. The following two sections describe a short summary of the radionuclides detected and the associated risks.

ANL-W Windblown Area. This area actually consists of two areas, the windblown area around the remotely located TREAT reactor and the windblown area around the ANL-W facility. Soil samples were collected at both these facilities in 1993, and analytical results from soil samples collected by the Radiological and Environmental Sciences Laboratory (RESL, which is now called the Environmental Science & Research Foundation, Inc.) were used to evaluate risks from exposure to contaminants at the site. Risks for the current occupational exposure scenario and the future residential exposure scenario were within the NCP target risk range (i.e.,1E-04 to 1E-06). In addition to human health, risks to ecological receptors were also evaluated. This evaluation showed no unacceptable risks to populations of exposed ecological receptors.

ANL-W-Stockpile site. The ANL-W Stockpile is an abandoned borrow pit that was excavated as part of road building activities near ANL-W in the 1950s. The borrow pit is located on the west side of the ANL-W entrance road and is approximately 300 ft long and 200 ft wide. In 1975, ANL-W personnel used the borrow pit to dispose of approximately 1,058 cubic yards of low-level radionuclide contaminated soil from the ANL-W Interceptor Canal. The Operable Unit 10-06 Phase II field investigation was conducted at the ANL-W Stockpile to determine the nature and extent of radionuclide- and metal- contaminated soils within the stockpile. Radioactive hot spots were identified in the stockpile soil using field radiation survey instruments. Data were collected from three of the hot spots. The main radionuclide contaminant that contributed most of the risk was cesium-137, with concentrations up to 26,700 pCi/g. The human health risk assessment that was performed indicated that for the 100-year residential exposure the total risk is 5E-03, which is attributed to the external exposure (4E-03) and food crop ingestion (9E-04) from Cesium-137. In 1996, a non-time critical removal action was

performed on the radionuclide contaminated stockpile site. The contaminated soils were removed using large excavation equipment and the soil was transported to the Warm Waste Pond at the Test Reactor Area. The preliminary remediation goal(PRG)for the Cesium-137 contaminated soil was 16.7 pCi/g and remaining soils were below this level. The remaining risks associated with this site is 1E-05 which is within the NCP target risk range.

6 SUMMARY OF SITE RISKS

6.1 Human Health Risk Evaluation

The human health risk assessment consists of two broad phases of analysis: (1) a site and contaminant screening that identified COPCs at retained sites, and (2) an exposure route analysis for each COPC. The exposure route analysis includes an exposure assessment, a toxicity assessment, and a risk characterization discussion. The OU 9-04 Comprehensive Baseline Risk Assessment includes an evaluation of human health risks associated with exposure to contaminants through soil ingestion, fugitive dust inhalation, volatile inhalation, external radiation exposure, groundwater ingestion, ingestion of homegrown produce, dermal adsorption of groundwater, and inhalation of water vapors because of indoor water use.

6.1.1 Contaminant Identification

Historical sampling data were used to identify contaminants present in surface soils at the WAG 9 sites. The list of contaminants was screened based on comparison with background concentrations determined for the INEEL, a detection frequency of less than 5%, and no evidence that the contaminant was released at the site, and whether the contaminant is routinely considered to be an essential nutrient. The complete contaminant of concern list for each of the sites retained for evaluation are shown in Tables 3-3 through 3-18 of the OU 9-04 Comprehensive RI/FS. Because substances that are essential nutrients can be toxic at high concentrations, this final screening step was applied only when the essential nutrient concentrations were less than 10 times the background concentrations.

6.1.2 Exposure Assessment

The human health exposure assessment quantifies the receptor intake of COCs for

select pathways. The assessment consists of estimating the magnitude, frequency, duration, and exposure route of chemicals to humans.

6.1.2.1 Exposure Scenarios

Only those exposure pathways deemed to be complete, or where a plausible route of exposure can be demonstrated from the site to an individual, were quantitatively evaluated in the risk assessment. The populations at risk because of the exposure from waste at the ANL-W were identified by considering both the current and future land use scenarios.

The residential scenarios model a person living on the site 350 days a year for 30 years, beginning in 2097 (100 years from 1997). The 100-year residential scenario was selected for analysis because the DOE control of the INEEL lands is currently expected to last for at least 100 years. For purposes of the baseline risk assessment the assumption was made that future residents will construct 10 foot basements beneath their homes, and so the residents could be exposed to contaminants down to that depth.

Two occupational scenarios were evaluated as part of the baseline risk assessment for ANL-W. The assumptions used in the baseline risk assessment include nonintrusive daily industrial use without restrictions for 250 days per year for 25 years. Two time periods that were evaluated are starting now

(1997) and lasting 25 years. The second occupational scenario that was evaluated starts in 30 years (2027) and lasts for 25 years.

6.1.2.2 Quantification of Exposure

The following exposure pathways were considered applicable to the evaluation of human exposure to contaminants at the ANL-W sites: ingestion of soil, inhalation of fugitive dust, inhalation of volatiles, external radiation exposure, groundwater ingestion (residential scenario only), ingestion of homegrown produce (residential use only), and inhalation from indoor use of groundwater (residential scenario only).

Adult exposures were evaluated for all scenarios and pathways (external exposure; inhalation of dust; and ingestion of soil, groundwater, and foods); child exposures (0 to 6 years old)

were considered separately only for the soils ingestion pathways in the residential scenarios. Children were included because children ingest more soil than adults, significantly increasing their exposure rate.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reasonable maximum exposure at a site. Use of this approach makes under-estimation of actual cancer risk highly unlikely. The exposure parameters used in the risk assessment were:

- All Path ways

-Exposure frequency, residential	350 days/yr
-Exposure frequency, occupational	250 days/yr
-Exposure duration, occupational	25 yr
-Exposure duration, residential	30 yr

- External exposure pathway

-Exposure time, residential	24 hr/day
-Exposure time, occupational	8 hr/day

- Soil ingestion pathway

-Soil ingestion rate, residential-adult	100 mg/day
-Soil ingestion rate, residential-child	200 mg/day
-Soil ingestion rate, occupational	50 mg/day
-Exposure duration,residential-adult	24 hr
-Exposure duration, residential-child	6 hr

- Dust inhalation pathway

-Inhalation rate	20 m 3 of air/day

- Groundwater ingestion pathway

-Groundwater ingestion rate, residential	2 L/day

The contaminant exposure point concentrations evaluated in the baseline risk assessment were developed from site-specific sampling information. The ninety-Five percent upper confidence level (95% UCL) of the mean concentration for the data set were calculated and depending on the size of the data set, either the 95% UCL or the maximum detected concentration was used as the concentration in the risk

assessment calculations. This follows EPA guidance to determine the reasonable maximum exposure

concentrations for contaminants at WAG 9.

6.1.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at ANL-W. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values (slope factors and reference doses) for the sites were obtained from EPA's Integrated Risk Information System (IRIS) database and EPA's Health Effects Assessment Summary Tables: Annual FY-95, 903-R-94-020, November 1995.

For the eleven sites that were retained for detailed analysis of human health risks, only one contaminant has been identified as a COPC in the Nature and Extent of Soil Contamination (Section 5.7.2 of this ROD). This contaminant is cesium-137 which is rapidly absorbed into the bloodstream of humans and is distributed thoughout the active tissures of the body. Metabolically, cesium- 137 behaves as an analog of potassium. Its distribution throughout the body and the energetic beta and gamma radiation from its decay daugther, barium-137 metastable result in essentially whole-body irradiation.

6.1.4 Human Health Risk Characterization

Excess lifetime cancer risks are estimated by multiplying the intake level (developed using the exposure assumptions) by the slope factor. These risks are probabilities that are generally expressed in either scientific notation (1x10 -6) or exponential notation (1E-06). An excess lifetime cancer risk of 1E-06 indicates that, an individual has an additional one in one million chance of developing cancer over a lifetime as a result of site-related exposure to a carcinogen under the specific exposure conditions at a site. If an individual has a typical United States average cancer risk of 1 in 4, or 25 percent, then exposure to a carcinogen at the risk threshold concentration would raise his cancer risk to 0.250001 from 0.25. Excess cancer risks estimated below 1E-06 typically indicate that no further investigation or remediation is needed. Risks estimated between 1E-04 to 1E-06 indicate that further investigation or remediation may be needed. Risks estimated above the 1E-04 typically indicate that further action is appropriate. However, the upper boundary of the risk range is not a discrete line at 1E-04, although EPA generally uses 1E-04 in making risk management decisions. A specific risk estimate above 1E-04 may be considered acceptable if justified based on site-specific conditions.

The calculation of the noncarcinogenic hazard quotients were also calculated for the contaminants at WAG 9. The hazard quotients are ratios of a single substance exposure level to a reference dose for the same time duration. The tolerance ability for humans varies and the reference dose is based on the most susceptible individuals and then multiplied by the uncertainty factors(up to 10,000). This produces a very conservative value for non-cancer causing COC's. The hazard quotients are added together by exposure pathway to determine the hazard index.

For the sites that were retained for detailed analysis of the risks in the OU 9-04 Comprehensive RI/FS, ANL-W has prepared summary tables of the routes and calculated risks. These tables have been separated out by the contaminants contributing to each of the risk ranges (i.e., risks > 1E-04, risks between 1E-04 and 1E-06, and sites with HI greater than 1). The complete list of calculated carcinogenic and non-carcinogenic risk values is found in Appendix B of the OU 9-04 Comprehensive RI/FS. Each of these tables shows the release site, exposure scenario, exposure pathway, COC contributing to the risk,

calculated risk or hazard quotient, and total exposure pathway excess cancer risk or hazard index. Table 6-1 shows only those sites with contaminants that have exposure pathway cancer risks greater than 1E-04. For contaminants that have not been identified as being a carcinogen the contaminant may still pose health risk to humans. The sites and contaminants with exposure pathway hazard index greater than 1 are shown in Table 6-2. Table 6-3 shows the sites and contaminants that have calculated exposure pathways cancer risks between 1E-04 and 1E-06. For the sites, contaminants, and exposure pathways with cancer risks less than 1E-06 have been screened from inclusion in this ROD.

6.1.5 Risk Management

The risk management process is used to formally document decisions that have been made by ANL-W, the EPA, and IDHW project managers to determine validity of the risk assessment to the actual site conditions. The baseline risk assessment results tend to be very conservative and are based on the EPA's default exposure parameters. These default exposure parameters tend to overestimate the exposure for a small site on the INEEL. The risk management section (5.11) of the OU 9-04

Comprehensive RI/FS described the 5 screening steps used by WAG 9 to determine which sites really pose unacceptable risks to human health or the environment. The five steps are:(1) elimination of sites with carcinogenic risk less than 1E-06;(2)elimination of sites with carcinogenic risks between 1E-04 and 1E-06, a risk management decision;(3)elimination of sites that the COC or exposure pathway has been eliminated;(4)elimination of contaminants at or below ANL-W specific background concentrations; and finally (5)elimination of sites with hazard quotients less than 1. Based on the risk management evaluation process, the human health evaluation resulted in three areas with unacceptable risks to human health. These three areas are the Industrial Waste Pond (ANL-01), the Interceptor Canal-Canal (ANL-09) and the Interceptor Canal-Mound (ANL-09). The contaminants, pathway, and risks for these three areas are shown in Table 6-4.

6.1.6 Human Health Risk Uncertainty

Many of the parameters used to calculate risks in the WAG 9 Baseline Risk Assessment and Ecological Risk Assessment (ERA) have various uncertainties associated with them. For example, limitations in site sampling produce some uncertainty associated with the extent of contamination at most of the WAG 9 sites. Limitations in the characterization of the WAG 9 physical environment produce some uncertainty associated with fate and transport properties of WAG 9 contaminants. To offset these uncertainties, parameter values were selected for use in the Baseline Risk Assessment and ERA so that the assessment's results would present an upper bound, yet reasonable, estimate of WAG 9 risks.

Table 6-5 shows risk assessment parameter, the uncertainties associated with it, and the effect on the risk. Uncertainties in analytical data include collection and evaluation are produced by variability in observed concentrations due to sampling design and implementation, laboratory analysis methods, seasonality, contaminant level variation, and natural concentration variation. Toxicity assumption uncertainties are inherent due to the nature of collecting toxilogical information from animal studies and relating those to humans. Other toxilogical uncertainties are encountered when uncertainty factors and modifying factors are used in derivation of the slope factors and reference doses. The exposure assessment uncertainties are produced by characterizing transport, dispersion, establishment of exposure settings, and derivation of chronic intakes. Contaminant modeling uncertainties are

encountered when

Table 6-1. Exposure sites with human health risks greater than 1E-04.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	COC	Calculated Cancer Risk	Contributing Cancer Risk	Justification for Screening (Step #)
ANL-01-IWP	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	9E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	5E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	4E-04	NA
ANL-09-Canal	0-25-year Occupational	External Radiation Exposure	Cs-137	5E-04	5E-04	3
	30-55-year Occupational	External Radiation Exposure	Cs-137	2E-04	2E-04	3
ANL-09-Mound	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	8E-04	NA
	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	4E-04	NA
	100-year Residential	External Radiation Exposure	Cs-137	1E-04	1E-04	NA
ANL-61A	100-year residential	Ingestion of Soil	PCBs	6E-04	6E-04	3
	1,000-year Residential	Ingestion of soil	PCBs	6E-04	6E-04	3
	100-year Residential	Ingestion of Homegrown Produce	PCBs	2E-04	2E-04	3
	1,000-year Residential	Ingestion of Homegrown Produce	PCBS	2E-04	2E-04	3
All WAG 9 sites (Cum Pathway)	100- and 1,000-year Residential	Ingestion of Groundwater	Arsenic	3E-04	3E-04	4

		100- and 1,000-year Residential	Inhalation of vapors from indoor water use	Arsenic	1E-03	1E-03	4

Table 6-2. Contaminant hazard index greater than 1 for OU 9-04 exposure sites, scenarios, and pathways.

ANL-W Release Site	Calculated Exposure Scenario	Justification for Screening	Exposure Pathway	COC	Contributing Excess Cancer Risk	Contributing Hazard Quotient	Pathway Hazard Index	Excess Hazard (Step #)
ANL-01-IWP	100- and 1,000 year Residential		Ingestion of Soil	Arsenic	0.3			
				Chromium(VI)	0.8	1	4	
			Ingestion of Homegrown Produce	Zinc	0.4			
				Mercury	0.5	1	5	
ANL-01 -Ditch A	100- and 1,000 year Residential		Ingestion of Homegrown Produce	Zinc	0.1			
				Mercury	0.9	1	5	
ANL-01-Ditch B	100- and 1,000 year Residential		Ingestion of Homegrown Produce	Zinc	0.8			
				Mercury	0.5	1	5	
All WAG 9 sites (Cumulative Pathway)	100- and 1,000 year Residential		Ingestion of Groundwater	OCDD	3E-01			
				2,4,5-TP(silvex)	2E-01			
				Antimony	2E-01			
				Arsenic	1E+00			
				Cadmium	6E-01			
				Fluoride	1E+00			
				Selenium	2E-01			
				Zinc	2E-01	5	4 & 5	

Table 6-3. Exposure sites with risks greater than 1E-06 and less than 1E-04.

Exposure Site	Justification for Screening Exposure Scenario (Step #)	Exposure Pathway	Contributing COC	Calculated Cancer Risk
ANL-W Release Pathway Cancer Risk				
Main Cooling Tower Blowdown Ditch(ANL-01A) 1E-05	0-25- and 30-55 year Occupational 2	Ingestion of Soil	Arsenic	1E-05
	0-25- and 30-55-year Occupational 2	External Radiation Exposure	U-238	2E-06
2E-06				
	100-year Residential 2	Ingestion of Soil	Arsenic	5E-05
5E-05				
	100-year Residential 2	External Radiation Exposure	U-238	4E-06
4E-06				
	100 Residential 2	Ingestion of Homegrown Produce	Arsenic	5E-06
5E-06				
Industrial Waste Pond (ANL-01) 5E-06	0-25- and 30-55-Year Occupational 2	Ingestion of Soil	Arsenic	5E-06
	0-25- Occupational 2	External Radiation Exposure	Co-60	6E-06
9E-04				
	100-year Residential 2	Ingestion of Soil	Arsenic	7E-05
7E-05				
	100-year Residential 2	Ingestion of Homegrown Produce	Arsenic	8E-06
8E-06				
Ditch A (ANL-01) 4E-06	0-25- and 30-55-year Occupational 2	Ingestion of Soil	Arsenic	4E-06
	0-25- and 30-55-year Occupational 2	External Radiation Exposure	U-238	5E-06
5E-06				

Figure 6-3. Continued.

ANL-W Release Site	Exposure Pathway	Justification for Screening Exposure Scenario (Step #)	Exposure Pathway	Contributing Coc	Calculated Cancer Risk
		100-year Residential	Ingestion of Soil	Arsenic	3E-05
		100-year Residential	External Radiation Exposure	U-238	9E-06
		100-year Residential	Ingestion of Homegrown Produce	Arsenic	4E-06
Ditch B(ANL-01)		0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06
		100-year Residential	Ingestion of Soil	Arsenic	2E-05
		100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06
Ditch C(ANL-01)		0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06
		0-25- Occupational	External Radiation Exposure	Co-60	1E-06
				U-238	2E-05
		30-55-year Occupational	External Radiation Exposure	U-238	2E-05
		100-year Residential	Ingestion of Soil	Arsenic	2E-05
				U-238	2E-06
		100-year Residential	External Radiation Exposure	U-238	3E-05

		100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2

Figure 6-3. Continued.

ANL-W Release Site	Calculated Cancer Risk	Justificafion for Pathway Screening Exposure Scenario (Step #)	Exposure Pathway	Contributing COC	Cancer Risk
Interceptor Canal- Canal (ANL-09)	3E-06	0-25- and 30-S5 year Occupational 2	Ingestion of Soil	Arsenic	3E-06
	5E-04	0-25-year Occupational 2	External Radiation Exposure	Co-60	2E-06
	3E-05	100-year Residential 2	Ingestion of Soil	Arsenic	3E-05
	8E-05	100-year Residential 2	External Radiation Exposure	Cs-137	8E-05
	3E-06	100-year Residential 2	Ingestion of Homegrown Produce	Arsenic	3E-06
Interceptor Canal-Mound (ANL-09)	8E-04	0-25-year Occupational 2	External Radiation Exposure	Co-60	1E-05
				U-238	2E-06
	4E-04	30-55-year Occupational 2	External Radiation Exposure	U-238	2E-06
	1E-04	100-year Residential 2	External Radiation Exposure	U-238	3E-06
Industrial Waste Liftstation Discharge Ditch (ANL-35)	6E-05	0-25-year Occupational 2	External Radiation Exposure	Co-60	2E-06
				Cs-137	5E-05
				U-238	2E-06

Figure 6-3. Continued.

ANL-W Release Site	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	Pathway Cancer Risk	Justificafion for Screening (Step #)
	30-55-year Occupational	External Radiation Exposure	Cs-137	3E-05		2
			U-238	2E-06	3E-06	2
	100-year Residential	External Radiation Exposure	U-238	3E-06		2
			Cs-137	9E-06	1E-05	2
Cooling Tower Riser Pits-South(ANL-53)	0-25- and 30-55-year Occupational	Ingestion of Soil	Arsenic	2E-06	2E-06	2
	100-year Residential	Ingestion of Soil	Arsenic	2E-05	2E-05	2
	100-year Residential	Ingestion of Homegrown Produce	Arsenic	3E-06	3E-06	2
EBR-II Transformer Yard(ANL-61A)	0-25- and 30-55-year Occupational	Ingestion of Soil	PCB's	7E-05	7E-05	2
AII WAG 9 sites (Cumulative Pathway)	100-year Residential	Ingestion of Groundwater	Bis(2-Ethylhexyl) Phthalate	4E-06		2
			Methylene Chloride	7E-06	1E-06	2
	100-year Residential	Inhalation of water vapors from Indoor Water Use	Methylene Chloride	1E-06	1E-06	2

Figure 6-3. Continued.

Exposure Pathway	Justificafion for Screening (Step #)	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	ANL-W Release Site Cancer Risk
TREAT Windblown Area(10-06)	2	30- year Residential	Ingestion of Homegrown Produce	Sr-90	2E-06	2E-06
Stockpile Soil (10-06)	2	100-year Residential	External exposure	Cs-137	1E-05	1E-05
AII WAG 9 sites (Cumulative Pathway)	2	100-year	Ingestion of Groundwater	Bis(2-Ethylhexyl) Phthalate	4E-06	2
				Methylene Chloride	7E-06	1E-06
	2	100-year Residential	Inhalation of water from Indoor Water Use	Methylene Chloride	1E-06	1E-06

Table 6-4. Sites retained for evaluation in the feasibility study because of human health risks.

Exposure Pathway	Justificafion for Screening (Step #)	Exposure Scenario	Exposure Pathway	Contributing COC	Calculated Cancer Risk	ANL-W Release Site Cancer Risk
ANL-01-1WP	NA	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	9E-04
	NA	30-55-year Occupational	External Radiation Exposure	Cs-137	4E-04	5E-04
	NA	100-year Residential	External Radiation Exposure	Cs-137	1E-04	4E-04
ANL-09 Mound	NA	0-25-year Occupational	External Radiation Exposure	Cs-137	8E-04	8E-04
		30-55-year Occpational	External Radiation Exposure	Cs-137	4E-04	

4E-04 NA

100-year Residential External Radiation Exposure Cs-137 1E-04
1E-04 NA

default values are used instead of actual site conditions and model outputs cannot be verified with actual
data.

Table 6-5. Uncertainties associated with the human health risk assessment.

Area	Uncertainties	Effect on Risk
Sampling and Analysis	A representative concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate
Concentration Terms	95% UCL values were used in Risk Assessment.	Overestimate
	ANL-W used one-half the detection limit when the constituent is not detected.	Overestimate
Fate and Transport	Use of conservative generic modeling parameters may not be truly representative of ANL-W site conditions.	Overestimate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
GWSCREEN Modeling	GWSCREEN input parameters (i.e., contaminant solubility limit, distribution coefficient (k d), and infiltration rate are considered conservative, but contain some uncertainty.	Underestimate or Overestimate
	Maximum source term concentrations are assumed for the entire volume modeled for each site.	Overestimate
Exposure Assessment	Assumes residence could be established in area that are uninhabitable due to physical or administrative limitations.	Overestimate
	Default exposure values assume maximum possible exposure times, particularly	

for the Overestimate
occupational scenario where exposure times were 8 hours per day rather than more
realistic time of a maximum of a few hours a week.

The dermal absorption pathway was not included in the risk assessment calculations. Underestimate

Toxicity Use of parent nuclide slope factor plus daughter (-D) rather than adding slopes for each Underestimate
Assessment radionuclide.

Extrapolation of values from nonhuman studies to humans, from high doses to low doses. Overestimate

Underestunate
Chromium was assumed to be 10% hexavalent and 90% trivalent form based on worst Overestimate
case studies at ANL-W.

Route-to-route extrapolations are used.
Overestimate or

Underestimate

Risk Risks are added across constituents and pathways, although they may not affect the same Underestimate
Characterization target organ or mechanisms of damage.
or Overestimate

Assumption that constituents are evenly distributed at the 95% UCL concentration. Overestimate

Toxicity values for some constituents such as chromium and silver are based on industrial
conditions.
Overestimate

6.2 Ecological Evaluation

The ecological assessment for ANL-W is a quantitative evaluation of the potential effects of the
sites on plants and animals other than people and domesticated species. A quantitative ecological
assessment is planned in conjunction with the INEEL-wide comprehensive RI/FS scheduled for 1999.
The assessment endpoints developed around the protection of biota represented by functional groups and
individual threatened and endangered and Category 2 species known to exist at ANL-W. Assessment endpoints were defined for ANL-W were in the INEEL ERA Guidance Manual (VanHorn et al., 1995)

and incorporate the suggested criteria for developing assessment endpoints, including ecological relevance and policy goals (EPA 1992).

The selection of measurement endpoints for the ANL-W flora and fauna were not surveyed directly. Rather, published references were used as the primary sources of ecological and toxicological data from measurement endpoints were derived. Values extracted from these references were used to calculate the ecological based screening levels for all ecological receptors and to develop the toxicity reference values for the contaminants.

The measurement endpoint are the modeled dose as compared to the toxicity reference values (TRVs) for each contaminant for each receptor or functional group. The dose was divided by the TRV to produce a hazard quotient (HQ) for each contaminant and receptor of concern. The HQ is ultimately used to measure whether the assessment endpoint has been attained, that is, no indication of possible effects is determined (i.e., HQs are less than target value for all receptors for each contaminant). This target value for the ecological HQs was established to be 10 times the HQ of the 95% UCL for the INEEL background.

This INEEL-wide ecological assessment provided an indication of the affect of INEEL releases in the ecology at a population level. In the area near ANL-W, there are no critical or sensitive habitats. Based on the present COCs and ecological information the quantitative eco-evaluation performed for this ROD. Six areas pose potentially unacceptable risks to the ecological receptors for up to five inorganics; chromium, mercury, selenium, silver, and zinc. Of these six areas, one also shows unacceptable human health risks. Table 6-6 lists the six areas, contaminants of concern, and corresponding mmltiplication of the HQ above the INEEL background HQ for those sites that were retained for the ecological receptors.

6.2.1 Species of Concern

The only federally listed endangered species known to frequent the INEEL is the peregrine falcon. The status of the bald eagle in the lower 48 United States was changed from endangered to threatened in July 1995. Several other species observed on the INEEL are the focus of varying levels of concern by either federal or state agencies. Animal and avian species include the ferruginous hawk, the northern goshawk, the sharp-tailed grouse, the loggerhead shrike, the Townsend's big-eared bat, the pygmy rabbit, the gyrfalcon, the boreal owl, the flammulated owl, the Swainson's hawk, the merlin, and

the burrowing owl. Plant species classified as sensitive include Lemhi milkvetch, plains milkvetch, wing-seed evening primrose, nipple cactus, and oxytheca. Table 6-6 shows the sites of concern along with the functional group identification number and a species common in the functional group.

Table 6-6. Sites that have unacceptable ecological,HQ,functional group, and species.

FFA/CO Site	Area Name/ size (ft)	COC	Multiple of INEEL natural background HQ*	Functional Group	Common Species
ANL-01	Industrial Waste Pond/200x250x0.5	Cr-3	200	Plants	Numerous
		Hg	30	(M222)	Merriams shrew
		Se	20	(M222)	Merriams shrew
		Zn	20	(AV232)	Red-winged blackbird
ANL-01	Ditch A / 5x400x0.5	Hg	50	(AV132)	Sora
ANL-01	Ditch B / 5x1,400x1.3	Cr+3	20	Plants	Numerous
		Zn	15	(AV232)	Red-winged black bird
ANL-01A	Main Cooling Tower Blowdown Ditch /	Cr+3	15	Plants	Numerous
ANL-04	Sewage Lagoons / 300x700x1	Hg	40	(M222)	Merriams shrew
ANL-35	Industrail Waste Lift Station Discharge Ditch / 4x500x1	Ag	30	Plants	Numerous

* The agencies agreed that action would be taken on WAG 9 sites where the haza d quotient caused by a COC exceeded the hazard quotient cased by natural background concentrations by a factor of 10 or more.

6.2.2 Exposure Assessment

The WAG 9 ecological risk assessment (ERA) evaluated all the FFA/CO sites and determined

that five sites have a potential source of contamination and/or a pathway to ecological receptors. These sites were evaluated using the general approach as discussed in VanHorn et al. (1995) and following guidelines proposed by EPA (EPA 1992). The results of the ERA evaluation of the remaining sites are presented as a range of hazard quotients (HQs) calculated for functional groups. Due to the uncertainty in the ERA methods, HQs are used only as an indicator of risk and should not be interpreted as a final indication of actual adverse effects to ecological receptors. In addition, DOE used the INEEL 95% UCL background concentrations for the inorganics which resulted in HQs greater than 1. Based on the conservative nature of the HQ calculations, DOE will only remediate those WAG 9 sites that have HQs that are at least 10 times the: HQ calculated using the INEEL or ANL-W specific 95% UCL background concentration. Six areas; ANL-01, Ditch A, Ditch B, ANL-01 A, ANL-04, and, ANL-35, were retained because of ecological risks.

6.2.3 Ecological Risk Uncertainites

Uncertainty is inherent in the risk assessment process. Principal sources of uncertainty lie within the development of an exposure assessment. Uncertainties inherent in the exposure assessment are associated with estimation of receptor ingestion rates, selection of acceptable HQs, variations in background inorganic concentrations, estimation of site usage, and estimation of plant uptake factors and bloaccumuolation factors. Additional uncertainties are associated with the depiction of site characteristics, the determination of the nature and extent of contamination, and the derivation of Threshold Limit Values. All of these uncertainties likely influence risk to some extent. Table 6-7 shows risk assessment parameter, the uncertainties associated with the identified parameter, and the effect on the risk.

The uncertainties for the ecological risk assessment conducted for WAG 9 include the use of HQ as an indicator of risk. The HQ is a ratio of the calculated dose for a receptor from a COC to the toxicity reference value. These ratios provide a quantitative index of risk to define functional groups or

individual receptors under assumed exposure conditions. A HQ less than the target value (i.e., typically 1) implies "low likelihood" of adverse effects from that contaminant. However, in many cases, INEEL background concentrations of inorganics produced HQ greater than 1. Thus, for WAG 9 the approach of using the ten times the background HQ was adopted in establishing the action levels.

6.3 Groundwater Risks

The GWSCREEN model was selected to perform the groundwater contaminant fate and transport calculations. The source areas were modeled individually instead of modeling a single composited site. Each source area was located according to its physical geographic location within the ANL-W facility and the contaminant specific plumes were added together to determine the maximum contaminant concentration. The maximum contaminant concentration for the groundwater was then used in the risk assessment calculations. The results of the cumulative evaluation of the groundwater indicate that arsenic and chromium are the only contaminants that pose a potentially unacceptable groundwater contaminant levels. The maximum arsenic and chromium concentrations for the future residents 100-years in the future were calculated. The chromium risk were less than 1E+06, and the arsenic resulted in a risk of 3E-04 for the ingestion of groundwater and 1E-03, for the inhalation of vapors from indoor water use. Both risk values for arsenic exceeded the upper limit of the National Contingency Plan level of 1E-04. The arsenic was determined to be from natural sources at the INEEL and screened as a contaminant of concern during the risk management process for these CERCLA sites at ANL-W. Additional information on the groundwater modeling and screening of arsenic as a contaminant of concern at ANL-W can be found in the OU 9-04 Comprehensive RI/FS Sections 5.4, 5.5, 5.6, 5.7, 5 8, and 5.11.2.4.

6.4 Basis for Response

The ANL-W OU 9-04 Comprehensive RI/FS evaluated the risks associated with the 37 sites from WAG 9 along with two sites form WAG 10. Together these 39 sites were evaluated to determine the risks to the current and future receptor scenarios. The following two paragraphs explain which sites pose unacceptable risks for the human health and ecological receptors.

Table 6-7. Uncertainties associated with the ecological risk assessment.

Area	Uncertainties	Effect on Risk
Sampling and Analysis	A representatrve concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate
Concentration	95% UCL values were used in Risk Assessment.	Overestimate
	ANL-W used one-half the detection limit when the constituent is not detected.	Overestimate
Fate and Transport	Use of conservative generic modeling parameters may not be truly representative of ANL-W site conditions.	Overestimate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
Functional Groups	The functional groups were designed to assess a hypothetical species using input values that represent the greatest exposure of the combined functional group members.	Overestimate
Estimation of Ingestion Rates	Only a few of the intakes for the terrestrial receptors were based on ingestion rates found in literature. Most of the ingestion rates were calculated using allometric equations available in literature.	Overestimate or Underestimate
Estimation of Plant Uptake Factors	Few bioaccumulation factors and plant uptake factors are available in the literature. In the absence of literature values, ANL-W calculated bioaccumulation and plant uptake factors from information in Baes. 1994.	Overestimate or Underestimate
Estimation of Toxicity Reference Values	Various adjustmemt factors are incorporated to extrapolate toxicity from the test organism to other species.	Overestimate or Underestimate
Site Use Factors	Home range is not known for many species and therefore a default of 1.0 was used.	Overestimate
Hazard Quotients	Variations in INEEL background concentrations of inorganics were not accounted for when calculating the toxicity reference values and ultimately effect the Hazard Quotient	Overestimate

value.

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementinig the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are; the Industrial Waste Pond (ANL-01), Ditch A (ANL-01), Ditch B (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sanitary Sewage Lagoons (ANL-04), the Interceptor Canal-Canal (ANL-09), the Interceptor Canal-Mound (ANL-09), and the Industrial Waste Station Discharge Ditch

(ANL-35). These eight areas with unacceptable human health or ecological risks are shown in Figure 6-1. A summary of the sites with actual or threatened releases of hazardous substances to humans or ecological receptors is shown in Table 6-8. These sites with unacceptable risks to humans and/or the ecological receptors are described in the following two paragraphs, respectfully.

The Baseline Risk Assessment (BRA) indicated that for the current and future occupational scenario, only one contaminant cesium-137, would produce an unacceptable risk to human health. The cesium-137 posed an unacceptable risk to both current and future occupational receptors and future residential receptors at two sites, the Industrial Waste Pond (ANL-01) and the Interceptor Canal-Mound (ANL-09). While the cesium-137 at the Interceptor Canal-Canal (ANL-09) site only poses an unacceptable risks for the current and future occupational receptors. The Interceptor Canal-Canal (ANL-09) risks will be mitigated for the current and future occupational receptors by implementation of the land use restrictions during the 100-year DOE control as defined in the land use assumptions. Thus, the Interceptor Canal-Canal (ANL-09) portion will only undergo implementation of standard operating procedures to reduce the risks to the occupational receptors to acceptable levels.

The results of the WAG 9 ERA indicate that of the 37 WAG 9 release sites and the 2 WAG 10 sites, only six areas produce potentially unacceptable risks for ecological receptors due to the presence of various inorganic contaminants. These six areas are; the Industrial Waste Pond, Ditch A, Ditch B (all from ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sewage Lagoons (ANL-04), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The remaining sites that were

evaluated as part of the OU 9-04 Comprehensive RI/FS had risks that were within the acceptable range of the National Contingency Plan. These sites are being mentioned here to formally document in this ROD that they require No Action.

None of the contaminants exceeded the hazard index of 1 for either the current or future occupational exposure route. The response actions selected in this ROD are designed to reduce the potential threats to human health and the environment to acceptable levels.

Table 6-8. Sites with unacceptable human health or ecological risks.

ANL-W Area /Site Code	Human Health Risk?	Ecological Risk?
Industrial Waste Pond / (ANL-01)	Yes*	Yes*
Ditch A / (ANL-01)	No	Yes
Ditch B / (ANL-0)	No	Yes
Main Cooling Tower Blowdown Ditch / (ANL-01A)	No	Yes
Sewage Lagoons / (ANL-04)	No	Yes
Interceptor Canal-Canal / (ANL-09)	Yes	No
Interceptor Canal-Mound / (ANL-09)	Yes	No
Industrial Waste Lift Station Discharge Ditch / (ANL-35)	No	sYes

* This is the only site with both human health and ecological risks.

<IMG SRC 98061O>

7 DESCRIPTION OF ALTERNATIVES

7.1 Remedial Action Objectives

Remedial action objectives (RAOs) for OU 9-04 sites with unacceptable risks were developed in accordance with the NCP and CERCLA RI/FS guidance. The RAOs were defined through discussions among the three agencies (IDHW, EPA, and DOE). The RAOs are based on the results of the human health and ecological risk assessment and are specific to the COCs and exposure pathways developed for

OU 9-04. They are as follows:

- For protection of human health:

  - Prevent direct exposure to radionuclide contaminants of concern (COCs) that would result in a total excess cancer risk of greater than 1 in 10,000 to 1 in 1,000,000 (1E-04 to IE-06) to current and future workers and future residents.

- For protection of the environment:

  Prevent exposure to COCs in soils which may have potential adverse effects to resident populations of flora and fauna, as determined by a HQ = 10 times the HQ calculated from INEEL background soil concentrations.

To meet these objectives, remediation goals (RGs) were established. These goals are quantitative cleanup levels based primarily on ARARs and risk-based doses. The RGs are used in remedial action planning and the assessment of effectiveness of remedial alternatives. Final RGs are based on the results of the baseline risk assessment and evaluation of expected exposures and risks for selected alternatives.

The 1 chance in 10,000 risk (1E-04) for human health and a hazard quotient of 10 times the INEEL background for ecological receptors were used to determine the RGs for the OU 9-04 sites of concern. For human health the basis for using the upper end of the NCP risk range of IE-04 to IE-06 was based on the remoteness of the INEEL site, conservativeness of the risk assessment, the absence of current residents, results based on the 100-year DOE control of INEEL lands, and current and future occupational workers are and will continue to be protected by standard operating procedures that are inplace and will continue to be updated while the ANT-W is operating. The RGs for the remediation of the cesium-137 for humans was determined by using a backward calculation of the concentration needed to produce a risk of 1E-04. Likewise, the RGs for the ecological receptors were also risk based and were determined by back calculating the concentrations equal to 10 times the HQ resulting from INEEL background soils. Table 7-1 shows the final RGs that have been established for the eight areas of concern at ANL-W.

Remedial actions will ensure that risk is mitigated to the point that exposure would not exceed these levels. On the basis of these RGs, areas and volumes of contaminated media that would require

some form of remedial action were identified. These estimated areas, depths, and volumes for the eight areas to be remediated are presented in Table 7-2.

Table 7-1. Final Remediation Goals for the WAG9 Sites.

Receptor	Site	Contaminant	95% UCL Concentration 1	RG* Concentration 1
Human Health	Interceptor Canal-Mound (ANL-09)	cesium-137	30.53	23.3
Human Health	Interceptor Canal-Canal (ANL-09)	cesium-137	18	23.3
Human Health	Industrial Waste Pond (ANL-01)	cesium-137	29.2	23.3
Ecological	Industrial Waste Pond (ANL-01)	chromium III	1,030	500
Ecological	Industrial Waste Pond (ANL-01)	mercury	2.62	0.74
Ecological	Industrial Waste Pond (ANL-01)	selenium	8.41	3.4
Ecological	Industrial Waste Pond (ANL-01)	zinc	5,012	2,200
Ecological	Ditch A (ANL-01)	mercury	3.94	0.74
Ecological	Ditch B (ANL-01)	chromium III	1,306	500
Ecological	Ditch B (ANL-01)	zinc	3,020	2,200
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	chromium III	709	500
Ecological	Main Cooling Tower Blowdown Ditch (ANL-01A)	mercury	8.83	0.74
Ecological	Sewage Lagoons (ANL-04)	mercury	3.2	

0.74				
Ecological	Industrial Lift Station Discharge Ditch (ANL-35)	silver	352	112

1 - Concentrations in mg/kg or pCi/g
* - Backward calculated risk-based concentration at the 1E+04 level.

Table 7-2. Volume of Contaminated Soil in the Eight areas Retained for Cleanup.

OU 9-04 Release site	Site name	Width (ft)	Length (ft)	Depth (ft)	Volume (yd 3)
ANL-01	Industrial Waste Pond	200	250	0.5	926
ANL-01	Ditch A	5	400	0.5	37
ANL-01	Ditch B	5	1,400	1.3	337
ANL-01A	Main Cooling Tower Blowdown Ditch	6	700	2	311
ANL-04	Sewage Lagoons	300	700	1	7,778
ANL-09	Interceptor Canal-Mound	20	500	4	1,481
ANL-35	Industrial Waste Lift Station Discharge Ditch	4	500	1	74

7.2 Summary of Alternatives

In accordance with Section 121 of CERCLA, the FS identified alternatives that (a.) achieve the stated RAOs, (b.) provide overall protection of human health and the environment, (c.) meet ARARs, and (d.) are cost effective. These alternatives, used individually or in combination, can satisfy the RAOs through reduction of contaminant levels, volume or toxicity, or by isolation of contaminants from potential exposure and migration pathways. For the OU 9-04 sites, soil is the only medium of concern targeted for remediation. Five alternative categories were identified to meet the RAOs for contaminated soil at OU 9-04 sites:

1. No Action (with monitoring)

2. Limited Action

3. Containment with Institutional Controls

4. Excavation and Disposal

5. Phytoremediation

Estimated present work costs for the remedial alternatives for all sites are shown in Table 9-3 in Section 9. Post-closure costs were estimated for 100-years of monitoring for Alternative 3, where the contaminants were left at WAG 9. For Alternatives 4 and 5, where contaminants are removed or treated to meet the RAOs, the monitoring period extended to the end of the removal or until the RAOs are met through treatment. DOE controls will be implemented for Alternatives 4 and 5, after the RAOs are met.

7.2.1 Alternative 1: No Action (With Monitoring)

Formulation of a No Action alternative is required by the NCP [40 CFR 300.430 (e)(6)] and guidance for conducting feasibility studies under CERCLA. The No Action alternative serves as the baseline for evaluating other remedial action alternatives. This alternative can include environmental monitoring, but does not include actions to reduce potential exposure pathways, such as fencing or deed restrictions. Therefore, the No Action alternative developed for OU 9-04 sites involves only environmental monitoring (groundwater, air, and sediment) in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan for at least 100 years after site closure. The monitoring would be necessary to validate that none of the contaminants were shown to migrate off-site or into the groundwater through modeling used in the OU 9-04 Comprehensive RI/FS.

While the No Action alternative does not involve any construction or operational activities that would result in disturbances to the surfaces of the OU 9-04 sites, IDAPA 16.01.01.650 (Rules for fugitive dust) could nonetheless apply to any sites that were a source of fugitive dust and is, therefore considered an ARAR that would not be met. Inorganics present in fugitive dust would not meet IDAPA 16.01.01.585-586 (Rules for the Control of Air Pollution in Idaho). IDAPA 16.01.11.200 (Rules for groundwater quality) would be met by ongoing groundwater monitoring. The No Action alternative would not meet DOE Orders because health risks to current workers and the potential future residents exceed allowable ranges. The estimated cost for implementing the No Action (with monitoring) alternative is relatively low when compared to the other alternatives.

7.2.2 Alternative 2: Limited Action

The limited action alternative involves only institutional controls to remain in effect for the next 100 years. This alternative essentially continues management practices currently in place at OU 9-04 and will continue for the next 100 years of DOE control. Actions under this alternative focus on routine maintenance and upkeep of the drainage ditches and Industrial Waste Pond, restricting access (posting warning signs and deed restrictions), and environmental monitoring including radiation surveys.

Current management practices and institutional controls are in place as a result of DOE responsibilities and authorities for maintaining security, control, and safety at DOE facilities, These responsibilities and authorities have their basis in the Atomic Energy Act of 1954. For DOE facilities, Federal Regulation 10 CFR 835 implements the Radiation Protection Guidance to Federal Agencies for Occupational Workers, recommended by the EPA and issued by the President on January 20, 1987. The requirements of this regulation include standards for control of occupational radiation exposure, control of access to radiological areas, personnel training, and record keeping.

In addition, the regulations specify limits for maintaining occupational radiation exposure as low as reasonably achievable (ALARA), and requires that DOE activities be conducted in compliance with a documented radiation protection program approved by DOE. At the INEEL, the requirements of 10 CFR 835 are primarily implemented through DOE Order 5400.5. Regulations for protection and security, of DOE facilities are included in 10 CFR 860, which prohibits unauthorized entry. This regulation is implemented through DOE Order 5632.1C.

Specific controls (e.g., fences, signs) that will be used to ensure that access will be restricted, the types of activities that will be prohibited in certain areas (e.g., excavation), and anticipated duration of such controls will be placed in the "INEEL Comprehensive Facility and Land Use Plan" maintained by the DOE-ID Office of Program Execution. DOE shall also provide the Bureau of Land Management the

detailed description of controls identified above. This information will be submitted to the EPA

and
IDHW once it has been placed in the INEEL Comprehensive Facility and Land Use Plan.

Monitoring and radiation survey programs would be established to ensure that the contaminants remain within the boundaries of the OU 9-04 sites, and would provide early detection of potential contaminant migration. These programs would be implemented annually for the First 5 years following site closure. The need for further environmental monitoring would be evaluated and determined by the Agencies during subsequent 5-year reviews.

Short-term effectiveness of this alternative is considered high, as this alternative is already implemented at the most of the sites. Radiation control area fences and signs are maintained. No specialized equipment, personnel, or services are required to continue to implement the Limited Action alternative. Implementation of this alternative would have no physical effect or habitat alteration on the environment beyond what has already occurred. The estimated costs for this alternative are shown in Table 9-3 of this ROD.

7.2.3 Alternative 3a and 3b: Containment Alternatives and Institutional Controls

The two centralized containment alternatives consist of the consolidation and isolation of contaminated soil from potential receptors for the period of time that unacceptable cumulative exposure risks will be present. This consolidation would place the contaminated soils from the OU 9-04 sites into an engineered landfill at WAG 9. The landfill would have a thick soil and for rock cover placed over it. The containment alternatives would include: long-term environmental monitoring, cover integrity monitoring and maintenance, access restrictions, and surface water diversion. Institutional controls are assumed to remain in effect for at least 100 years. These two centralized containment alternatives were considered for all eight areas at ANL-W.

Alternative 3a consists of consolidation of contaminated soils and capping with engineered cover originally developed by the Uranium Mill Tailings Remedial Action (TRA) program for stabilization of abandoned uranium mill tailings. This design, based on the recent biointrusion research studies at the INEEL, was recently constructed at the INEEL Stationary Low-Power Reactor-1 burial ground site. Advantages of this engineered cover are:

- Requires minimal maintenance

- Inhibits inadvertent human intrusion

- Minimizes plant and animal intrusion

- Inhibits contaminant migration

The cover design consists of four layers of natural geological materials including native soil, gravel, basalt cobbles, and rip-rap. Implementing Alternative 13a), for sites at ANL-W would entail consolidation of soils from both the radiological and ecological sites into one centralized location at WAG 9 prior to capping. The volume of soils in most of the ANL-W sites is relatively small and the costs associated with building multiple engineered covers at each release site is not justifiable. The most logical centralized location for the engineered cover would be near the Interceptor Canal and the Industrial Waste Pond which have the largest volume of contaminated soil. The engineered cover (3a) would prevent both human and ecological receptors from contacting the soils. Additionally the engineered cover (3a) would be sloped accordingly to prevent ponding of surface waters which should

have the potential to migrate through the soils and "leach out" the radiological and inorganic contaminants. Site-specific considerations (such as annual precipitation, frost depth, and anticipated soil erosion rates) would be used to design the optimum configuration for this alternative during the remedial design phase.

Alternative 3b consists of consolidation of contaminated soils in an engineered landfill with a native soil cover. The native soil cover would consist of 10 ft of clean INEEL soil, with a surface covering of vegetation, rock armor or other material. Implementing this alternative at OU 9-04 would require a centralized location near the release sites in which to build the containment, moving the contaminated soil to the centralized location, and then adding clean soil layers above grade to bring the total thickness to 10 ft. The native soil cover is applicable to both the radiologically and inorganically, contaminated sites. The long-term effectiveness of this type of cap to prevent exposure of inorganics past the 100-year institutional control period is not known. The native soils cap would be effective for the radiological contamination since the cesium-137 risk would be at the upper limit of the NCP risk range within 130 years.

Each capping technology is designed to prevent direct radiation exposures to resist erosion due

to wind and surface water runoff, and to resist biointrusion that may penetrate into the contamination zone, or facilitate erosion. The primary differences between the two capping technologies are the length of time these functions can be maintained and the effectiveness of the biointrusion and erosion control components of the designs. The design life of the capping technologies specified for the containunent alternatives will depend on the construction materials specified, number and thickness of layers required, and sequence of those layers. The long-term effectiveness and permanence required by the Interceptor Canal-Mound (ANL-09) and the Industrial Waste Pond (ANL-01) is driven by the radioactive decay of the cesium-137 contaminant in their soils and sediments. The cesium-137 contaminant will decay to acceptable risk levels in 130 years. The multilayered engineered barrier design (alternative 3a) is likely to provide a higher level of protection against biointrusion. A 10-foot thick soil cover would eliminate intrusion into contaminated soil by most of the burrowing INEEL species, but not all plants and invertebrates. Root intrusion into contaminated soils could result in mobilization of radionuclides through the plant exposing envirorunental receptors. Costs associated with the cover alternatives at each site are detailed in Sections 8 and 9 of this ROD.

7.2.4 Alternatives 4a and 4b: Excavation and Disposal

These alternatives involve complete removal of contaminated materials that pose an unacceptable risk to human health and/or ecological receptors. Two alternatives were evaluated during the WAG 9 RI/FS. Alternative 4a consists of excavation and disposal at two on-INEEL location whereas in Alternative 4b the soils would be disposed at an off-INEEL private facility. Both Alternatives 4a and 4b would include collection of verification samples after removal to ensure that the final remediation goals were met.

Implementation of Alternative 4a would require excavating all soils and debris from the radiological and inorganic contaminated sites that are above the RGs, and transporting the soil to either the proposed INEEL Soil Repository, or the Radioactive Waste Management Complex (RWM). An INEEL Soils Repository, is included as part of the WAG 3 Proposed Plan that will be presented for public comment in the fall of 1998. The other option for on-INEEL disposal is to use the currently operating RWMC facility. Each of these on-INEEL facilities are expected to have or will have specific acceptance criteria that the WAG 9 soils currently meet. The final selection between the on-INIEEL

disposal areas would be completed during the WAG 9 RD/RA workplan development that is scheduled to start in the summer of 1998. The excavation and transport of the radiologically contaminated soils would require additional monitoring to verify that workers do not receive excessive radiation exposure. Verification sampling would be used to ensure that all contamination exceeding RGs was removed.

Implementation of Alternative 4b would require excavation of all soils and debris from the radiological and inorganically contaminated soil sites that are above the RGs, and transporting the soil to a rail transfer station at the INEEL Central Facilities Area (CFA) for shipment to a private off-INEEL disposal facility. The operating permit for the private off-INEEL disposal facility will specify the radionuclide activity levels that can be accepted. The WAG 9 soils have concentrations that are currently acceptable by most off-INEEL facilities that are permitted to accept radiologically contaminated material. The excavation and transport of the radiologically contaminated soils would require additional monitoring to ensure that no excess exposures are encountered. Verification sampling would be performed to ensure all contamination above the RGs has been removed.

These alternatives will provide long-term effectiveness because the contamination would be removed from the site. Long-term monitoring would no longer be required, assuming removal of contaminated soils achieve acceptable levels. DOE will continue with short-term monitoring of the soil, air, vegetation, and groundwater for 20 years in accordnace with DOE Orders and the ANL-W Environmental Monitoring Plan until 2018. These samples will be collected only to ensure continued compliance of current discharges and/or migration from past releases. After implementation of either Alternative 4a or 4b, the contaminated soil concentrations will be below the remediation goals. The remediation will ensure that the RGs would meet the established remedial action objectives. Costs of the excavation and disposal for both on-INEEL Alternatives 4a (proposed INEEL Soils Repository or using the currently existing RWMC facility) as well as costs of Alternative 4b (private off-INEEL facility) are shown in Sections 8 and 9 of this ROD.

7.2.5 Alternative 5: Phytoremediation

Alternative 5, would be implemented for both the radiological and inorganic contaminated sites at ANL-W. This alternative would consist of in situ remediation of the contaminated sites using cultivated and harvested plants to extract contaminants from soil. This alternative would avoid high excavation, transport, and disposal costs. One site, the ANL-09-Mound, has radiological contamination

to a maximum depth of four feet and may require grading of the contaminated soils to facilitate the use of farming equipment.

The phytoremediation alternative appears to have applicability for remediation of contaminants for soils at ANL-W based on the performance of phytoremediation at other DOE sites. To determine if phytoremediation has the potential to meet the RAOs for ANL-W soils, bench-scale greenhouse test are currently being performed. The results of the bench-scale greenhouse tests will determine which plants have the greatest potential to remove the ANL-W radionuclides and inorganics. The bench-scale testing is currently being conducted, with presentation of results scheduled for late summer of 1998. A phytoremediation Work Plan has been written to describe the major activities associated with the bench scale testing of phytoremediation on ANL-W soils.

If, after the bench-scale, greenhouse tests is completed, the results are not favorable (based on problems with contaminant extraction rates, costs, or increased contaminant leaching due to irrigation), phytoremediation will be eliminated as a possible alternative. If the bench-scale testing shows favorable

results, ANL-W will conduct a full-scale two-year demonstration field test in 1999 and 2000 on the ANL-W sites of concern. Engineering controls would be utilized to control possible spread of contamination. Propagation of nonnative plants will be controlled by harvesting prior to the plants going to seed. The plant matter will be dried, baled, and stored in a controlled area prior to shipment to an incinerator for volume reduction in accordance with off-site requirements. Air pollution controls used to control air emissions would be required and the resulting ash would be properly disposed of in an approved disposal facility. Depending on the plants that are selected, two or more "crops" are possible each field season. After completion of the two-year demonstration field test (1999 and 2000), ANL-W will collect data to determine if the process is working as predicted in the actual field situation. This data will be used to determine the remaining number of field seasons that would be required to meet the RGs as well as provide a means of projecting future costs. This field data would be required to determine the feasibility of the technology for the treatment of the radiological and inorganic contaminants at WAG 9,
In the fall of 2000, after analysis of the soil samples, the agencies will review the data and make the

determination on continued use of phytoremediation at WAG 9. If phytoremediation is working and the process is continued, verification sampling would be used after the final field season to ensure that the RGs have been met.

This alternative provides long-term effectiveness and permanence because the soils would actually be treated insitu to remove the contaminant. Long-term monitoring would no longer be required, assuming removal of contaminated soils achieve acceptable levels. DOE will continue with short-term soil, air, vegetation, and groundwater sampling for 20 years in accordance with DOE orders and the ANL-W Environmental Monitoring Plan until the year 2018. These samples will be collected only to ensure continued compliance of current discharges and/or migration from past releases. CERCLA five-year reviews would be required for the next 100 years to ensure that the RGs would meet the established RAOs DOE anticipates that the five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure DOE controls are still in place. Costs of insitu phytoremediation are shown in Sections 8 and 9, and are relatively low as compared to other alternatives that do not treat the contaminated soils.

7.3 Summary of Comparative Analysis of Alternatives

The five alternatives discussed in Section 7.2 were evaluated using the nine evaluation criteria as specified by CERCLA. These criteria are:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection of human health and the environment, and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs- addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

3. Long-term effectiveness and permanence-refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume through treatment addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the COCs including how trearment is used to address the principal risks posed

by the site.

5. Short-term effectiveness- addresses any adverse impacts on human health and the environment that may be posed during the construction and implementation period, and the period of time needed to achieve cleanup goals.

6. Implementabilty- addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost- includes estimated capital and operation costs, expressed as net present-worth costs.

8. State acceptance- reflects aspects of the preferred alternative and other alternatives that the state favors or objects to, and any specific comments regarding state ARARs or the proposed use of waivers.

9. Community acceptance- summarizes the public's general response to the alternatives described in the Proposed Plan and in the RI/FS. The evaluation of this criterion is based on public comments received.

Table 7-3 presents the results of the comparative analysis of the five alternatives using a ranking based on an alternative's ability to meet the nine evaluation criteria. Table 7-4 provides a ranking of alternatives for each on the basis of the comparative analysis. The following sections describe how each alternative either does or does not meet the criteria.

Each of the five alternatives subjected to the detailed analysis was evaluated against the nine evaluation criteria identified under CERCLA. The criteria are subdivided into three categories: (1) threshold criteria that mandate overall protection of human health and the enviromment and compliance with ARARs; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction in toxicity, mobility, or volume through treatment, and cost: and (3) modifying criteria that measure the acceptability of alternatives to state agencies and the community.
The following sections summarize the evaluation of the five alternatives against the nine evaluation criteria.

7.3.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the two threshold criteria: overall protection of human health and the environment and compliance with ARARs. The selected remedial action must meet the threshold criteria. Although the No Action alternative does not meet the

threshold criteria, this alternative was used in the detailed analysis as a baseline against which the other alternatives were compared, as directed by EPA guidance. Alternatives 2 and 3b, limited action and containment with native soil cover, respectively, do not meet the threshold criteria for protection of the environment due to the potential for plant root intrusion and were screened from further evaluation in the FS.

Table 7-3. Comparative Analysis of Remedial Alternatives Using the Evaluation Criteria.

Criteria	Alternative 1 No Action	Alternative 3a Engineered cover Phytoremediation	Alternative 4a: Conventional excavation and off-site disposal at INEEL	Alternative 4b: Conventional excavation and off-site disposal at private Soil Repository or RWMC facility	Alternative 5:
Overall protection of human health and the environment					
Human health protection	No reduction in risk.	Engineered cap would prevent direct exposure to contaminated soil and debris for over 130 years. Minimal exposure risks during cap construction.	Eliminates potential exposure from contaminated soil at site. Protectiveness is completely based on removing contamination from site. Short-term risk is moderate due to direct exposure during excavation.	Eliminates potential exposure from contaminated soil at site. Protectiveness is completely based on removing contamination from site. Short-term risk is moderate due to direct exposure during excavation.	Treatment reduces the potential exposure from contaminated soil at site to acceptable levels Long term protectiveness is base on reduction of the concentrations. Short-term risk is low.
Environmental protection from site.	Allows possibe migration of contaminated surface soil by wind and surface water erosion	Provides effective protection for over 130 years. Minimal environmental impacts during construction.	Eliminates contamination from site.	Eliminates contamination from site.	The treatment reduces the contaminant concentrations below the RGs.
Compliance with ARARs					

Action- specific

Idaho Fugitive Dust Would not meet Will meet ARAR by Will meet ARAR by
Will meet ARAR by Will meet ARAR by
Emissions-IDAPA ARAR because no eliminating potential for eliminating
potential for eliminating potential for eliminating potential for
16.0101.650 et seq. controls would be windblown soil contamination windblown soil
windblown soil windblown soil contamination
implemented
treatment.

Idaho Hazardous NA NA Soil samples would
be Soil samples would be Plant samples would be
Waste Management collected and
analyzed so collected and analyzed so collected and analyzed so
Act-IDAPA wastes can be
regulated as wastes can be regulated as wastes can be regulated as
16.01 05.005 et seq. necessary
necessary necessary

Idaho Hazardous NA NA NA
NA Plant samples will be tested
Waste Mangement
by using approved methods to
Act-IDAPA
determine if the plant matter
1601.05.006 et seq.
is hazardous waste

Table 7-3. (continued).

Alternative 4a: Alternative 4b:

Alternative 1 Alternative 3a
Conventional excavation and Conventional excavation and
Alternative 5
off
-site disposal at INEEL off-site disposal at private
Criteria No action Engineered cover
Soil Repository or RWMC facility
Phytoremediation

General Requirements NA NA
Placards would be applied to Placards would be applied to Trucks used to
transport the
for shippers 49 CFR the
trucks during transport the trucks and rail cars plant material will
have the
173 on-
INEEL facility during transit to the off- have the

appropriate placards

INEEL facility.

National Contingency NA NA NA
NA If determined to be a
Plan-Procedures for
hazardous waste, the ash from
planning and
incinerated plant matter will
implementing off-site
be shipped off-site to a RCRA
response actions
Subtitle C landfill which is
(40CFR 300.440)
operated in compliance with

RCRA.

Chemical-specific

NESHAPS-40 CFR NA Would meet ARAR by
Would meet ARAR by Would meet ARAR by Would meet ARAR
by
61 92 controlling the source term for
eliminating the source term eliminating the source term treating the
soils so the
all exposure pathways for
all exposure pathways for all exposure pathways contaminants are
below the

RGs for all exposure

pathways

Rules for the Control Would not meet Would meet ARAR through
Would meet ARAR by Would meet ARAR by Would meet ARAR
by
of Air Pollution in ARAR if toxic use of engineerong controls
removing cntamination removing contamination treatment to
reduce the
Idaho-IDAPA metals or organics from
site. from site. contamination to
levels below
16.01.01.585 and .586 were present in
the RGS.
fugitive dust,
because no controls
would be
implemented.

Location-Specific

National Historic NA These sites are in areas that are

These sites are in areas that These sites are in areas that These sites are in areas that
Preservation Act-16 50 years old in previously are 50 years old in are 50 years old in are 50 years old in previously
USC 470 disturbed areas. If cultural
previously disturbed areas. previously disturbed areas. disturbed areas. If cultual
artifacts are encountered, DOE If cultual artifacts are If cultural artifacts are artifacts are encountered,
will stop work and conduct a
encountered, DOE will stop encountered, DOE will stop DOE will stop work and
detailed survey of the area. work and conduct a detailed work and conduct a detailed conduct a detailed survey of
surv
ey of the area. survey of the area. the area

Table 7-3. (continued).

Alternative 4a: Alternative 4b:

Alternative 1 Alternative 3a
Conventional excavation and Conventional excavation and Alternative 5

off-site disposal at INEEL off-site disposal at private
Criteria No action Engineered cover
Soil Repository or RWMC facility Phytoremediation

To Be Considered

Environmental Would not meet Would meet TBC through use
Would meet TBC through Would meet TBC through Would meet TBC through use
Protection, Safety, and TBC because no of engineering and institutional
use of engineering controls use of engineering controls of engineering controls and
Health Protection controls would be controls and best management
and best management and best management best management practices.
Standards-DOE Order implemented. practices.
practices. practices.
440.1

Radioactive Waste Would not meet Would meet TBC through use
Would meet TBC through Would meet TBC through Would meet TBC

through use
Management-DOE TBC because no of engineering and institutional
use of engineering controls use of engineering controls of engineering
controls and
Order 5820.2A and controls would be controls and best management
and best management and best management best management
practice.
new order 435.1 in FY implemented. practices.
practices. practices. Final disposal
of plant matter
2000
after incineration.

Radiation Protection of Would not meet Would meet TBC through use
Would meet TBC through Would meet TBC through Would meet TBC
through use
the Public and TBC because no of engineering and institutional
use of engineering controls use of engineering controls of engineering
controls and
Environment-DOE controls would be controls and best management
and best management and best management best management
practices.
Order 231.1 implemented. practices.
practices. practices. Final
incineration of biomass

would be conducted in an

approved facility.

Long-term effectiveness and permanence

Magnitude of residual No change from Source-to-receptor pathways
No reduction in contaminant No reduction in contaminant In-situ
treatment of the soils
risk existing risk eliminated while cap remains
concentrations. All concentrations. All would result in
contaminant
in place. Inherent hazards of
contaminated soils would be contaminated soils would be levels that are
below the RGs.
inorganics would remain. Cs-
removed from site and removed from site and
137 within IE-04 acceptable
transported for disposal at transported for disposal at
range after 130 years.
another facility. another facility.

Adequacy and No control and, Limited access to contaminated
Disposal facility is assumed Disposal facility is assumed
Phytoremediation treatment
reliability of controls therefore, no soil and environmental
to provide adequate and to provide adequate and has been
successfully used in

reliability monitoring effective only
reliable control over reliable control over mining
applications
during institutional period of
disposed soil and debris. disposed soil and debris Contingency
alternative could
control (at least 100 years).
be selected if
Barrier control over
phytoremediation is not
contaminated soil for at least
working at ANL-W.
130 years.

Table 7-3. (continued).

Alternative 4a: Alternative 4b:

Alternative 1 Alternative 3a
Conventional excavation and Conventional excavation and

off-site disposal at INEEL off-site disposal at private
Alternative 5:
Criteria No action Engineered cover
Soil Repository or RWMC facility
Phytoremediation

Reduction of toxicity, mobility, and volume through treatment

Treatment process NA NA
NA NA
Phytoremediation.
used

Amount destroyed or NA NA
NA NA All
radioactively and
treated
inorganically contaminated

soils above the RGs.

Reduction of toxicity, None None
None None No
reduction in toxicity, the
mobility, of volume
most mobile contaminants

will be removed, and no

increase in volume of

contaminated soil. The

volume of biomass would be

incinerated to reduce volume

to be disposed.

Irreversible treatment NA NA
NA NA Yes

Type and quantity of NA NA
NA NA The
soils remaining after
residuals remaining
treatment will contain
after treatment
contaminants below the RGs.

The soil can be reused for any

application such as farming,

or community development.

Statutory preference NA NA
NA NA
Treatment method is
for treatment
relatively new and more plant

species are being tested for

their affinity to bioaccumulate

contaminants.

Short-term effectiveness

Community protection No increase in No increase in potential risks to
Slight increase in potential Slight increase in potential No
increase in potential risks
potential risks to the the public.
risks to the public during risks to the public during to
the public.
public.
off-site transportation. off-site transportation.

Table 7-3. (continued).

Alternative 4a: Alternative 4b:

Alternative 1 Alternative 3a
Conventional excavation and Conventional excavation and
Alternative 5:

off-site disposal at INEEL off-site disposal at private
Criteria No action Engineered cover
Soil Repository or RWMC facility
Phytoremediation

Worker protection No increase or Worker risk during barrier
Worker risk is minimal after Worker risk is minimal after Worker risk
from exposure to
decrease in installation is minor due to
the soil is removed and the soil is removed and contaminatcd
soil during
potential risks to the shielding afforded by
existing meets the established RAOs. meets the established RAOs.
farming activities will require
worker. clean soil and engineering
administrative and
controls.
engineering controls.

Environmental impacts No change from Limited to disturbances from
Limited to disturbances Limited to disturbances Limited
increase in animal
existing conditions. vehicle and material
transport from vehicle and material from vehicle and material
usage of the sites outside the
activities associated with
transport activities transport activities ANL-W facility
during the
barrier construction. Limited
associated with excavation. associated with excavation.
phytoremediation. Very small
potential for airborne
Limited potential for Limited potential for Limited
potential for airborne
contamination in the form of
airborne contamination in airborne contamination in contamination
in the form of
fugitive dust, due to use of
the form of fugitive dust, the form of fugitive dust, fugitive dust,
due to use of
engineering controls.
due to use of engineering due to use of engineering engineering
controls and
controls.

controls. irrigation.

Time Until action is NA Approximately 12 to
Approximately 18 to Approximately 18 to Estimated to be
5 years based
complete 15 months.
24 months. 24 months. on the use of
multiple

plantings per field season.

Implementability

Ability to construct No construction or Involves available
construction Somewhat difficult, due to Somewhat difficult, due to
Small farming equipment is
and operate operation. technology.
redundant and/or conflicting redundant and/or conflicting readily
available. Site

safety requirements for safety requirements rom application to
select plant

ANL-W and LMITCO. both ANL-W and LMITCO. species, soil
amenities,

Potential scheduling if irrigation schedules, and

problems because of rail disposal of biomass will be

shipment to off-site private determined per field season.

facility.

Table 7-3. (continued).

Alternative 4a: Alternative 4b:

Alternative 1 Alternative 3a
Conventional excavation and Conventional excavation and Alternative
5

off-site disposal at INEEL off-site disposal at private
Criteria No action Engineered cover
Soil Repository or RWMC facility
Phytoremediation

Ease of implementing May require repeat Additional remedial actions
Shipment of the soil to an In addition to co-ordination Use of this

treatment additional action if on-site disposal facility not inhibit necessary would require interaction between ANL-W and later LMITCO that could cause delays in the schedule.	of feasibility study/ between ANL-W and record of decision LMITCO, the off-site process. disposal facility would also have to be involved in the discussions and scheduling.	would be difficult, as the barrier is intended to prevent access to contamination. Barrier would require removal.	technology would the use of a different alternative
Ability to monitor The effectiveness in removing all contaminated materials associated with site is easily monitored.	Monitoring of The effectiveness in conditions is readily removing all contaminated implemented. materials associated with site is easily monitored.	Barrier performance can be monitored through radiation surveys, and can be visually assessed on the basis of physical integrity.	The effectiveness in removing contaminants to levels below the RGs can be determined through sampling. Once the soil is treated future monitoring would not be required.
Ability to obtain approvals and coordinate with regulatory agencies compliance.	No approvals required. Potentially difficult, due to additional requirements for environmental assessments, safety analyses, and ARARs compliance.	No difficulties identified.	Potentially difficult, due to additional requirements for environmental assessments, safety analyses, and ARARs compliance. No difficulties identified.
Availability of services and capacity subcontractor.	None required Services available either onsite or offsite through subcontractor.	Barrier design and services reside within the DOE and are considered readily available to	Services available either onsite or offsite through subcontractor.

		the INEEL.	
Availability of	None required	Equipment and materials are	
Equipment and materials are	Equipment and materials are		Equipment and materials are
equipment, specialists,		readily available at the INEEL	
either available onsite,	either available onsite,		either available onsite or
and materials		or within surrounding	
through subcontractors or	through subcontractors or		through subcontractors
		communities.	
will be purchased. Trained	will be purchased. Trained		
specialists are available	specialists are available.		
within the communities	within the communities		
surrounding the INEEL.	surrounding the INEEL.		
Availability of	None required	Readily available at the INEEL.	
Readily available at the	Readily available at the		Readily available at INL-East
technology		INEEL.	
INEEL.	with experienced personnel.		
Cost (present worth)			
	See Table 9-2	See Table 9-2	
See Table 9-2	See Table 9-2		See Table 9-2

NA - Not Applicable

<IMG SRC 98061P>

7.3.1.1 Overall Protection of Human Health and the Environment

The primary measure of this criterion is the ability of an alternative to achieve RAOs for the sites. Since this is a threshold criterion, each alternative must be able to meet the RAOs in order for the alternative to be retained. Alternatives 4a, 4b, and 5 meets the criteria and would provide the best long-term protection of human health and the environment because the soils would be removed from WAG 9 (Alternatives 4a and 4b) or the concentrations would be reduced to acceptable levels (Alternative 5). Alternatives 4a and 4b (conventional excavation and landfill disposal) would accomplish this

by
removing the contaminated soil from the ANL-W site. Alternative 3a (engineered landfill at WAG 9)
meets the criteria because it would not prevent unacceptable exposure to cesium-137 after the 100-year
DOE control period. Alternative 1 (no action) would not prevent exposures resulting in risks greater than
1E-04, and is therefore eliminated from further consideration.

7.3.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Compliance with ARARs is also a threshold criterion. Each alternative must be able comply with all ARARs in order for the alternative to be retained. For this criterion Alternative 5 is ranked the highest because the planting, harvesting and irrigating of the contaminated soils would result in no emissions of fugitive dust. Alternatives 3a, 4a, and 4b are ranked equally, since all are considered equally capable of achieving compliance through use of engineering controls to meet the State of Idaho regulations for controlling emissions of fugitive dust and toxic substances. Alternatives 3a, 4a, and 4b are also ranked equally in compliance with other ARARs.

are also ranked equally in compliance with other ARARs.

7.3.2 Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the remedial alternatives and weigh major tradeoffs among alternatives. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The balancing criteria are: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

7.3.2.1 Long-term Effectiveness and Permanence

Alternative 5 would provide the highest degree of long-term effectiveness and permanence, because the contamination would have been reduced to acceptable levels for this criterion. Alternative 4a and 4b provide the next highest degree of long-term effectiveness and permanence, because contaminated soil exceeding cleanup goals would no longer exist at the sites. Alternative 3a would be

effective as long as the cap prevents human and biotic intrusion and controls erosion and leaching of contaminants.

7.3.2.2 Reduction In Toxicity, Mobility, or Volume Through Treatment

Alternative 5 is the only treatment alternative that provides reduction in toxicity mobility or volume through treatment. In addition to removing the contaminants from the soil, Alternative 5 also reduces the volume of contaminants to be disposed. For phytoremediation, a large reduction in volume is anticipated by incineration of the plant matter, incineration, and solidification of the ash as compared to excavation and disposal of the contaminated soil. The other alternatives were ranked the lowest since they do not reduce the toxicity, mobility, or volume of the contaminated soils through treatment. However, Alternative 3a, 4a, and 4b do reduce the toxicity and mobility of the contaminants through containment.

7.3.2.3 Short-term Effectiveness

These WAG 9 sites are not located near inhabited areas and no public roads are in the vicinity. Thus, no significant impacts to surrounding communities would be anticipated from exposure to contaminants during remediation in the WAG-9 sites. However, there is a potential short-term impact to workers who will be conducting the remedial action. Alternatives 4a, 4b, and 5 are equally ranked and are higher than Alternative 3a, because the wastes would remain on site or would only have to be moved once. Alternative 3a is ranked the lowest because the soils would have to be handled twice, once for the removal from the ditches and once when the soils are consolidated into the cap.

7.3.2.4 Implementability

Each of the alternatives retained for detailed analysis is technically implementable. The relative making of the alternatives with respect to implementabitiry is shown in Table 7-4. Alternatives 3a, 4a,

and 4b are equally ranked because they will require the procurement of a contractor to perform the

excavation, construction, transport of equipment, permits, and coordination with other on-site and off-site contractors. These permits would consist of safe work permits, digging permits, radiation safe work permits, and transportation placards. Alternative 5 is ranked the lowest because of the unknowns associated with it meeting the RAOs within a cost effective time frame. The potential success of Alternative 5 will be determined through bench-scale and field testing. If Alternative 5 is utilized, ANL-W personnel can plant and harvest the phytoremediation plants and farming equipment is available locally.

7.3.2.5 Cost

Separate line item costs are developed for the primary components of each remedial action alternative, such as monitoring; capping; excavation; disposal; and reporting requirements such as remedial design/remedial action scope of work, remedial design/remedial action work plans, safety documentation, and progress reports. The estimated present worth cost of each alternative is shown in Table 9-3 and the relative ranking for this criterion is shown in Table 7-4.

7.3.3 Modifying Criteria

The modifying criteria, state and community acceptance, are used in the final evaluation of remedial alternatives. For both of these criteria, the factors include the elements of the alternatives that have strong opposition.

7.3.3.1 State Acceptance

The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs with the selected remedial alternative of phytoremediation for the eight areas that have been identified for remedial action, as well as the 33 No Action sites in this ROD. The IDHW is signatory to the ROD with DOE and EPA.

7.3.3.2 Community Acceptance

Community participation in the remedy selection process includes participation in the public meetings held in January 1998 and review of the Proposed Plan during the public comment period

of
January 12 through March 12, 1998. Community acceptance is summarized in the Responsiveness Summary presented as Appendix A of this document. The Responsiveness Summary includes comments received either verbally or in writing from the public, and the agencies' responses to these comments.

As shown in the Responsiveness Summary, most of the public agreed with the selection of Alternative 5, phytoremediation to clean up the eight areas at ANL-W. The commentors also expressed
concern over the possible selection of non-native plants, possible increased exposure to ecological
receptors that may browse on the plants, and incineration and ash disposal issues. The agencies have

addressed these comments and, where applicable, have incorporated these comments in this ROD. Other comments will be addressed during implementation and interpretation of the phytoremediation
bench-scale greenhouse testing. The agencies appreciate the public's participation in this process and
acknowledge the value of the public comment.

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8 SELECTED REMEDY

The results of investigations and risk assessments at WAG 9, OU9-04, at INEEL indicate that
eight areas pose unacceptabie risks to human health and/or the environment. Two areas have human
heath carcinogenic risks greater than 1 In 10,000 (1 E-04), five areas have unacceptable HQs greater than
10 times the HQ for INEEL background, and one area has both human and ecological risks. The
investigation also showed that 33 FFA/CO sites do not exceed a IE-04 carcinogenic risk or have HQ less
than the 10 times the HQ for INEEL background, and therefore require no action. It is important to note
that there are no unacceptable cumulative effects from the WAG 9 sites, and the remedial actions being
recommended address individual risks as well as prevent cumulative risks to a future residential receptor
at WAG 9. Based on consideration of the requirements of CERCLA, the detailed analysis of
alternatives, and public comments, DOE, EPA, and IDHW have a selected and a contingent alternative
for remediation of the sites contained in this ROD. The justification for the selection of

the remedial alternatives is discussed in the following sections.

8.1 Ranking of Alternatives

Table 7-4 provides a summary of how the alternatives rank relative to one another. This comparative analysis provides a measure of the relative performance of alternatives against each evaluation criterion. The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative.

Although the contaminated soil types (radiologically- and inorganically-contaminated soil) were evaluated separately against the evaluation criteria, both soil types produced similar rankings of the remedial alternatives. The overall ranking order of the alternatives is 5, 4a, 3a, and 4b. Thus, the information presented in the following paragraph presents the results of the ranking of soil types along with the justification for the selected alternative.

Each of the retained alternatives with the exception of the no action alternative (Alternative 1), would meet the remedial action objectives associated with the protection of human health and the environment. Alternative 1, No Action, does not meet the threshold criteria of overall protection of human health and the environment but it serves as a baseline to determine the benefits of the other alternatives. Alternative 2, Limited Action and Alternative 3b, Native Soil Cap were screened prior to the detailed analysis of the alternatives because they do not meet the threshold criteria of overall protection of human health and the environment. However, certain limited action items such as access restrictions, land use restrictions, and monitoring are employed in Alternatives 3a, 4a, and 5. Alternatives 3a, 4a, and 4b meet all the remedial action objectives and provide overall protection of human health and the environment. But, these alternatives do not use treatment to reduce the toxiciry, mobility, or volume of the contaminants. They do however eliminate the potential exposure of human and ecological receptors to the contaminants. Although Alternatives 3a, 4a, and 4b use similar containment technology to reduce the exposure of the contaminants to humans and the environment, Alternative 4a was ranked higher than Alternatives 3a and 4b because of the lower present value costs. Alternative 5 is the only alternative that reduces the toxicity, mobility, and volume of the contaminated

media through treatment. In addition, it is anticipated that the costs of using phytoremediation are less than the costs of Altematives 3a, 4a, and 4b. Alternative 5 can be used for both radiologically and inorganically contaminated soils and provides a barrier against windblown contamination. Alternative 5 best meet the first seven evaluation criteria and is therefore the preferred alternative. Alternative 5,

reduces the mass of contaminated material that must be disposed of to less then one percent of the mass of the contaminated soil. After the anticipated five field seasons for phytoremediation, the concentrations of contaminants in the soils should meet the established RAOs and the soils will remain under land use and access restrictions until they can be released for unlimited used. DOE anticipates that this wil be in approximately 100 years from now (2098).

8.2 Selected Remedy

The selected remedial remedy for the eight WAG 9 areas with unacceptable risks to human health and/or the environment is Alternative 5, phytoremediation. This alternative is the only altemative that offered a permanent solution for reduction of the toxicity, mobility, or volume of the contaminated material through treatment. This alternative is protective of human health and the environment, was ranked the best for three of the five modifying criteria including; long-term permanence, reduction of toxicity, mobility, or volume, and cost, and received generally favorable comments from the IDHW and public during the public involvement process. Monitoring of the soil, groundwater, and vegetation will continue for 20 years (2018) approximately 15 years after the RGs are met for each site in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan, (ANL-W, 1998). The soil, groundwater, and vegetation monitoring results collected semi-annually will determine trends of low level radionulcide and inorganic contaminant levels around the ANL-W facility. After the RGs are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable. DOE anticipates that these five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure that DOE administrative controls are still in place. Phytoremediation would not be initiated on the Sanitary Sewage Lagoons because they will remain in service until approximately the year 2033 when

the facility is scheduled for closure. Likewise, the Industrial Waste Pond phytoremediation will not be initiated until the cooling water discharges from the Sodium Processing Facility are completed. The final sodium cooling water discharges are currently planned for 2002. This delay in phytoremediation startup does not pose any unacceptable risks to human health and or the environment since these sites would be in a wetted condition. The major components of the selected remedy for ANL-W are:

- Completion of the phytoremediation workplan for the bench-scale testing

- Conducting a bench-scale phytoremediation test of selected plant species at the sites that pose unacceptable risks

- Determine effectiveness and implementabiliry of phytoremediation based on results of bench scale testing

- Collecting and analyzing of soil and plant samples from the two-year field season to determine the effectiveness of phytoremediation on the ANL-W soils insitu

- Harvesting, compacting, incinerating, and disposing of the above and below ground plant matter in a permitted landfill

- Continue planting/harvesting process until RAOs are attained if the two-year field-scale testing is successful

- Installing access restrictions consisting of fences, bird netting, and posting warning signs

- Review of the selected remedy no less than every Five years until the RAOs have been met

- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

Implementation of this alternative will increase the short-term human and ecological exposure to the contaminants. These short-term increases in exposure are estimated to last for five years and will ultimately reduce the long-term exposure of the contaminants to humans or the ecological receptors. Engineering controls will be used to reduce the short-term exposures to the human workers, while fencing, covering, and harvesting methods will be optimized to reduce the short-term

exposure to the ecological receptors. These engineering controls will be further detailed and described in the RD Work Plan for WAG 9.

In summary, phytoremediation has been selected as the remedial alternative for cleanup of the eight areas at WAG 9 that pose unacceptable risks. Phytoremediation is an innovative treatment technology that appears to be the most appropriate remedy for WAG 9. However, bench-scale greenhouse testing and insitu field testing is needed to verify the technology's applicability for use on WAG 9 soils. The bench-scale greenhouse tests are currently being conducted and the results will indicate if the uptake rates are too low, or if it would take too long to meet the RGs. The results of the bench-scale greenhouse testing will determine if the selected remedial remedy will be replaced with the more conventional contingent alternative.

8.3 Selected Contingent Remedy

Alternative 4a, excavation and disposal at an on-INEEL facility has been selected as the contingent remedial remedy for the eight areas that pose unacceptable risks to human health and the environment. This contingent remedial alternative has been selected because it offers a proven technology to meet the RGs. This contingent remedy would be implemented if the selected remedial remedy (phytoremediation) does not prove adequate for use on the WAG 9 soils. Alternative 4a involves the physical removal of the contaminated soil at the eight areas at WAG 9. The soils will be transported to either the proposed INEEL Soils Repository or the RWMC facility. The final determination of which of these two facilities would be used will be determined during the remedial design phase after the ROD has been signed. The excavation with on-INEEL disposal alternative offers the highest degree of implementability and the second lowest costs of the retained alternatives. It is estimated that the excavation and disposal will take two years to complete after being initiated. DOE will continue soil, air, and groundwater monitoring for 20 years from now (to 2018) for the ANL-W site in accordance with DOE Orders and the ANL-W Environmental Monitoring Plan, (ANL-W, 1998). The soil, groundwater

and vegetation monitoring results collected semi-annually will determine trends of low level

radionulcide and inorganic contaminant levels around the ANL-W facility. After the remediation goals are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable. DOE anticipates that these five-year reviews will consist of a memorandum summarizing a checklist-driven inspection of the signs, fences, and other physical features that assure that DOE administrative controls are still in place. The major components of the contingent remedy for ANL-W are:

- Contaminants in the waste areas will be excavated and transported to either the RWMC or the INEEL Soils Repository for on-INEEL disposal

- Verification sampling would be used to validate that the remaining soil concentrations are below the RAOs

- Review of the remedy no less than every five years until the RAOs have been met

- Implementation of DOE controls which limit residential land use for at least 100 years from now (2098).

The No action alternative is reaffirmed and selected as the appropriate alternative for the remaining 33 areas at the ANL-W facility. These 33 areas have risks that are at acceptable levels based on the information gathered during the remedial investigation.

The possibility exists that contaminated environmental media not identified by the INEEL FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dismantlement activities at ANL-W. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, that contaminant source will be evaluated and appropriate response action taken in accordance with the FFA/CO.

8.4 No Action Sites

The No Action alternative was reaffirmed as the appropriate alternative for 35 areas, 33 areas from WAG 9 and two sites from WAG 10. This alternative was chosen because there are no known or suspected contaminant releases, contaminants exceeding acceptable levels, or previous cleanups resulted in acceptible risks to human health and the environment. For this reason, long-term environmental monitoring is not warranted for these sites. It should be noted that these 36 No Action sites do not pose a

cumulative risk. These 35 areas are listed below.

Operable Unit-None

- ANL-10 Dry Well between T-1 and ZPPR Mound
- ANL-11 Waste Retention Tank 783 (never used)
- ANL-12 Suspect Waste Retention Tank bv 793 (removed 1979)
- ANL-14 Septic Tank and Drain Fields (2) by 753 (tank removed 1979)
- ANL-15 Dry Well by 768
- ANL-16 Dry Well by 759 (2)
- ANL-17 Dry Well by 720
- ANL-18 Septic Tank and Drain Field by 789 (removed 1979)
- ANL-20 Septic Tank and Leach Field by 793
- ANL-21 TREAT Suspect Waste tank and Leaching Field (non-radioactive)
- ANL-22 TREAT Septic Tank and Leaching Field
- ANL-23 TREAT Seepage Pit and Septic Tank W of 720 (filled 1980)
- ANL-24 Lab and office Acid Neutralization Tank

- ANL-25 Interior Building Coffin Neutralization Tank
- ANL-26 Critical Systems maintenance Degreasing Unit
- ANL-32 TREAT Control Building 721 Septic Tank and Leach Field (present)
- ANL-33 TREAT Control Building 721 Septic Tank and Seepage Pit (removed 1978)
- ANL-27 Plant Services Degreasing Unit

Operable Unit-9-01

- ANL-19 Sludge Pit W of T-7 (Imhoff Tank) (Filled in 1979)
- ANL-28 EBR-II Sump (regeneration)
- ANL-29 Industrial Waste Lift Station
- ANL-30 Sanitary Waste Lift Station
- ANL-36 TREAT Photo Processing Discharge Ditch
- ANL-60 Knawa Butte Debris Pile
- ANL-61 EBR-II Transformer Yard
- ANL-62 Sodium Boiler Building (766) Hotwell
- ANL-63 Septic Tank 789-A

Operable Unit-9-02

- ANL-08 EBR-II Leach Pit (radioactive)

Operable Unit-9-03

- ANL-05 ANL Open Burn Pits #1 #2 and #3
- ANL-31 Industrial/Sanitary Waste Lift Station (industrial side not used)
- ANL-34 Fuel Oil Spill by building 755

Operable Unit-9-04

- ANL-01 Only the Ditch C portion of ANL-01
- ANL-53 Cooling Tower Riser Pits

Operable Unit-10-06

- ANL-W Stockpile site
- ANL-W Windblown Area

8.5 Remediation Goals

The purpose of selecting a remedial response action in this ROD is to formally document the remedial alternative and contingent alternative that will be implemented at WAG 9. The successful completion of the remediation technology will reduce the contaminant risks to acceptable levels for the human and environmental receptors. For the eight areas that require an action, phytoremediation is the selected treatment technology. Excavation and disposal has been selected as the contingent remedial alternative. The RGs are the same for either remedial alternative selected. These RGs are shown in Table 7-1 for each of the eight areas at ANL-W. Confirmation soil samples will be collected after the phytoremediation field seasons, or after excavation and disposal in order to ensure that the cleanup meets or exceeds the RGs.

8.6 Estimated Cost Details for the Selected Remedy

A summary of the costs for each of the alternatives retained for detailed analysis are shown in Tables 8-1 through 8-6. Table 9-3 shows the estimated costs for all the alternatives that met the threshold criteria for protection of human health and the environment.

Table 8-1. Detailed Cost Estiamte Summary Sheet for Alternative 3, Containment.

Cost Elements		Estimated Costs ($)
WAG 9 Management Costs		
CERCLA RD/RSA Oversight	Subtotal	$ 1,526,974
Documentation Package		
Site surveying		$ 47,250
Final Design Bid Package		$ 7,000

Safety Analysis Report	$ 8,750
Verification Sampling Plan	$ 7,000
Verification Sampling Costs	$ 10,500
Safe Work Permit	$ 3,500
Radiation Work Permit	$ 3,500
Excavation Permit	$ 3,500
RCRA Subtitle D Landfill Application	$ 35,000
Subtotal	$126,000
Construction Costs	
Mobilization and Demobilization	$ 70,000
Construction of Base	$ 1,161,944
Density Testing of Base	$ 7,000
Soil Removal	$ 1,161,944
Backfill Site to Grade	$ 1,619,444
Re-vegetation	$ 192,350
Cap Construction	$ 958,000
WAG 9 Construction Oversight	$ 70,000
Fencing	$ 150,600
Surface Water Diversion	$ 30,120
Subtotal	$4,963,913
Operations and Maintenance Costs	
Post-closure Management	$ 812,500
Monitoring	$ 1,196,000
WAG 9, Five-year Reviews	$ 338,000
Subtotal	$2,346,500
Total in 1998 dollars	$ 8,963,387
Total in Net Present Value dollars*	$ 7,580,000

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-2. Detailed Cost Estimate Summary Sheet for Alternative 4a, Excavation and Disposal at the INEEL Soils Repository.

Cost Elements	Estimated Costs ($)
WAG 9, Management Costs	
CERCLA RD/RA Oversight	
Subtotal	$1,232,496
Documentation Package	
Site surveying	$ 31,500
Final Design Bid Package	$ 7,000
Safety Analysis Report	$ 8,750
Verification Sampling Plan	$ 7,000
Verification Sampling Costs	$ 10,500
Safe Work Permit	$ 3,500
Radiation Work Permit	$ 3,500
Excavation Permit	$ 3,500
Waste Acceptance Report to LMITCO	$ 52,500
Subtotal	$127,750
Construction Costs	
Mobilization and Demobilization	$ 70,000
Soil Removal	$ 1,161,944
Soil Transport to INEEL Repository	$ 1,161,944
Tipping Fee/cy	$ 232,388
Backfill Site to Grade	$ 1,619,444

Re-vegetation	$ 192,350
Subtotal	$4,438,070
Operations and Maintenance Costs	
Post-closure Management	$ 203,125
Monitoring	$ 239,200
WAG 9, Five-year Reviews	$ 338,000
Subtotal	$780,325
Total in 1998 dollars	$ 6,578,641
Total in Net Present Value dollars*	$ 5,876,000

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-3. Detailed Cost Estimate Summary Sheet for Alternative 4a, Excavation and Disposal at RWMC.

Cost Elements	Estimated Costs ($)
WAG 9 Management: Costs	
CERCLA RPD/RA Oversight	Subtotal $1,232,496
Documentation Package	
Site surveying	$ 31,500
Final Design Bid Package	$ 7,000
Safety Analysis Report	$ 8,750
Verification Sampling Plan	$ 7,000
Verification Sampling Costs	$ 10,500
Safe Work Permit	$ 3,500
Radiation Work Permit	$

3,500

Excavation Permit $ 3,500

Waste Acceptance Report to LMITCO, $ 52,500

Subtotal $127,750

Construction Costs

Mobilization and Demobilization $ 70,000

Soil Removal $ 1,161,944

Soil Transport to RWMC $ 1,549,259

Tipping Fee/cy $ 0

Backfill Site to Grade $ 1,619,444

Re-vegetation $ 192,350

Subtotal $4,592,997

Operations and Maintenance Costs

Post-closure Management $ 203,125

Monitoring $ 239,200

WAG 9, Five-year Reviews $ 338,000

Subtotal $780,325

Total in 1998 dollars $ 6,733,568

Total in iNet Present Vilue dollars* $ 6,110,000

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-4. Detailed Cost Estimate Summary Sheet for Alternative 4b, Excavation with Disposal at Private Faciltiy.

Cost Elements	Estimated Costs ($)

WAG 9 Management Costs

CERCLA RD/RA Oversight Subtotal $ 2,905,696

Documentation Package

Site surveying	$ 31,500
Final Design Bid Package	$ 7,000
Safety Analysis Report	$ 8,750
Verification Sampling Plan	$ 7,000
Verification Sampling Costs	$ 10,500
Safe Work Permit	$ 3,500
Radiation Work Permit	$ 3,500
Excavation Permit	$ 3,500
Waste Acceptance Report to LNUTCO and Private Faciltiy	$ 52,500
Subtotal	$127,750

Construction Costs

Mobilization and Demobilization	$ 70,000
Soil Removal	$ 1,161,944
Soil Transport to Railyard	$ 1,161,944
Tipping Fee/cy	$ 5,422,407
Backfill Site to Grade	$ 1,619,444
Re-vegetation	$ 192,350
Subtotal	$9,628,089

Operations and Maintenance Costs

Post-closure Management	$ 203,125
Monitoring	$ 239,200
WAG 9, Five-year Reviews	$ 338,000
Subtotal	$780,325

Total in 1998 dollars	$ 13,441,860
Total in Net Present Value dollars*	$ 13,126,000

* Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these future costs are then totaled and a 5% discount rate is applied to determine the net present value.

Table 8-5. Detailed Cost Estimate Summary Sheet for Alternative 5, Phytoremediation.

Cost Elements		Estimated Costs ($)
WAG 9 Management Costs		
CERCLA RD/RA Oversight	Subtotal	$528,259
Documentation Package		
Site surveying	$	8,400
Final Design Bid Package	$	7,000
Safety Analysis Report	$	8,750
Verification Sampling Plan	$	7,000
Verification Sampling Costs	$	21,000
Safe Work Permit	$	3,500
Radiation Work Permit	$	3,500
Excavation Permit	$	3,500
Waste Acceptance Report to LMITCO	$	35,000
	Subtotal	$97,650
Construction Costs		
Specialized Equipment Cost	$	300,000
Prepare Soil for Planting	$	28,852
Planting/growing season	$	28,852
Irrigating/growing season	$	57,705
Fertilizing/growing season	$	14,416
Harvesting/growing season	$	28,852
Bailing/growing season	$	28,852
Rad Surveys/growing season	$	12,022
Transport to INEEL WERF Incinerator/season	$	28,852
Additional Four Year Phyto Costs	$	913,662
Fencing	$	150,600
Surface Water Diversion	$	30,120
	Subtotal	$1,622,795
Operations and Maintenance Costs		
Post-closure Management	$	203,125
Monitoring	$	239,200
WAG 9, Five-year Reviews	$	338,000
	Subtotal	$780,325
Total in 1998 dollars	$	3,029,029
Total in Net Present Value dollars*	$	2,824,000

*Net present value costs are determined by taking the cost estimates for performing the work in 1998 and assumes
a constant 5% inflation rate to determine the projected future costs between 1999 and 2098. The total of these

future costs are then totaled and a 5% discount rate is applied to determine the net present value.

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9 STATUTORY DETERMINATIONS

The selected and contingent remedy for remediation of the eight WAG 9 areas meets the statutory requirements for CERCLA § 121, the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. Both remedies meet the threshold criteria established in the NCP(i.e., protection of human health and the environment and compliance with ARARs). CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies, to the maximum extent practical, and that the implemented action be cost effective. Finally, the statute includes a preference for remedies that employ treatment to permanently and significantly reduce the toxicity, mobility, or volume through treatment.

Phytoremediation works well for sites that have relatively shallow contamination over a large area at concentrations slightly above the cleanup levels. This is the case for the eight areas at WAG 9. Two of these areas that have low levels of radionuclide contamination, five areas have slightly elevated levels of inorganics, and one area has both low levels of radionuclides and inorganics. It is anticipated after the remedial action, none of the 39 total sites at WAG 9 will have contaminated soils and sediments left in place at levels associated with a risk greater than 1E-04 or a hazard quotient greater that 10 times the background hazard quotient. However, after the remediation goals are met, CERCLA 5 year reviews would be required to ensure that the assumption of DOE control of the INEEL lands is still applicable.

9.1 Protection of Human Health and the Environment

As previously described in Section 8, both the selected phytoremediation and the contingent excavation and disposal remedies can meet the RGs described in Table 7-1 that ensure protection of human health and the environment. The phytoremediation alternative will utilize treatment to

remove
contaminants from soils to levels at or below the RGs. While the contingent alternative excavation with
on-INEEL disposal, will ensure protection of human health and the environment by physically removing
the contaminated soil to levels below the RGs.

9.2 Compliance with ARARs and To Be Considered

Applicable requirements are those cleanup standards, standards of control, and other substantive
environmental protection requirements, criteria, or limitations promulgated under federal or state law
which specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or
other circumstance at a CERCLA site. Relevant and appropriate requirements are those same standards
mentioned for applicable requirements, except while not applicable at the CERCLA site, address
problems or situations sufficiently similar to those encountered at the site such that their use is well
suited to the particular site.

Three types of ARARs exist: location-specific, action-specific, and chemical-specific. In
general, location-specific ARARs place restrictions on the concentration of hazardous substances or the
conduct of activities solely because they occur in special locations. Action-specific ARARs are usually

technology or activity based requirements or limitations on actions or conditions involving specific
substances. Chemical-specific ARARs are health or risk-based numerical values or methodologies that
result in the establishment of numerical values. The values establish the acceptable concentrations of
chemicals or substances that may be found in or discharged to the environment.

Documents that are not legally binding are identified as To-Be-Considered (TBC) guidance or
procedures documents. Both the selected phytoremediation and the contingent excavation and on
INEEL disposal facility meet the TBC procedures or guidance documents that were identified by the
agencies. The following two sections identify the specific ARARs and TBCs that were considered for
the selected and contingent alternatives to be remediated at WAG 9.

9.2.1 Selected Remedy Compliance with ARARs

Implementation of phytoremediation remedy will be designed to comply with all chemical-,
action-, and location-specific Federal and State ARARs, and TBCs as shown in Table 9-1. Table 9-1
lists each the ARAR statutes, specific citation reference, reason why the ARAR is retained,

relevancy,
and how DOE will attain compliance with the ARAR. In addition to including the ARARs in Table 9-1,
the TBCs are also included. For the ANL-W facility, the TBCs consist of DOE Orders which act as
guidance documents for work practices at DOE facilities. These DOE Orders are TBCs and are used in
the absence of applicable state or federal regulations. As shown in Table 9-1, all of the ARARs and
TBCs for the selected phytoremediation remedy can be met.

Other Federal and State laws are not included as ARARs for WAG 9 but may be invoked during
future phases of the phytoremediation remedy. The future phases involve the disposal of ash at the
Waste Experimental Reduction Facility (WERF) from the incineration of the contaminanted plant matter
generated during phytoremediation. The resultant ash will be tested and depending on the results, either
be disposed of at an approved Hazardous waste Treatment, Storage, and Disposal facility or a subtitle D
landfill. The sampling and disposal of the incinerated ash will be conducted under the standard operating
procedures outlined in the latest revision of the Reusable Property, Recyclable Materials, and Waste
Acceptance Criteria (RRWAC) document. The two action-specific laws, IDAPA 16.01.05.008 (40 CFR
264) -"Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal
facilities" and IDAPA 16.01.05.011(40 CFR 268)-"Land Disposal Restrictions" have not been included
as ARARs but may become applicable to the disposal facility if the incinerated ash is found to be a land
disposal restricted hazardous waste. Another action specific law, IDAPA 16.01.05.006(40 CFR 262.34)
"Accumulation of Waste" may become applicable if plant matter is determined to be a hazardous waste.
and if a large quantity of plant matter must be accumulated at ANL-W prior to shipping. One chemical
specific law, IDAPA 16.01.11.200-Idaho Groundwater Quality Rule" has not been included as an ARAR
but may become applicable if future groundwater concentrations exceed those levels that were predicted
in the OU 9-04 Comprehensive RI/FS. Currently DOE does not exceed any of these regulated
groundwater concentrations at WAG 9 and does not expect to exceed them in the future. However, DOE
will continue with groundwater monitoring in accordance with the ANL-W Environmental Monitoring Program.

9.2.2 Contingent Remedy Compliance with ARARs

Implementation of the contingent remedy of excavation with on-INEEL disposal will comply
with all chemical-, action-, and location-specific Federal and State ARARs, and TBCs as shown in Table

Table 9-1. Evaluation of ARARs and TBC compliance for the selected remedy- Alternative 5: phytoremediation.

ARAR Statute	Citation	Reason	Relevancy	Attained by
Action				
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.650	To control dust during excavation/farming operations.	Applicable	Application of water and/or chemical dust suppressants to land disturbed by excavation and/or farming operations.
Idaho Hazardous Waste Management Act	IDAPA 16.01.05.006 (40 CFR 261)-"Identification and Listing of Hazardous Waste"	All plant materials will need to be sampled for hazardous materials prior to shipment to an incinerator.	Applicable	Plant material samples will be collected and analyzed to determine if the plant matter is regulated hazardous waste.
Idaho Hazardous Waste Management Act	IDAPA 16.01.05.006 (40 CFR 262.11)-Hazardous Waste Determination"	All waste that could potentially contain hazardous constituents must be sampled using approved methods.	Applicable	Plant material samples will be tested using approved EPA methods to determine if the plant matter is regulated as a hazardous waste.
General Requirements for Shippers	49 CFR 173	DOE will have to comply with the requirements for packaging and transporting of radioactive and hazardous material to an incinerator.	Applicable	These packaging and transportation regulations will be met by placing the waste in appropriate shipping container and applying the appropriate placards.
National Contingency Plan - Procedures for planning and implementing off-site response actions	40 CFR 300.440	The statute will apply if incinerated ash is a RCRA regulated hazardous waste and is shipped off-site for disposal.	Applicable	If determined to be a hazardous waste, the ash will be shipped off-site to a RCRA Subtitle C landfill which is operated in compliance with RCRA.
Chemical				
NESHAPS-Radionuclides other	40 CFR 61.92	Limits the exposure of radioactive	Applicable	Monitors for airborne radionuclides are currently

than Radon-222 and Radon-220 contaminant release to 10 mrem/year for the installed around the ANL-W facility and can be at DOE facilitics-Emission off-site receptors. supplemented with additional portable monitors if Standard necessary. Dust control measures will also help

limit the release of radioactive contaminants.

Table 9-1. (Continued).

ARAR Statute	Citation	Reason	Relevancy	Attained by
Rules for the Control of Air Pollution in Idaho	IDAPA 16.01.01.585 and 586	Idaho rules governing the release and verification of carcinogenic and noncarcinogenic contaminants into the air.	Applicable	The phytoremediaiton will add live vegetation as a soil cover material that will prevent the release of dust/air pollution due to wind erosion. Air monitoring will be used to verify that the limits specified in 585 and 586 are not exceeded.
Location				
Archeological and Historic Preservation Act	16 USC 470	This will be applicable if unexpected artifacts are uncovered during excavation/farming operations.	cultural Relevant and Appropriate	The areas at WAG 9 that will be remediated are less than 50 year old man made ditches and ponds and have not been identified as having cultural significance. If cultural artifacts are encountered, DOE will stop work and conduct a detailed survey of the area.
To Be Considered				
Environmental Protection, Safety, and Health Protection Standards	DOE Order 440.1	DOE Orders for protecting workers. Worker compliance with Standard Operating Procedures specified in the DOE Order-based Environmental Safety and Health manual ensures safe remediation activities.	To Be Considered	

Radioactive Waste Management DOE Order 5820.2A DOE Orders provide guidance on disposal of To Be Worker compliance with Standard Operating
and 435.1 in FY 2000 low-level radioactive waste.
Considered Procedures specified in the DOE Order-based

Environmental Safety mid Health manual and the

Waste Handling manual ensures safe packaging and

disposal of low-level radioactive waste.

Radiation Protection of the DOE Order 231.1 DOE Orders that provide guidance on
To Be Worker compliance with Standard Operating
Public and Environment radiological environmental protection
and Considered Procedures specified in the DOE Order-based
guidelines on cleanup of residual
radioactive Environmental Safety and Health manual ensures
material prior to release of the
property. protection of the public and enviornment from

radiological hazards.

Table 9-2. Evaluation of ARARs and TBC compliance for the contingent remedy - excavation and On-INEEL disposal of contaminated soils.

ARAR Statute Citation Reason
Relevancy Attained by

Action
Idaho Fugitive Dust Emissions IDAPA 16.01.01.650 To control dust during excavation
operations. Applicable Application of water and/or chemical dust

suppressants to land disturbed by

excavation/trucking operations.

General Requirements for 49 CFR 173 DOE will have to comply with the
requirements Applicable These packaging and transportation regulations will
Shippers for packaging and transporting of
radioactive be met by placing the waste in appropriate shipping
and hazardous material to on-INEEL disposal
containers and applying the appropriate placards.
site.

Chemical

NESHAPS-Radionuclides other 40 CFR 61.92 Limits the exposure of radioactive

contaminant Applicable Monitors for airborne radionuclides are currently
than Radon-222 and Radon-220 release to 10 mrem/year for the off-site
installed around the ANL-W facility and can be
at DOE facilities-Emission receptors.
supplemented with additional monitors if necessary.
Standard
Dust control measures will limit the releasa of

radioactive contaminants.

Rules for the Control of Air IDAPA 16.01.01.585 Idaho rules governing the release and
Applicable The excavation and truction operations will use
Pollution in Idaho and 586 verification of carcinogenic and
water and chemical suppressants to limit the release
noncarcinogenic contaminants into the air.
of dust. Revegetation of the disturbed areas will be

completed after the excavations. Air monitoring

will be used to verify that the limits specified in

sections 585 and 586 are not exceeded.

Table 9-2 (Continued).

ARAR Statute Citation Reason
Relevancy Attained by

Location

Archeological and Historic 16 USC 470 This will be applicable if unexpected
cultural Relevant and The areas at WAG 9 that will be remediated are less
Preservation Act artifacts are uncovered during excavation
Appropriate than 50 years old man made ditches and ponds and
operations.
have not been identified as having cultural

significance. If cultural artifacts are encountered,

DOE will stop work and conduct a detailed survey

of the area.

To Be Considered

Environmental Protection, DOE Order 440.1 DOE Orders for protecting workers.
To Be Worker compliance with Standard Operating
Safety, and Health Protection
Considered Procedures specified in the DOE Order-based
Standards

Environmental Safety and Health manual ensures

safe remediation activities.

Radioactive Waste Management DOE Order 5820.2A DOE Orders provide guidance on disposal of
To Be Worker compliance with Standard Operating
and 435.1 in FY 2000 low-level radioactive waste.
Considered Procedures specified in the DOE Order-based

Environmental Safety and Health manual and the

Waste Handling manual ensures safe packaging and

disposal of low-level radioactive waste.

Radiation Protection of the DOE Order 231.1 DOE Orders that provide guidance on
To Be Worker compliance with Standard Operating
Public and Environment radiological environmental protection and
Considered Procedures specified in the DOE Order-based
guidelines on cleanup of residual
radioactive Environmental Safety and Health manual ensures
material prior to release of the property.
protection of the public and enviornment from

radiological hazards.

9-2. Table 9-2 lists each the ARAR statutes, specific citation reference, reason why the ARAR is retained, relevancy, and how DOE will attain compliance with the ARAR. In addition to including the ARARs in Table 9-2, the TBCs are also included. For the ANL-W facility, the TBCs consist of DOE Orders which prescribe minimum standards for work practices at DOE facilities. These DOE Orders are TBCs and are used in the absence of applicable state or federal regulations. As shown in Table 9-2, all of the ARARs and TBCs for the contingent remedy of excavation and On-INEEL disposal can be met.

Other Federal and State laws are not included as ARARs for WAG 9 but may be invoked for the on-INEEL disposal site operator. The operator of the disposal site will have to comply with these action specific laws: IDAPA 16.01.05.008(40 CFR 264)-"Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities" and IDAPA 16.01.05.011(40 CFR 268)-"Land Disposal Restrictions". One chemical-specific law, IDAPA 16.01.11.200- Idaho Groundwater Quality Rule" has not been included as an ARAR but may become applicable to the contingent remedy if future groundwater concentrations exceed those levels that were predicted by the OU 9-04 Comprehensive RI/FS. Currently ANL-W does not exceed any of these regulated groundwater concentrations and does not expect to exceed them based on modeling results. However, DOE will continue with groundwater monitoring in accordance with the ANL-W Environmental Monitoring Program.

9.3 Cost Effectiveness

The selected remedial action of phytoremediation for the ANL-W sites of concern is cost effective because it is anticipated that its costs will be the lowest of those alternatives that met the RAOs. The costs for phytoremediation will depend on the actual uptake percentages for the radionuclide and inorganic contaminants that are being determined during the bench-scale testing. The contingent remedy of excavation with on INEEL disposal offers the second lowest costs for meeting the RAOs. The costs for the excavation with on-INEEL disposal costs are well defined since the packaging and transportation of hazardous and low level radioactive wastes are routine operations.

Table 9-3 summarizes the estimated costs in net present value for all of the alternatives that were retained for detailed analysis. These costs were estimated assuming an annual inflation rate of 5%. The selected remedy of phytoremediation is the most cost effective remedial alternative for all eight areas with the exception of the Industrial Waste Pond. The contingent remedy of excavation and on-INEEL disposal is the next lowest cost alternative. The variations in costs between the phytoremediation and the excavation and on-INEEL disposal depended on the depth of contamination and surface area of the remedial sites. Compared to excavation and disposal, the costs of phytoremediation are lower for sites that have relatively large surface areas and which have contamination at relatively shallow depths (i.e., 0.5 to 4 feet). Due to cost savings which can be realized on overhead and equipment costs when one cleanup technique is applied to all WAG 9 sites, phytoremediation was selected for all WAG 9 sites. Costs for the bench-scale-greenhouse testing have not been included into the phytoremediation alternatives for each site. These bench-scale greenhouse costs are relatively small (less than $200,000) and are being incurred prior to the signing of the ROD and as such are considered pre-ROD costs.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy will result in the permanent removal of contaminants from the soil and will concentrate the wastes, minimizing the volume of waste to be disposed. The phytoremediation is designed to work on sites that contain radionuclide and/or inorganically contaminated wastes. Tests on the effectiveness of phytoremediation to extract the radionuclides and/or inorganics from the ANL-W soils are currently being performed. The outcome of these tests will determine the implementability of

phytoremediation prior to the start of the 1999 growing season. The contingent remedy of excavation and on-INEEL disposal offers a permanent solution to the removal of the radionuclide and/or inorganic wastes from ANL-W in a non-concentrated form. Both the selected and the contingent remedies offer permanent solutions since both alternatives will remove the contaminants from the ANL-W site.

Table 9-3. Net present value of capital, operating and maintenance (O&M) and total cost for remedial alternatives at OU 9-04 sites.

Alternative	Technology	Capital Costs	Operations and Maintenance Costs	Total Cost
Alternative 3a	Engineered Cover with Institutional Controls	$6,625,000.00	$954,000.00	$7,580,000.00
Alternative 4a	Excavation and Disposal at the On-INEEL Proposed INEEL Soils Repository	$5,340,000.00	$535,000.00	$5,876,000.00
Alternative 4a	Excavation and Disposal at the On-INEEL RWMC Facility	$5,575,000.00	$535,000.00	$6,110,000.00
Alternative 4b	Excavation and Disposal at a Private Off-INEEL Facility	$12,591,000.00	$535,000.00	$13,126,000.00
Alternative 5	Phytoremediation with Off-INEEL Disposal of Plant Matter/Ash	$2,289.000.00	$535,000.00	$2,824,000.00

9.5 Preference for Treatment as a Principal Element

The selected remedial remedy of phytoremediation, satisfies the criterion for treatment of the contaminated media. The phytoremediation is an innovative treatment technology that appears to be the most appropriate remedy for cleanup of both radionuclide- and inorganically-contaminated soils at

WAG 9. CERCLA grants preferential treatment to technologies that treat soils to reduce principal wastes. Field tests will be conducted to verify the performance of phytoremediation on the ANL-W soils,
The contingent remedy, excavation with on-INEEL disposal, does not include treatment, but does provide a proven conventional technology to meet the established RGs for each of the eight areas at
WAG 9.

10 DOCUMENTATION OF SIGNIFICANT CHANGE

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD.

Cost estimates for Alternatives 4a excavation and disposal at the RWMC have since been prepared. These costs are similar in magnitude to those of the Alternative 4a for the proposed INEEL
Soils Repository. Costs are slightly higher because of the increase in travel costs associated with the
longer transportation distance. The overall project costs for Alternative 4a using the proposed INEEL
Soils Repository or the RWMC facility are considered to be essentially the same. Thus, if the selected
alternative does not work, and the contingent alternative is implemented, the final selection of which
disposal option in Alternative 4a will be made during the remedial design phase.

One area, the Ditch C portion of ANL-01 was identified as having inorganic contaminants that
posed unacceptable risks to the ecological receptors in the Proposed Plan. This area has now been
eliminated as an area requiring remediation. In preparation of the Screening Level Ecological Risk
Assessment (SLERA) the maximum contaminant concentrations were used to calculate the HQ for the ecological receptors. These HQs were determined by using the maximum contaminant concentration at
these two sites. New HQs have been calculated for all WAG 9 sites using the 95% UCL concentrations
reported in Appendix A of the OU 9-04 Comprehensive RI/FS. Under CERCLA the calculation of the contaminant concentration is based on a reasonable maximum exposure (RME). The 95% UCL
concentration is more reasonable than using the maximum concentration when the number of samples in
the data set is greater than 10. The result of using the 95% UCL concentration verses the maximum
concentration reduced the ecological receptors HQs at these two sites to acceptable levels. Thus, the
Ditch C portion of ANL-01 will no longer require remedial action because the 95% UCL inorganic concentrations are below the remediation goal concentrations. The remaining six areas identified in the
Proposed Plan as having inorganics that posed unacceptable risks to the ecological receptors, have had
similar refinements in the calculation of the HQs using 95% UCL values verses the maximum concentrations. These remaining six areas are; Industrial Waste Pond (ANL-01), Ditch A (ANL-01), Ditch B (ANL-01), Main Cooling Tower Blowdown Ditch (ANL-01A), Sewage Lagoons (ANL-04), and

the Industrial Waste Liftstation Discharge Ditch (ANL-35). All of these six areas still have at least one
inorganic contaminant at concentrations above the RGs and are still retained for remedial action.

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11 RESPONSIVENESS SUMMARY

The Responsiveness Summary is designed to provide the agencies with information about community preferences regarding the selected remedial alternatives and general concerns about the site. Secondly, it summarizes how public comments were evaluated and integrated into the decision-making process and records how the agencies responded to each of the comments. Appendix A provides a summary of community involvement in the CERCLA process for OU 9-04 and a summary of comments received and corresponding agency responses.

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Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

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APPENDIX A

RESPONSIVENESS SUMMARY

A Summary of Comments Received

During the Public Comment Period

A-1. OVERVIEW

Operable Unit (OU) 9-04 is within Waste Area Group (WAG) 9 at the Argonne National Laboratory - West (ANL-W) at the Idaho National Engineering and Environmental Laboratory (INEEL). WAG 9 contains 37 identified release sites contained within four operable units. DOE added 2 sites from WAG 10 to the 37 release sites evaluated in the OU 9-04 Comprehensive RI/FS. Eight subareas from five of these 39 sites were determined to have contamination that posed a potential risk to human health and the environment. For those sites that will require remedial action to reduce or eliminate those risks, the remedial action alternatives were evaluated and a preferred alternative was selected. In addition to the eight areas of concern at OU 9-04, there were 33 areas that were determined to pose no unacceptable risk to human health or the environment and were identified by the agencies as requiring No Action. A Proposed Plan that summarized the results of the RI/FS and presented the preferred remedial alternative and the contingent alternative was released by the agencies for public review on January 8, 1998. Public comment on this document started on January 12, 1998, and was extended until March 12, 1998 due to a request from the public. Public meetings were held in Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively.

This Responsiveness Summary responds to both written and verbal comments received during the public comment period and meetings. Generally, support for the preferred alternative was favorable with some commentors expressing concern over mobility of contaminants and the introduction of non-native plant species to remove the contaminants from soils.

A-2. BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sections 113(k)(2)(B)(I-v) and 117, a series of opportunities were made available for public information and participation in the remedial investigation and decision process for OU 9-04, WAG 9 of the ANL-W from 1991 to the present. Public outreach activities included distribution of fact sheets that briefly discussed the status of investigations to date, INEEL Reporter articles and updates, a Proposed Plan, and focus group interactions, including tele-conference calls, briefings, presentations, and public meetings.

On January 8, 1998, the U.S. Department of Energy (DOE) issued a news release to more than 100 media contacts concerning the beginning of a 30-day public comment period pertaining to the WAG 9 ANL-W Proposed Plan, which began January 12, 1998, and was extended to March 12, 1998. In addition, an INEEL Reporter article was sent to approximately 6,700 people on the INEEL Community Relations Plan mailing list and mentioned the public meeting schedule. Both the news release and INEEL Reporter gave notice to the public that WAG 9 ANL-W investigation documents would be available before the beginning of the comment period in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library, the INEEL Boise Office, and public libraries in Fort Hall, Pocatello, and Moscow, Idaho. Following the announcement of the public comment period, 6,700 copies of the Proposed Plan were mailed to the public for their review and comment. In addition, public meetings were held at Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively. Written comment forms were available at the meetings, and a court recorder was present at each meeting to record transcripts of discussions and public comments. A total of about 75 people not associated with the project attended the public meetings. Overall, 9 citizens provided formal comments; of these, 1 citizen provided verbal comments and eight provided written comments. Comments were also received from the INEEL Citizens Advisory Board and are included in this responsiveness summary.

This Responsiveness Summary has been prepared as a part of the Record of Decision (ROD). All formal verbal comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the ROD. Table A-1 is provided as a reference and lists the commentors in alphabetical order, identifies the comment and response number, and identifies the page the comment and response can be found. The ROD presents the selected alternative and contingent

alternative for the eight areas in OU 9-04 that are of concern and recommends No Action for the remaining 33 areas. The selected alternative was chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan). In addition, the selected alternative fully complies with CERCLA § 121 statutory preference for treatment of contaminants for as a permanent solution. The decisions presented in the ROD are based on information contained in the Administrative Record.

A-3. LISTING OF COMMENTERS, COMMENT NUMBERS, AND PAGE NUMBERS

All of the formal comments submitted by the public in either written or verbal form were tabulated and assigned a comment number. Where applicable the commentors are listed alphabetically in the first column, the comment number appears in the second column, and the page the comment and response can be found on is shown in the third column.

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
CAB	Citizen Advisory Board	40	17
CAB	Citizen Advisory Board	41	17
CAB	Citizen Advisory Board	42	18
CAB	Citizen Advisory Board	43	18
CAB	Citizen Advisory Board	44	18
CAB	Citizen Advisory Board	45	19
Beatrice Brailsford	Snake River Alliance	57	22
Beatrice Brailsford	Snake River Alliance	58	22

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
Beatrice Brailsford	Snake River Alliance	59	22
Beatrice Brailsford	Snake River Alliance	60	23
Beatrice Brailsford	Snake River Alliance	61	23
Beatrice Brailsford	Snake River Alliance	62	23
Beatrice Brailsford	Snake River Alliance	63	23
Beatrice Brailsford	Snake River Alliance	64	24
Beatrice Brailsford	Snake River Alliance	65	24
Beatrice Brailsford	Snake River Alliance	66	24
Chuck Broscious	Environmental Defense Institute	4	6
Chuck Broscious	Environmental Defense Institute	5	7
Chuck Broscious	Environmental Defense Institute	6	7
Chuck Broscious	Environmental Defense Institute	7	8
Chuck Broscious	Environmental Defense Institute	8	8

Chuck Broscious	Environmental Defense Institute	9	10
Chuck Broscious	Environmental Defense Institute	10	10
Chuck Broscious	Environmental Defense Institute	11	10
Chuck Broscious	Environmental Defense Institute	12	10
Chuck Broscious	Environmental Defense Institute	13	10
Chuck Broscious	Environmental Defense Institute	14	11
Chuck Broscious	Environmental Defense Institute	15	11
Chuck Broscious	Environmental Defense Institute	16	11
Chuck Broscious	Environmental Defense Institute	17	12
Chuck Broscious	Environmental Defense Institute	18	12
Chuck Broscious	Environmental Defense Institute	47	5
Dennis Donnelly	Concerned Citizen	19	12
Dennis Donnelly	Concerned Citizen	20	12
Dennis Donnelly	Concerned Citizen	21	12
Dennis Donnelly	Concerned Citizen	22	13

NAME	AFFILIATION	COMMENT #	APPENDIX A PAGE #
Dennis Donnelly	Concerned Citizen	23	13
Dennis Donnelly	Concerned Citizen	24	13
Dennis Donnelly	Concerned Citizen	25	14
Walt Hampson	Concerned Citizen	27	14
Walt Hampson	Concerned Citizen	28	14
Walt Hampson	Concerned Citizen	29	14
Walt Hampson	Concerned Citizen	30	15
Walt Hampson	Concerned Citizen	31	15
Martin Huebner	Coalition 21	34	16
Martin Huebner	Coalition 21	35	16
Martin Huebner	Coalition 21	36	16
Darwin Jeppesen	Concerned Citizen	37	16
Darwin Jeppesen	Concerned Citizen	38	16
Darwin Jeppesen	Concerned Citizen	39	17
KayLin Loveland	Envirocare of Utah Inc.	48	19
KayLin Loveland	Envirocare of Utah Inc.	49	20
KayLin Loveland	Envirocare of Utah Inc.	50	20
KayLin Loveland	Envirocare of Utah Inc.	51	21
KayLin Loveland	Envirocare of Utah Inc.	52	21
KayLin Loveland	Envirocare of Utah Inc.	53	21
KayLin Loveland	Envirocare of Utah Inc.	54	21
KayLin Loveland	Envirocare of Utah Inc.	55	22
KayLin Loveland	Envirocare of Utah Inc.	56	22
Swen Magnuson #1	Concerned Citizen	1	5
Swen Magnuson #1	Concerned Citizen	2	6
Swen Magnuson #1	Concerned Citizen	3	6
Swen Magnuson #2	Concerned Citizen	26	14
Unknown #1	Unknown	32	15

NAME	AFFILIATION	COMMENT	PAGE #
Unknown #1	Unknown	33	15
Unknown #2	Unknown	46	19

A-4. SUMMARY OF COMMENTS WITH RESPONSES

Comments and questions raised during the public comment period on the Proposed Plan for the WAG 9, OU 9-04 Comprehensive RI/FS for ANL-W are summarized below. The public meetings were divided into a brief presentation, an informal question-and-answer session, and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginning of the meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal period of the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meetings are addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message using INEEL's toll-free number.

Comment 1 I am concerned that DOE-ID appears to be using the engineered barrier or rock cover that was emplaced at the SL 1 burial grounds and at the BORAX facility as the prototype barrier for any subsequent proposed disposal facilities on the INEEL. This SLI-style rock cover or "barrier" is part of the containment alternative presented in the proposed plans for both WAG 8 and WAG 9. It is well documented that the effect of this rock cover would be to increase infiltration and minimize evaporation thereby increasing the amount of water available to leach contaminants from the disposed soil the cover is supposed to protect. I have read the proposed plan for WAG 8 and pertinent portions of the WAG 8 Comprehensive RI/FS and see no acknowledgment that this rock cover will increase infiltration. The fact that this rock cover will increase infiltration

and leaching should be plainly stated in the proposed plan for the information of members of the public. If anything, the wrong impression is given in the Overall Protection of Human Health and the Environment section of the proposed plan for WAG 8 (page 16) where it is stated that Alternative 3 will "minimize infiltration". This last statement is miserably incorrect and needs to be changed.

Response If the "engineered cover" had been selected as the remedial alternative, it would have been designed to limit the infiltration of water over the containment area with the use of multiple layers of different materials. The "engineered cover" depicted in the WAG 9 Proposed Plan was only a sketch giving an idea of the relationship between the contaminated soil and a generic multi layer rock cover. The "engineered cover" is not the selected alternative nor is it the contingent alternative for WAG 9 because other alternatives offered greater benefit at reduced cost. Because of the nature and location of the radiologically contaminated soils at the Naval Reactors Facility (WAG 8), the engineered cover has been selected as the preferred alternative for WAG 8. WAG 8 engineers are currently evaluating the use and effectiveness of various media that could be potentially used in their multilayered engineered cover.

Comment 2 While the groundwater pathway may not have been a risk in the baseline risk assessment for either WAGs 8 or 9, even with infiltration rates as high as 1 m/yr, it still seems wrong from an environmental stewardship viewpoint to needlessly install a rock cover that will undoubtedly increase leaching from the contaminated soil and increase concentrations of leached contaminants in the Snake River Plain aquifer. I feel this statement is true even if the increased infiltration caused by the rock cover only incrementally increases contaminant concentration in the aquifer because there are better cover alternatives. True engineered barriers that provide the necessary shielding and biotic protection have been designed and are being tested on the INEEL. These barriers are resistant to erosion and minimize infiltration. These barrier designs should be given a thorough comparative evaluation to an SL1-style barrier for use in the

selected alternative. This comparison should include analysis of even incremental risk increases in the groundwater pathway from increased infiltration due to the rock cover. Hopefully, this comparison will occur since there are words in the Comprehensive RI/FS for WAG 8 that the proposed rock cover in Alternative 3b is a "conceptual design" and that the final design will be developed during the remedial design process.

Response a The "engineered cover" as depicted on page 15 of the WAG 9 proposed plan is only conceptual figure. If an engineered barrier were selected as the remedy, it would be disgned to reduce infiltration, resist erosion, and prevent biotic intrusion. Decisions as to the use of an impermeable layer will be made during the remedial design phase of this CERCLA process.

Comment 3 The WAG 8 Comprehensive RI/FS cites Reith and Caldwell (1990) as stating the proposed barrier is appropriate for containment in an arid area. I have read the article by Reith and Caldwell, and, although the article admits that several of these rock covers have been built at UMTRA sites, the main point presented in the article is that since vegetated soil covers are more effective for reducing infiltration and subsequent leaching from contaminated soils rather than simple rock covers. This gives the appearance that the Reith and Caldwell article is incorrectly cited out of context for purposes of justifying the choice of engineered barriers.

Response INEEL Vegetated soil covers were not selected because some plants indigenous to the have very deep tap roots that could penetrate the soil cover. This could lead to inadvertent uptake by these plants and possible exposure to other ecological receptors. The "native soil cover" is not the preferred alternative nor is it the contingent alternative for WAG 9 because other alternatives offered benefit gains at reduced costs.

Comment 4 This must not be called a "comprehensive" plan because it does not include ANL-W's underground high-level waste site (Radioactive Scrap and Waste Facility) which as of

1981 has 81 cubic meters of waste containing 9,823,000 curies of radioactive materials

including 40.73 grams of plutonium [ID-100.54-81@19] DOE must not continue to postpone treatment and disposition of this waste.

Response The OU 9-04 comprehensive RI/FS included an evaluation of all active, operating facilities which are co-located near the 37 WAG 9 inactive waste sites that are being investigated under CERCLA. Any release sites discovered in the future will be evaluated as new sites for remediation under the provisions of the FFA/CO. The Radioactive Scrap and Waste Facility (RSWF), is one such facility. The RSWF is a dry-type spent nuclear fuel and radioactive waste storage facility. The spent fuel and waste is stored in double lined steel containers that are inserted into cathodically protected steel cylinders which are set vertically into the ground. All RSWF spent fuel and waste is retrievable and DOE plans to treat these materials prior to disposal in an appropriate off-site disposal facility. The RSWF is currently operating under a Resource Conservation and Recovery Act (RCRA) storage permit for hazardous and radioactive mixed wastes. Closure of the RSWF will be governed by RCRA closure requirements.

Comment 5 ANL-W intends to continue to use the contaminated Industrial Waste Pond (ANL-01) and the sewage Lagoons (ANL-04) and the State and EPA regulators are silent. Continued waste water discharge perpetuates the leaching of contaminates into the soil column and eventually to the aquifer below.

Response The fate of all contaminants at WAG 9 inactive waste sites have been modeled using a very conservative modeling program (GWSCREEN). This program takes into account the soil types, depth to the aquifer (630 ft), and continued water discharges to these sites. The results of this conservative modeling show that continued use of the Industrial Waste Pond and Sewage Lagoons does not pose an unacceptable risk to human health or the environment. Core samples collected in drainage ditches as well as the Industrial Waste Pond verify that the contaminants have not migrated greater than 3.5 feet below the surface after 37 years of operation. The planned continued use of these facilities for approximately the next 5 and 35 years, respectively, is also not likely to drive these contaminants down to the aquifer at levels that pose unacceptable risk to human health and the environment. The contaminants will be remediated down to the cleanup goals after the useful life of the Industrial Waste Pond and Sewage Lagoons, approximately 5 and 35 years, respectively.

Comment 6 The Plan acknowledges that: "Human health risks from cesium-137 will be at acceptable levels within 130 years due to radiological decay," [Plan@ 14] Yet in the next paragraph, the plan states: "Institutional controls are assumed to remain in effect for at least 100 years." What about the next 30 years. Once the CERCLA process is wound up in a few years, there are uncertainties that DOE or any other federal agency is going to fulfill its questionably enforceable commitment to provide monitoring and institutional control to ensure no people gain access to the waste sites. Again, a trust fund is warranted and a requirement under the NRC 10 CRF ss 61.63 "Financial Assurances for Institutional Controls."

Response It is true that the cesium-137 contamination would radioactively decay to acceptable levels in 130 years if no action were taken at the WAG 9 site. The 100 years of institutional controls proposed in Alternative 3, is based on the most likely future use of the INEEL which is the continued control the land by DOE.. Alternative 3, includes an engineered cover that is designed to last longer than the 130 years necessary to limit the direct radiation exposure pathway to future residents.

Comment 7 ANL-W's Plan, like the NRF deficient Plan, is to consolidate all the contaminated soil into the Industrial Waste Pit, and again, it does not meet Applicable or Relevant and Appropriate Requirements (ARAR's). This lack of full disclosure by the polluter and the regulators is unacceptable. The drawing offered in the Plan [plan@ 15] of the Industrial Pit does not vaguely resemble the 20 foot deep localized depression that the pit is in. The Plan drawing shows a flat terrain with the leach pit being the only depression. This is a major discrepancy. Continued pooling of surrounding precipitation over the pit (covered or not) will provide water to leach contaminates towards the aquifer. Moreover, the cap does not include an impermeable seal to keep precipitation out. The Waste Pit currently receives drainage from a considerable area to the southeast in addition to storm water from the ANL-W site. A major flaw in the Plan is not providing drainage diversion away from the pit regardless of the alternative chosen. The

fact that chromium, mercury, selenium, and zinc are in the pit sediments compels DOE to do Toxicity Characteristic Leaching Procedure (TCLP) to determine if it qualifies the waste as a mixed hazardous/radioactive waste and it must be then disposed pursuant to RCRA land disposal restrictions (40 CFR-148). DOE's preferred remedial alternative simply is not supported by essential information.

Response None of the alternatives evaluated for WAG 9 include consolidating contaminated soils in an Industrial Waste Pit. The containment alternative (Alternative 3) would consolidate the WAG 9 contaminated soils in an engineered landfill located at a well-drained location near ANL-W. If the contingent Alternative 4a (use of an INEEL Soils Repository, or RWMC) is selected, the soils would be consolidated several miles away from WAG 9 under an engineered cover that would prohibit the pooling of surface water or precipitation. The "engineered cover" as depicted on page 15 of the WAG 9 proposed plan is only a conceptual figure. Decisions as to the use of an impermeable layer will be made during the remedial design phase of this CERCLA process. Contaminant modeling has shown that continued use of the ANL-W Industrial Waste Pond as a drainage collection area does not pose an unacceptable risk to humans or the environment.

Samples have been collected and analyzed for total and TCLP analysis in the waste sites with the highest concentrations of arsenic, chromium, mercury and lead. All of these samples had concentrations less than the TCLP limits and therefore, do not have the potential to leach to groundwater at concentrations high enough to pose a risk. None of the WAG 9 soils have the potential to fail the TCLP test for selenium.

Comment 8 The plan states at page 8 that: "contaminantes to the groundwater show only arsenic and chromium exceeded the cleanup goal screening levels." The ANL-W RI/FS well (M-13) 1993 sample data shows strontium-90 at 1,330 pCi/L. [RI/FS, Vol III App.H pg.3]. EPA maximum concentration level for strontium-90 in drinking water is 8 pCi/L. Sampling in 1994-95 shows well M-12 contains organic chemicals hundreds of times over the MCL [RI/FS, Vol v]. The Plan does not acknowledge this strontium migration or propose remedies that will correct the problem. This contaminate migration

exemplifies the disastrous impact of leach pits and why the ANL-W Industrial Pond must be immediately closed and appropriately cleaned up.

Response The Proposed Plan actually states that "the modeling of contaminants to the groundwater shows that only arsenic and chromium exceeded the cleanup goal screening levels. Therefore, the maximum concentrations of the arsenic and chromium at 100 years in the future were used to determine the risks to human health." The cleanup goal screening levels provided a tool to screen contaminants from inclusion into the risk assessment because of the contaminants low concentrations and or mass.

The organic contaminant detected at well M-12 is bis(2-Ethylhexyl)phthalate and was detected numerous times in the sampling of the upgradient as well as the downgradient wells at WAG 9. This is a common laboratory contaminant and as such the EPA recognizes that samples can be qualified as un-detectable if the concentration is less then 10 times the concentration in the blank sample. The bis(2-Ethylhexyl)phthalate was screened as a contaminant of concern for the following reasons; (1) because the highest concentration of bis(2-Ethylhexyl)phthalate was detected in the upgradient well (M-12), (2) no data trends exist of increasing concentrations, and (3) EPA recognizes it is a common laboratory contaminant.

It is correct that strontium-90 had an estimated detection of 1,330 pCi/L from the ANL-W downgradient monitoring well M-13 for the sample collected October 25, 1995. However, the sample collected the same day for the upgradient monitoring well M-12 also had an estimated detection of strontium-90 of 1,320 pCi/L. The data from this October 25, 1995 sampling has been qualified as estimated (J) by the data validator because the laboratory control samples (LCS) were outside control limits. Because the data was flagged by the data validator, at thousands of times above the detection levels, DOE believes that laboratory error was the cause of these erroneously high values.

Also, data results collected on July 31, 1995 showed 0.7 and 0.1 pCi/L from M-12 and M-13, respectively. These well are located 4,928.83 feet apart with M-13 almost directly downgradient of M-12. The groundwater in the Snake River Plain Aquifer flows at most 10 feet per day and thus it would take 492 days for the water under M-12

to reach M-13. If this were the case the strontium-90 would have to have been detected in the upgradient M-12 well for over a year and this is not the case since the July 31, 1995 data shows both the M-12 and M-13 strontium-90 results at 0.7 and 0.1 pCi/L. In an effort to substantiate the strontium-90 detections in the M-12 and M-13 wells, two groundwater samples from each well were collected on December 14, 1995. The upgradient M-12 samples were both non-detects at 0.4 and 0.0 pCi/L, while the downgradient M-13 well had one non-detect at 0.5 and one detection at 1.6 pCi/L. Also, results of drinking water wells EBR-II #1 and 2 have been analyzed semi-annually for gross beta with the results being lower than the MCL level of 8 pCi/L.

Comment 9 Alternative 5 (phytoremediation) that would use plants, over five growing seasons to absorb the contaminants in the leach pit, is so ludicrous in an arid environment that it does not deserve rebuttal.

Response Phytoremediation is a technology that has proven successful at other DOE radiologically contaminated waste sites and has been selected as the preferred alternative to remediate soils in feight areas at ANL-W. Because WAG 9 is located in a semi-arid environment, the contaminant extracting plants would be irrigated as required to enhance plant growth. The EBR-II Leach Pit was remediated in 1993 and is not part of this proposed action.

Comment 10 There are issues of plant density to prevent wind erosion (contaminate dispersion).

Response Four of the eight areas where the Agencies propose using phytoremediation are ditch bottoms and ponds. Based on the physical nature of these depressed sites, they tend to accumulate windblown sediments. The one site (ANL-09-Mound) is on the banks of a large storm water Interceptor Canal and currently has only sparse vegetation growing. Any additional vegetation that is growing during the dry season will only help prevent against windblown contamination. The contaminant extracting plants would be densely planted to ensure effective root penetration into contaminated soils.

Comment 11 What is ANL going to do after annual harvest and between growing seasons to prevent

wind erosion?

Response After each of the growing seasons are completed, DOE may continue to keep the area wetted until the ground freezes. This would prevent any windblown contamination problems. Other erosion control options may include use of a biodegradable soil tackifier that would be sprayed on after each harvest.

Comment 12 Bench scale tests in ANL's greenhouse will only reflect efficiencies in an artificial climate controlled environment, not the real desert thing.

Response Every effort is being taken during the greenhouse studies to simulate actual conditions at the INEEL. These include temperature control, humidity control, and sunlight duration.

Comment 13 The Sanitary Waste Lift Station (ANL-31) is listed as a no action site presumably because ANL wants to continue to use the pumps. The Plan offers no data to substantiate this no action decision.

Response As stated in the Operable Unit 9-04 Comprehensive RI/FS, the ANL-31 building consists of two lift stations in the same building. The South side contains a sanitary sewage waste lift station and will remain in service. The North side of ANL-31 contained the industrial lift station that was used to pump wastes to the EBR-II Leach Pit. This side of ANL-31 was remediated in 1995 when ANL-W collected samples, removed the sludge, collected verification samples and backfilled this half of the building with clean sand. Also, all of the associated piping and contaminated soil below the piping from the industrial lift station to the EBR-II Leach Pit was removed and disposed of at RWMC in 1995 and 1996. In their current conditions, neither of the two lift stations in the ANL-31 site poses an unacceptable risk to human health or the environment.

Comment 14 The Track 2 Investigation shows maximum concentrations of sludge collected from the Lift Station as follows: cesium-137 at 9,380 pCi/g, strontium-90 at 2,470 pCi/g, uranium at 4.8 pCi/g, neptunium-237 at 13 pCi/g, and cobalt-60 at 16.3 pCi/g. [Vol. III track 2 App. -H pg4] This contamination suggests that this Lift Station was inappropriately excluded from the cleanup. May 1995 Track 2 reflect continued high gross alpha and

gross beta in the pump water and sludge. [Vol. III Appendix - E]

Response The Track 2 investigation resulted in the removal action that is described in the response to comment 13. The lift station no longer poses an unacceptable risk to human health or the environment.

Comment 15 The EBR-II Leach Pit (ANL-08) underwent an interim "cleanup" action in 1993 when only "the majority of the sludge was removed" and the pit was backfilled. The Plan fails to acknowledge that the remaining sludge had the following pCi/g concentrations: cesium-137 at 29,110, iodine-129 at 124, neptunium-237 at 329, strontium-90 at 2,247, yttrium-90 at 2,247. [RI/FS Vol. II pg. 59-60] Inadequate interim actions end up being permanent because of the additional volume of contaminated soil used as backfill is now part of the problem.

Response Every effort was taken during the 1993 removal action to remove as much of the sludge as possible. These actions included pressure washing of the irregular basalt floor and collection of the material that was removed during the washing. The residual sludge remaining was estimated to be at most one-eighth of and inch thick, a worst case estimate of the sludge volume (using a one-eighth-inch thickness) was used in modeling the transport of contaminants to the aquifer. These values were used in the OU 9-04 Comprehensive RI/FS along with the modeling of contaminants that may have leached from the sludge in the years prior to the 1993 removal action. The modeling of past and future contaminant behavior shows that the EBR-II Leach Pit no longer poses an unacceptable risk to human health or the environment.

Comment 16 The public has demanded for many years that DOE treat its radioactive waste into a stable vitrified form so that it can be stored onsite until a safe permanent repository can be established.

Response Vitrification was evaluated as a potential alternative in Chapter 7 of the OU 9-04 Comprehensive RI/FS and screened out because of it is typically used for long lived radionuclide wastes. Contaminants at WAG 9 are short lived radionuclides and do not require isolation for 10,000 years. In addition the high cost of vitrification is not justifiable for use on the short lived radionuclide wastes and offer very little gained

benefits over the selected and contingent remedies.

Comment 17 At the very legal minimum, all contaminated soil should be shipped off the INEEL site to a licensed and permitted RCRA hazardous/radioactive disposal site.

Response None of the wastes at the WAG 9 sites have failed the TCLP test for RCRA wastes. The off-INEEL disposal (Alternative 4b) was not selected because of the cost effectiveness. The preferred and contingent alternatives at ANL-W are protective of human health and the environment, and comply with Applicable and Relevant and Appropriate Requirements, including the requirements of the Resource Conservation and Recovery Act.

Comment 18 a compromise would be if there is an area on the INEEL site that is not over the Snake River Plain Aquifer, use it to build a licensed and permitted RCRA hazardous/radioactive disposal site for INEEL low-level wastes only.

Response None of the wastes at the WAG 9 sites have failed the TCLP test for RCRA wastes. The Agencies have proposed Alternative 5, phytoremediation as the preferred alternative. This alternative would treat the soils to remove the contaminants. The contaminants would then be recovered, stabilized, and disposed of in accordance with the Waste Acceptance Criteria of a licensed off-site disposal facility.

Comment 19 I feel the goal of your contamination cleanup should be the unrestricted future use of the land and water resources at the site.

Response The Agencies agree that the goal of the cleanup at WAG 9 should be the unrestricted future use of the land and water resources at ANL-W. By selecting Alternative 5, phytoremediation, as the preferred alternative to remediate the eight areas of WAG 9 that pose unacceptable risks to human health and the environment, the Agencies will be able to release the lands without any restriction after the remediation goals are met.

Comment 20 To attain unrestricted future use of the land and water resources at the site, I feel the plan should address the removal of spent fuel from all the reactors.

Response OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, and two inactive waste sites from WAG 10 near ANL-W that have had past releases to

the environment, and active ANL-W facilities were reviewed for future releases. The active facilities are currently operating under stringent operating procedures and permits. When the operating facilities are shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition. Four of five reactors at ANL-W have been shutdown and have been defueled. The remaining small neutron radiography reactor is still operating and will be defueled when DOE terminates its operation.

Comment 21 What about the sodium from the Experimental Breeder Reactor II, all of it-- what will be its fate? The plan should remove of all the sodium coolant and materials contaminated with radioactive sodium. I feel the sodium is especially important due to the environmental mobility of sodium and the location of this site over the aquifer that supplies most of the water for this region.

Response As part of the DOE's shutdown plan for the Experimental Breeder Reactor-II, the primary and secondary sodium coolant will be drained and chemically converted to non hazardous sodium carbonate. DOE has constructed a facility at ANL-W to convert all EBR-II sodium and sodium potassium alloy to sodium carbonate powder, a non-hazardous compound that has very low levels of radioactivity.

Comment 22 When I visited the Argonne-West site over fifteen years ago, I remember seeing, on the northeast side of the complex, a series of waste-holes that appeared to be vertical pipes with concrete lids that were said to contain intermediate-level radioactive wastes which were contaminated with sodium. I see no mention of these structures in your description of the sites-- Have they been removed?

Response The Radioactive Scrap and Waste Facility (RSWF), is a dry-type spent nuclear fuel and radioactive waste storage facility. The spent fuel and waste is stored in double lined steel containers that are inserted into cathodically protected steel cylinders which are set vertically into the ground. All RSWF spent fuel and waste is retrievable and DOE plans to treat these materials prior to disposal in an appropriate off-site disposal facility. The

RSWF is currently operating under a Resource Conservation and Recovery Act (RCRA) storage permit for hazardous and radioactive mixed wastes. Closure of the RSWF will be governed by RCRA closure requirements.

Comment 23 I also remember the Hot Fuel Examination Facility, and how really hot the cells were inside. Your contamination cleanup should address this contamination, as well as all other fission or activation products onsite.

Response OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, two inactive waste sites from WAG 10 near ANL-W, and active ANL-W facilities. The active facilities, such as the Hot Fuel Examination Facility, are currently operating under stringent operating procedures and permits. When the operating facilities are eventually shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition. At that time residual risks to human health and/or the environment will be evaluated under the CERCLA process with appropriate remedies undertaken as necessary.

Comment 24 This plan's general approach of covering existing waste with a couple feet of dirt and rock and leaving it there is unacceptable.

Response If an engineered cover were implemented it would be designed to prevent the infiltration of water and exposure to humans and ecological receptors. However, the preferred alternative for remediation of the eight areas that pose unacceptable risks to human health and the environment is phytoremediation. The applicability of phytoremediation to remove the contaminants from the soil is currently being evaluated using bench-scale greenhouse tests. If phytoremediation does not work satisfactorily, a contingent alternative of off-site containment and disposal in a soils repository has been selected.

Comment 25 I feel your program should address and plan to truly cleanup the big problems at the site, as well as the little ones. My fear is that if you do not, no one ever will.

Response The goal of the CERCLA activities at WAG 9 is to eliminate unacceptable risks to human health and the environment. OU 9-04 Comprehensive RI/FS investigated the 37 inactive waste sites at ANL-W, two inactive waste sites from WAG 10 near ANL-W,

and also addressed active ANL-W facilities. The active facilities are currently operating under stringent operating procedures and permits. When the operating facilities are shut-down they will be defueled and decontaminated and left in a radiologically and industrially safe condition.

Comment 26 I commend the agencies for selecting an innovative and relatively inexpensive approach to remediate a facility that is environmentally clean compared to other facilities in the INEEL and especially compared to other facilities in the DOE-complex.

Response The agencies acknowledge the commentor's statement that the preferred Alternative 5, phytoremediation is the best and most cost effective alternative option.

Comment 27 Analyses seem conservative and thorough. I favor Alternative 3, considering cost and expeditious improvement over the present state.

Response Although Alternative 3, capping in-place would offer expeditious implementation, it's costs are considerably higher than other alternatives that treat the soils. Thus, the preferred Alternative is 5 and the contingent Alternative is 4a.

Comment 28 Phytoremediation may be scientifically interesting with some long range potential. So pursue that on the parallel path - a small scale development and proof-tests.

Response ANL-W has started bench-scale greenhouse tests to determine the applicability on ANL-W soils. If the bench-scale greenhouse test results are a success a two-year field season will be implemented with verification samples collected to determine how well it is working in the field. If phytoremediation is unsuccessful at either the bench-scale tests or two-year field season, the contingent Alternative 4a would be implemented. The costs associated with parallel implementation of phytoremediation with other alternatives would be prohibitive.

Comment 29 Let's not delay progress on known methods of improvement for years permitting proof of new ideas.

Response The extra costs of using the excavation and disposal over the phytoremediation alternative is not warranted by the benefits gained. Institutional controls practices that

are currently in-place are preventing exposures to current occupational workers at ANL-W. Phytoremediation has proven successful at other DOE contaminated sites for remediating radionuclide and metal contaminated soils. However, ANL-W, with it's specific set of contaminants and location in a semi-arid climate; coupled with the agencies desire to use native plants as much as possible mandates that the evaluation process be conducted for however long it takes to grow, harvest, and analyze the plants to determine contaminant uptake factors, both in the greenhouse study and at ANL-W. The results of the sampling show that after nearly 40 years of operation, the contaminants are relatively shallow (0-2 feet) and the continued facility continued operation will not leach the contaminants to deeper depths. Thus, there appears to be no determent in allowing phytoremediation to be implemented over the expected time frame.

Comment 30 To say that phytoremediation is "site specific" is probably an understatement qualifying its practicality for general use?

Response Phytoremediation is very contaminant and site specific. That is why the Agencies have selected a contingent alternative if phytoremediation does not work satisfactorily during the bench-scale tests and the two-year field season.

Comment 31 I would hasten to add "more power to new/better ideas - innovation etc"; let's just prove them out before large scale application where sure results are needed.

Response ANL-W has started bench-scale greenhouse tests to determine the applicability on ANL-W soils. If the beNch-scale greenhouse test results are a success a two-year field season will be implemented with verification samples collected to determine how well it is working in the field. If phytoremediation is unsuccessful at either the bench-scale tests or two-year field season the contingent Alternative 4a (consolidation at a soils repository) will be selected.

Comment 32 I feet the damage is done! We keep moving this contaminated material around.

Response The OU 9-04 Comprehensive RI/FS determined that only eight areas pose unacceptable risks to human health and the environment. Phytoremediation has been selected by the Agencies as the preferred alternative to remediate these areas. Phytoremediation extracts the contaminants from the soil, thus eliminating the need to move the contaminated soil around. The plants used in phytoremediation will be incinerated (volume reduction) and the ash solidified prior to shipment to an approved landfill.

Comment 33 We just keep piling the contaminated soil on the INEEL so It can filtrate through the soils to the groundwater or be released to the atmosphere.

Response The preferred Alternative 5, phytoremediation, will use plants to uptake

contaminants
into the plant tissues. This will eliminate the chance that they can filtrate in the soil or
be spread to the atmosphere.

Comment 34 The Coalition 21, wishes to commend the DOE and the ANL for considering the phytoremediation technology. The Coalition concurs, contingent on the success of on-going and future studies of this technology that this should be the preferred method.

Response The Agencies acknowledge the commentor's statement that the preferred Alternative 5 phytoremediation, is the best and most cost effective alternative option.

Comment 35 Care should be taken that if non-native plants are used in the proposed phytoremediation
that such exotic species be absolutely prevented from escaping into the Idaho environment.

Response If non-native plants to the INEEL are selected for phytoremediation, DOE will take every precaution to prevent their propagation. These precautions will, at a minimum include harvesting the plants prior to flowering, and may also include spraying a herbicide to form a sterile zone around the sites to be remediated, and harvesting the
whole plant (above and below ground).

Comment 36 Also, the methods for disposing of the ash residues that contains the materials removed
from the ANL-West site per this Waste Plan should be specified and evaluated to ensure
that the methods meet all applicable criteria.

Response The ash residue after incineration will meet the acceptance criteria of an appropriate
radioactive waste disposal facility, or a RCRA permitted hazardous waste disposal facility. The actual method for preparation of the ash for disposal will depend on the
standard operating procedures for the operation of the incinerator used.

Comment 37 My comment is that I noticed that there was no mention of a soil type or series in your
report.

Response That is correct, the Proposed Plan did not mention the soil type or series. The Proposed
Plan is only a short 28 page summary of the 2,600 page OU 9-04 Comprehensive RI/FS Section 2.5 of the OU 9-04 Comprehensive RI/FS discusses the soils type and series,

Comment 38 Being a BLM Soil Scientist. I maybe able to assist you in identifying the national soil
series located adjacent to your Argon clean up site. If your soil is what I think may be

there, The Natural Resource Conservation Service and I have a complete characterization lab analysis of this soil on the INEEL.

Response The Agencies would appreciate any help in confirming the specific soil series of the sites where phytoremediation would be implemented. Figure 2-4 of the OU 9-04 Comprehensive RI/FS shows the general soils types near ANL-W. This figure shows that WAG 9 is located in a transition zone between two soil types (432-Malm-Bondfarm-Matheson complex, and 425- Bondfarmn-Rock outcrop-Grassy Butte complex).

Comment 39 Gale Olson, Randy Lee with Lockheed and I have published soil information on the site in: "The Status Of Soil Mapping for the Idaho National Engineering Laboratory," Jan. 1995 through the Lockheed Company. (INEL-95/0051) Soil series at Argonne are believed to be different than those found in the Bonneville and Jefferson County USDA soils survey reports.

Response DOE used the Gale Olson, Randy Lee document to complete Section 2.5 Soils type for the OU 9-04 Comprehensive RYFS. Figure 2-4 was taken from this report.

Comment 40 The INEEL CAB recommends selection of Alternative 5, phytoremediation, as the preferred alternative for achieving remedial objectives at ANL-W. As described in the Proposed Plan, Phytoremediation is an innovative technology that utilizes plants to uptake toxic metals and radionuclides through roots in situ. Plants that have been used successfully in the past include grasses, shrubs, and/or trees. Following uptake the plant vegetation would be harvested, sampled, and incinerated for volume reduction. The resultant ash would be sampled and sent to a permitted disposal facility. Alternative 5 was ranked best in 6 out of the 7 evaluation criteria, and the cost is significantly lower than the other alternatives. We will be pleased if the technology proves successful. We will support continued endeavors to pursue innovative technologies that could enhance INEEL's role as an environmental laboratory and that could be marketed for use at other contaminated sites

Response The agencies acknowledge the INEEL Citizens Advisory Board's support for Alternative 5, phytoremediation, as the best and most cost effective alternative option for WAG 9 contaminated sites.

Comment 41 We are concerned about the potential for spread of any non-native INEEL species that may be used in the remediation. We recommend that the Record of Decision (ROD) provide more detailed explanations of the species to be used and how DOE proposes to

control their potential spread.

Response If non-native plants to the INEEL are selected for phytoremediation, DOE will take every precaution to prevent their propagation. These precautions will, at a minimum include harvesting the plants before flowering, and may also include spraying a herbicide to form a sterile zone around the sites to be remediated, and harvesting the whole plant (above and below ground). The ROD includes selection of the alternatives. The actual selection of the plants would follow successful completion of the bench-scale greenhouse testing. This documentation of the selected plant species as well as planting and harvesting practices will be documented in the Remedial Design Work Plan.

Comment 42 In addition, we are concerned that contaminants taken up into vegetation could be consumed by animals, using the remediation area for habitat and feeding. We recommend the ROD address this concern and provide an explanation of steps that will be taken to limit ecological risks to wildlife populations.

Response Some of the plants being investigated in the bench-scale greenhouse test are weedy plants that animals and insects do not eat. The actual selection of the plants would follow successful completion of the bench-scale greenhouse testing. A thorough description of the selected plant species, as well as planting, harvesting, and animal fencing practices will be documented in the Remedial Design Work Plan.

Comment 43 We are finally concerned about dioxins resulting from incineration. We recommend that the combustion of secondary wastes should be addressed in the ROD.

Response Recently, more information has become available on the production of dioxins through incomplete burning of wet and damp vegetation and wood in the presence of high chloride/chlorine concentrations. The plants that DOE is proposing to use have low levels of chloride/chlorine and they will also be completely dried prior to bailing and submittal to the incinerator. Standard Operating Procedures used at the incinerator will prevent incomplete oxidation during the incineration of the plant matter. The off-site rule requires the use of a RCRA subtitle C incinerator or testing of the off-gas. Secondary waste from the burning of dried phytoremediation plant matter would not be of concern since plant matter will have to meet the operating incinerator acceptance criteria. Meeting the incinerator's acceptance criteria will ensure that emissions remain under limits described in the incinerator's air quality permit.

Comment 44 With regard to the contingency identified in the preferred alternative

(i.e.Alternative 4A,
which would include excavation and disposal on-site at the Soils Repository proposed for Waste Area Group 3 - Idaho Chemical Processing Plant), we have some concern regarding the identification of a facility that may or may not be constructed. We understand that the Radioactive Waste Management Complex (RWMC may be licensed at some time to receive wastes generated through implementation of cleanup activities in
compliance with the Comprehensive Environmental Response, Compensation, and Liability Act. If so, the ROD should explicitly name the RWMC as a back-up to Alternative 4 and document that it would perform similarly to the Soils Repository according to the evaluation criteria.

We understand that the costs associated with the use of RWMC would be comparable to the Soils Repository. The ROD should provide more complete disclosure of the costs associated with the contingency and its backup to support comparisons between them.

Response The language in the Proposed Plan was intended to describe the use of either the Proposed, INEEL Soils Repository or the RWMC as a contingent remedial alternative. These two possible locations are identified as Alternative 4a (excavation and disposal on
the MEL) in the OU 9-04 Comprehensive RI/FS. The final selection would be completed in the Remedial Design phase of the CERCLA process, because of the unknowns associated with the proposed NEEL Soils Repository. Costs for both the RWMC and proposed INEEL Soils Repository will be included in the ROD.

Comment 45 Finally, we urge the rapid determination of the feasibility of phytoremediation so that it
or the contingency plan can be implemented expeditiously. We request that DOE report the results of the bench scale tests to the INEEL CAB once available.

Response DOE will release the results of the phytoremediation bench-scale tests in August/September 1998, to the CAB as well as other INEEL WAG managers as soon as they are available.

Comment 46 Agree that alternative 5 is best/cost effective option.

Response The Agencies acknowledge the commentor's statement that the preferred alternative is the best and most cost effective alternative option.

Comment 47 DOE's continued use of Envirocare in Utah is unacceptable because it is not a permitted
and licenced RCRA/NRC Subtitle C hazardous/radioactive dump. Envirocare is currently being sued by the Natural Resources Defense Council for RCRA non compliance.

Response The use of Alternative 4b, excavation and disposal off-INEEL was not retained as the preferred or the contingent alternative for the WAG 9 soils that require remediation.
Therefore, no WAG 9 CERCLA wastes would be sent to the Envirocare facility for

disposal.

Comment 48 The remediation time is lengthy. At least five growing seasons will be required for the remediation to be implemented. This obviously prolongs the risk to human health and the environment for at least four years longer than Alternative 4, Excavation and Disposal, which is the next preferred option and could easily be accomplished commercially in one construction season.

Response Although Alternative 4, would offer expeditious implementation, it's costs are considerably higher than Alternative 5 and no benefits would be gained because current institutional controls at ANL-W limit the occupational worker exposures to acceptable levels. The only risk to humans is from the exposure of cesium-137. These sites are outside the work area of ANL-W that is enclosed with a security fence. Well over 95% of the workers at ANL-W work exclusively within the security fenced area. If work is ever performed in these areas, institutional controls will be implemented to reduce the worker exposure to the levels that pose acceptable risks.

In addition, under CERCLA, permanent solutions and alternative treatment technologies or resource recovery technologies the maximum extent practicable, are given preference. Alternative 5 offers cost effective treatment while Alternative 4 does not. Thus, Alternative 5 has been selected for use at WAG 9.

Comment 49 If phytortmediation does not work after the five growing seasons, an alternative remedy will have to be implemented, costing additional time and money and extending the safety and health risks. Additionally, Alternate 4b could be implemented for the same approximate cost and completed in a much shorter time.

Response Phytoremediation will undergo two series of tests with stringent go, no-go, criteria prior to full utilization at WAG 9. The first is a bench-scale greenhouse test conducted on ANL-W soils and based on these results the second full scale two-year field test will be implemented or the contingent alternative will be selected. At the end of the two-year Field rest, samples will be collected of the soil and the plants to determine if Alternative 5 is still practicable for use or if the contingent alternative should be implemented. The long-term benefits gained by being able to remove the contaminants from the soils justify the costs of conducting the bench-scale greenhouse test and the two-year field

season. Institutional controls are in-place to reduce the occupational worker exposures to acceptable levels during the implementation of the phytoremediation tests.

Comment 50 Phytoremediation is a complicated, multi-step process including five separate planting and harvesting campaigns, incineration of each harvest and consequent disposal of all ash generated from plant burns. In comparison, excavation and disposal is a quick and proven technology that will insure that all remediation goals are met.

Response The long-term benefits gained by being able to remove the contaminants from the soils justify the costs of conducting the bench-scale greenhouse test and the two-year field season. These sites are outside the work area of ANL-W that is enclosed with a security fence. Well over 95% of the workers at ANL-W work exclusively within the security fenced area. Thus, institutional controls are in-place to reduce the occupational worker exposures to acceptable levels during the implementation of the phytoremediation tests.

Comment 51 Although fugitive dust and toxic substances may be reduced while plant life is growing in the contaminated area, five harvesting cycles create five invasive situations where dust will present contamination problems and expose workers, rather than a one time remediation.

Response The risk driver to humans is through the direct exposure pathway of the radionuclides. Engineering controls such as the use of Personnel Protection Equipment, dust suppression, fencing, and commercially available farm equipment with climate controlled cabs can be utilized to reduce the workers exposure.

Comment 52 The government must continue to pay surveillance costs for at least five years until the contaminated area remediation is complete, thus the operations and maintenance costs should be significantly higher than Alternative 4, Excavation and Disposal.

Response DOE is proposing that Alternatives 4 and 5 would each have continued operations and maintenance (O&M) costs that would include continued groundwater, soil and air monitoring in accordance with DOE Orders for the next 20 Years. The continued O&M will allow DOE to validate the contaminant modeling results in the RI/FS. Thus, no savings would be realized in O&M costs between Alternatives 4 and 5.

Comment 53 It is important to calculate increases in cost over time since this remediation is spread out over five years and Alternative 4 can be completed in one construction season. The cost of this alternative increases over time, and a realistic comparison must account or this.

Response DOE performed the present value costs for all the retained alternatives for WAG 9. The present value cost for Alternataive 5 was estimated to be less than the present value cost for Alternative 4. The present value costs take into account the inflation costs of work performed in the future as well as the time value of money interest rates. To account for these unknowns, seven years worth of growing seasons were used in preparation of the estimate, evan though it is estimated to take only five years.

Comment 54 The reasoning and facts used to discount Alternative 4b were flawed in some areas. The cost analysis exaggerated commercial excavation and disposal by approximately 240% over disposal costs that are currently available to the DOE and INEEL through existing contracts.

Response DOE used a tipping fee of $350 per cubic yard for disposal of low level radioactive contaminated soil at private facility. The tipping fee was based on costs presented by Envirocare during a soil remediation seminar in Idaho Falls in the fall of 1996. These tipping fee costs along with the $10 per cubic yard rail transport costs. make this alternative much more expensive for large sites than either Alternative 4a or 5.

Comment 55 The reasoning and facts used to discount Alternative 4b were flawed in some areas. Operations and maintenance costs are listed at $535,000. Why is there a cost for this since remediation could be completed in one construction season?

Response See response to comment 52.

Comment 56 The fervor with which the preferred alternative was presented at the Idaho Falls public meeting seemed to transcend the enthusiasm for environmental remediation customarily displayed by the Department of Energy and the State of Idaho.

Response DOE, EPA,and the State support phytoremediation for use at WAG 9 because this remedy is the least invasive to the existing ecosystem, has a high probability of success, and is the least costly. In addition, this alternative meets the CERCLA preference

for
treatment of contaminated soils.

Comment 57 Phytoremediation is being pursued under a Cooperative Research and Development Agreement between Argonne and Applied Natural Sciences. How much federal money has and will be invested in this CRADA? What other federal resources is Applied Natural Sciences using for this project? How will any eventual profits from Treemediation be distributed?

Response This information that you are referring to came from literature of past studies of phytoremediation. DOE is pursuing phytoremediation through it's ANL-W contractor who is working with the ANL-E phytoremediation experts. All costs of the project are going to pay for labor and operations for ANL employees. ANL is a non-profit organization and is only interested in improving the technology and helping others implement it at other facilities.

Comment 58 Is research on phytoremediation going forward in the private sector unaided by the federal government? Is Argonne making use of that research?

Response Private sector use of phytoremediation is growing rapidly with major cleanup activities
at non-government facilities. The private research information is being shared betwveen
companies on the applicability and success of phytoremediation. however, each of the private companies have patent pending processes and specialized plants that they are using that they will not share with others outside the company.

Comment 59 It is unclear how often harvest will occur. Will the plants be dug up only once (at the
end of five growing seasons), after every growing season, after the 1999 field season (to
obtain sample results)?

Response The answer to this question will be determined after the bench-scale greenhouse testing
is complete. If a small annual grass plant is selected the plants would be harvested after
each growing season. Likewise if a perennial plant is selected, the harvesting will occur
after two year growing season.

Comment 60 Are the tests planned for the end of the 1999 Field season of the contaminated soil or of
the plants?

Response Successful bench-scale greenhouse tests have to be completed prior to the two-year long
field season. If the bench-scale greenhouse testing is successfal, both plant and

soil samples will be collected after the two-year long field season and used to validate the applicability of the phytoremediation process at WAG 9. The contaminant analysis of the plants will determine percent uptake of the contaminats on a dry weight basis. These uptake rates will be used along with the density of the plants and the mass of the plant matter to determine the length of time needed to achieve the RAOs. If phytoremediation is unsuccessful at either the bench-scale greenhouse test or the two-year field season, the contingent alternative will be selected.

Comment 61 Phytoremediation seems to necessitate handling the same contaminant several times: during harvest, during sampling, during incineration, during further sampling, entrained on filters, in transport to disposal, during disposal. Are the public and worker health. environmental, and economic costs of each of those steps included in the analysis under review?

Response One of the CERCLA criteria used to evaluate the alternatives is short-term effectiveness. Short-term effectiveness addresses any adverse impacts on human health and the environment that may be posed during the implementation period and period of time needed to achieve the cleanup goals. Institutional controls will be used to reduce worker exposure during activities associated with phytoremediation including; planting, harvesting, shipping, sampling, incineration, characterization, and disposal.

Comment 62 Has Argonne undertaken a mass balance analysis yet? Even an attempt at a theoretical mass balance: analysis (curies in soil vs curies disposed) would be useful.

Response DOE has performed a rough mass balance of total curies of cesium-137 in the soil and the total curies of cesium-137 that would have to be removed to meet the remediation goals for WAG9. A total of 0.295 curies of cesium-137 is in the sites that pose unacceptable human health risks and DOE would have to remove 0.06 curies to meet the established 233 pCi/g cleanup goal. This is approximately 20 percent removal of the cesium- 137.

Comment 63 When the plants are dug up, airborne releases of contaminants might occur. When asked about that possibility at the Boise public meeting, presenters seemed to indicate that the workers doing the digging would be protected by radiation suits. In Idaho Falls, however, there was reference instead to holding down the dust with a garden hose. The

contrast between those two responses seems to indicate a lack of planning and, perhaps, a lack of respect for public concerns.

Response DOE apologizes for the inconsistencies between the meetings. The risk driver to humans is through the direct exposure pathway of the radionuclides. Engineering controls such as the use of Personnel Protection Equipment, dust suppression, fencing, and commercially available farm equipment with climate controlled cabs can be utilized to reduce the workers exposure. Final design of the correct engineering controls will be defined in the Remedial Design phase after completion of the ROD.

Comment 64 The low grade, ongoing problems at Envirocare, a commercial nuclear dump in Utah, emphasize that shipping contamination from here to there may not effect any particular enviromental benefit.

Response DOE agrees that no benefit is gained by hauling the soil from WAG 9 and placing it under a cap at an off-INEEL landfill. Ultimately the soil contamination still exists and potential harm to the existing ecosystem from excavation could be significant.

Comment 65 Has INEEL investigated all possible offisite disposal options and their relative risks and benefits? Is that analysis available to the public?

Response DOE has evaluated two off-site disposal options as part of the 24 possible remedial process options evaluated in the WAG 9 RI/FS. These process options were screened using effectiveness, cost, and implementablilry and used to develop the WAG 9 remedial alternatives. The five WAG 9 remedial alternatives were then evaluated using the nine CERCLA evaluation criterion. The possible offsite disposal option that was retained for WAG 9 is Alternative 4b. In this alternative DOE used the Envirocare facility in Utah to develop the cost estimates. The final selection of an offsite facility would take place in the Remedial Design phase. However, Alternative 4b is not the preferred or the contingent alternative for WAG 9.

A complete review of this process can be found in Chapters 7, 8, 9, and 10 of the WAG 9 Comprehensive RI/FS.

Comment 66 When was the management and operating contract for Argonne National Laboratory last put out for competitive bid?

Response To date, the management and operating contract for Argonne National Laboratory has never been put out on a competitive bid.

Appendix B

Administrative Record

Appendix B

Administrative Record

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ENVIRONMENTAL RESTORATION & WASTE MANAGEMENT
ADMINISTRATIVE RECORD DOCUMENT CATEGORY LISTING
January 20, 1998

AR1.0 SITE IDENTIFICATION

- AR1.1 Background
- AR1.2 Notification/Site Inspection Reports
- AR1.3 Preliminary Assessment (PA) Report
- AR1.4 Site Investigation (SI) Report
- AR1.5 Previous Operable Unit Information
- AR1.6 No Action Sites
- AR1.7 Initial Assessments

AR2.0 REMOVAL RESPONSE

- AR2.1 Sampling and Analysis Plans (SAP)
- AR2.2 Sampling and Analysis Data/Chain of Custody Forms (COC)
- AR2.3 EE/CA Approval Memorandum

AR2.4 EE/CA
AR2.5 Action Memorandum
AR2.6 Amendments to Action Memorandum
AR2.7 Health and Safety Plan
AR2.8 Workplan
AR2.9 Quality Assurance Project Plan
AR2.10 Hazard Classification

AR3.0 REMEDIAL INVESTIGATION (RI)

AR3.1 Sampling and Analysis Plans (SAP)
AR3.2 Sampling and Analysis Data/Chain of Custody Forms (COC)
AR3.3 Work Plan
AR3.4 RI Reports
AR3.5 Track I Investigations
AR3.6 Track II Investigations
AR3.7 Interim Actions
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AR3.9 Quality Assurance Project Plan
AR3.10 Scope of Work
AR3.11 Field Sampling
AR3.12 RI/FS Reports
AR3.13 Cost Analysis
AR3.14 Track 2 Summary Report
AR3.15 Health & Safety Plan

AR3.0 REMEDIAL INVESTIGATION (RI)(continued)

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AR3.17 Remedial Investigation and Baseline Risk Assessment Report
AR3.18 Environmental Assessment (EA)
AR3.19 Finding of No Significant Impact (FONSI)
AR3.20 Treatability Study
AR3.21 Schedule
AR3.22 Track 2 Decision Statement
AR3.23 Track 2 Preliminary Scoping Package

AR4.0 FEASIBILITY STUDY (FS)

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AR4.2 FS Reports
AR4.3 Proposed Plan
AR4.4 Supplements and Revision to the Proposed Plan
AR4.5 Feasibility Study Questionnaire

AR5.0 RECORD OF DECISION (ROD)

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AR5.2 Amendments to ROD
AR5.3 Explanation of Significant Differences
AR5.4 Record of Decision Review Comments
AR5.5 ESD ROD

AR6.0 STATE COORDINATION

AR6.1 Cooperative Agreements/SMOAs
AR6.2 State Certificate of ARARs

AR7.0 ENFORCEMENT

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AR7.2 Endangerment Assessments
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AR10.3 Public Notice(s) (Availability of the Administrative Record File, Availability of the Proposed Plan, Public Meetings)
AR10.4 Public Meeting Transcripts
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AR11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

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AR11.3 State Guidance
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IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR NO ACTION SITES
FOR THE ARGONNE NATIONAL LABORATORY - WEST WAG 9
11/04/94

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.6 NO ACTION SITES

· Document #: 5170
Title: ANL-10 Dry Well between T-1 and Zppr Mound
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5173
Title: ANL-11 Waste Retention Tank 783 (never used)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5174
Title: ANL-12 Suspect Waste Retention Tank by 793 (removed 1979)
Author: Stewart, N. A.
Recipient: Sekot, M.

Date: 09/21/92

· Document #: 5175
Title: ANL-14 Septic Tank and Drain Fields (2) by 753 (removed 1979)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5176
Title: ANL-15 Dry Well by 768
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5177
Title: ANL-16 Dry Well by 759 (2)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

NO ACTION SITES WAG 9 11/04/94

ADMINISTRATIVE RECORD VOLUME II
FILE NUMBER

AR1.6 NO ACTION SITES (continued)

· Document #: 5178
Title: ANL-17 Dry Well by 720
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5179
Title: ANL-18 Septic Tank and Drain Field by 789 (removed 1979)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5180
Title: ANL-20 Septic Tank and Leach Field by 703
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5181
Title: ANL-21 TREAT Suspect Waste Tank and Leaching Field (non-radioactive)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5182

Title: ANL-22 TREAT Septic Tank and Leaching Field
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5183
Title: ANL-23 TREAT Seepage Pit and Septic Tank W of 720 (filled 1980)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

NO ACTION SITES WAG 9 11/04/94

FILE NUMBER

AR1.6 NO ACTION SITES (continued)

· Document #: 5184
Title: ANL-24 Lab and Office Acid Neutralization Tank
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5185
Title: ANL-25 Interior Building Coffin Neutralization Tank
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

ADMIMSTRATIVE RECORD VOLUME III

· Document #: 5186
Title: ANL-26 Critical Systems Maintenance Degreasing Unit
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 091/21/92

· Document #: 5187
Title: ANL-27 Plant Services Degreasing Unit
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5188
Title: ANL-32 TREAT Control Building 721 Septic Tank and Leach Field (present)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

· Document #: 5189
Title: ANL-33 TREAT Control Building 721 Septic Tank and Leach Field

(removed 1978)
Author: Stewart, N. A.
Recipient: Sekot, M.
Date: 09/21/92

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

· Document #: 5475
Title: ANL-10, Dry Wells Between T-1 and ZPPR Mound
Author: N/A
Recipient: N/A
Date: 10/08/86

· Document #: 5476
Title: ANL-11, Waste Retention Tank 783 (Never Used)
Author: N/A
Recipient: N/A
Date: 09/09/86

· Document #: 5477
Title: ANL-12, Suspect Waste Retention Tank 783 (Removed 1979)
Author: N/A
Recipient: N/A
Date: 10/14/86

· Document #: 5478
Title: ANL-14, Suspect Tank and Drain Fields (2) by 753 (Tank Removed 1979)
Author: N/A
Recipient: N/A
Date: 10/05/86

· Document #: 5479
Title: ANL-15, Dry Well By 768
Author: N/A
Recipient: N/A
Date: 09/15/86

· Document #: 5480
Title: ANL-16, Dry Well By 759 (2)
Author: N/A
Recipient: N/A
Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

· Document #: 5481
Title: ANL-17, Dry Well By 720
Author: N/A
Recipient: N/A
Date: 10/06/86

· Document #: 5482
Title: ANL-18, Septic Tank and Drain Field by 789 (Removed 1979)
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5484
Title: ANL-20, Septic Tank and Leach Field by 793
Author: N/A
Recipient: N/A
Date: 10/05/86

· Document #: 5485
Title: ANL-21, TREAT Suspect Waste Tank and Leaching Field (Non-Radioactive)
Author: N/A
Recipient: N/A
Date: 10/02/86

· Document #: 5486
Title: ANL-22, TREAT Septic Tank and Leaching Field
Author: N/A
Recipient: N/A
Date: 10/03/86

· Document #: 5487
Title: ANL-23, TREAT Seepage Pit and Septic Tank W of 720 (Filled 1980)
Author: N/A
Recipient: N/A
Date: 10/05/86

· Document #: 5488
Title: ANL-24, Lab and Office Acid Neutralization Tank
Author: N/A
Recipient: N/A
Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

· Document #: 5489
Title: ANL-25, Interior Building Coffin Neutralization Tank
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5490
Title: ANL-26, Critical Systems Maintenance Degreasing Unit
Author: N/A
Recipient: N/A
Data: 10/05/86

· Document #: 5491
Title: ANL-27, Plant Services Degreasing Unit
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5496
Title: ANL-32, TREAT Control Building 721 Septic Tank and Leach Field (Present)
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5497
Title: ANL-33, TREAT Control Building 721 Septic Tank and Seepage Pit (Removed 1978)
Author: N/A
Recipient: N/A
Date: 10/03/86

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

· Document #: 5471
Title: ANL-04, ANL Sewage Lagoons, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/15/86

· Document #: 5483
Title: ANL-19, Sludge Pit W of T-7 (Imhoff Tank) (Filled in 1979), OU 9-01
Author: N/A

Recipient: N/A
Date: 10/21/86

· Document #: 5492
Title: ANL-28, EBR-II Sump (Regeneration), OU 9-01
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5493
Title: ANL-29, Industrial Waste Lift Station, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/23/86

· Document #: 5494
Title: ANL-30, Sanitary Waste Lift Station, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/08/86

· Document #: 5500
Title: ANL-36, TREAT Photo Processing Discharge Ditch, OU 9.01
Author: N/A
Recipient: N/A
Date: 07/21/87

TRACK I INVESTIGATION OF OPERABLE UNIT 9-01 11/18/96

FILE NUMBER

AR3.1 SAMPLING AND ANALYSIS PLAN*

· Document #: W7500-4234-NP-01, Rev. 1
Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
Author: Lee, S.D.
Recipient: Not specified
Date: 11/11/94

*This document can be found in OU 9-03, Volume II

AR3.5 TRACK INVESTIGATION

· Document #: 5704
Title: Track 1 Investigation of WAG 9, Site Code: ANL-19, Imhoff Tank and Sludge Pit
Author: ANL-W
Recipient: N/A

Date: 04/12/94

· Document #: 5743
Title: Track 1 Investigation of WAG 9, Site Code: ANL-28 EBR-II Sump
Author: ANL-W
Recipient: N/A
Date: 07/25/94

· Document #: 5744
Title: Track 1 Investigation of WAG 9, Site Code: ANL-30 Sanitary Waste Lift Station
Author: ANL-W
Recipient: N/A
Date: 07/27/94

· Document #: 5745
Title: Track 1 Investigation of WAG 9, Site Code: ANL-60 Knawa Butte Debris Pile
Author: ANL-W
Recipient: N/A
Date: 07/25/94

TRACK 1 INVESTIGATION OF OPERABLE UNIT 9-01 11/18/96

ADMINISTRATIVE RECORD VOLUME II
FILE NUMBER

AR3.5 TRACK INVESTIGATION (continued)

· Document #: 5758
Title: Track 1 Investigation of WAG 9, Site Code: ANL-04 ANL Sewage Lagoons - Proceed to Track 2 or RI/FS
Author: ANL-W
Recipient: N/A
Date: 07/25/94

· Document #: 5759
Title: Track 1 Investigation of WAG 9, Site Code: ANL-62 Sodium Boiler Building (766) Hotwell - No Further Action
Author: ANL-W
Recipient N/A
Date: 07/28/94

· Document #: 5760
Title: Track 1 Investigation of WAG 9, Site Code: ANL-63 Septic Tank 789-A - No Further Action
Author: ANL-W
Recipient: N/A
Date: 07/27/94

· Document #: 10293
Title: Addendum to the Previously Signed WAG 9 Track 1 ANL-W Sewage Lagoons, Site Code: ANL-04
Author: Not specified

Recipient: N/A
Date: 05/23/96

· Document #: 10294
Title: Addendum to the Previous Signed WAG 9 Track 1 ANL-W Industrial Lift Station, Site Code: ANL-29
Author: Not specified
Recipient: N/A
Date: 05/23/96

TRACK 1 INVESTIGATION OF OPERABLE UNIT 9-01 11/18/96

FILE NAME

AR3.5 TRACK 1 INVESTIGATION (continued)

· Document #: 10295
Title: Track 1 Investigation of WAG 9, Site Code: ANL-29 Industrial Waste Lift Station (778-A) - No Further Action
Author: ANL-W
Recipient: N/A
Date: 07/25/94

· Document #: 10302
Title: Track 1 Investigation of WAG 9, Site Code: ANL-36 TREAT Photo Processing Discharge Ditch - No Further Action
Author: DOE, EPA, IDHW
Recipient: N/A
Date: 07/25/94

· Document #: 10303
Title: Track 1 Investigation of WAG 9, Site Code: ANL-61 EBR-II Transformer Yard - No Further Action
Author: DOE, EPA, IDHW
Recipient: N/A
Date: 07/27/94

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 ANL-W
12/03/97

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

· Document #: 5473
Title: ANL-08, EBR-II Leach Pit (Radioactive), OU 9-02

Author: N/A
Recipient: N/A
Date: 10/24/86

AR2.1 SAMPLING AND ANALYSIS PLANS

· Document #: W7630-0004-ES-00
Title: Sampling and Analysis Plan - Sludge Removal and Waste Solidification - EBR-II Leach Pit
Author: Jannotta, D.
Recipient: ANL-W
Date: 09/06/93

AR2.2 SAMPLING AND ANALYSIS DATA/CHAIN OF CUSTODY FORMS (COC)

· Document #: 5277
Title: Report For The EBR-II Leach Pit Sampling and Analysis Program and Monitoring Well Installation
Author: Golder Associates
Recipient: Sekot, M.
Date: 05/18/93

ADMINISTRATIVE RECORD VOLUME II

AR2.4 EE/CA

· Document #: 5291
Title: Engineering Evaluation/Cost Analysis Report for EBR-II Leach Pit Removal for Inclusion into the Administrative Record File
Author: Marshall, G.C.
Recipient: Hughes, E.J.
Date: 06/15/93

TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 12/03/97

FILE NUMBER

AR3.3 WORK PLAN

· Document #: W7630-0002-ES-00
Title: Technical Work Plan - Sludge Removal and Waste Solidification - - EBR-II Leach Pit
Author: Jannotta, D.
Recipient: ANL-W
Date: 08/23/93

AR3.7 INTERIM ACTIONS

· Document #: W7630-0007-ES-00
Title: Spill Prevention, Control and Countermeasures Plan Sludge Removal and Waste Solidification - EBR-II Leach Pit
Author: Jannotta, D.

Recipient: ANL-W
Date: 08/24/93

AR3.8 RISK ASSESSMENT

· Document #: W7630-0006-ES-00
Title: Hazards Assessment for the EBR-II Leach Pit Sludge Removal Project at Argonne National Laboratory - West
Author: Jenkins, S.L.
Recipient: N/A
Date: 08/24/93

AR3.9 QUALITY ASSURANCE PROJECT PLAN

· Document #: W7630-0005-ES-00
Title: Quality Assurance Project Plan - Sludge Removal and Waste Solidification - EBR-II Leach Pit
Author: Jannotta, D.
Recipient: ANL-W
Date: 09/06/93

TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 12/03/97

FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

· Document #: DOE/ID-12584-162
Title: Preliminary Scoping Track 2 Summary Report for Operable Unit 9-02: EBR-II Leach Pit, Volumes I and II
Author: Not specified
Recipient: Not specified
Date: 04/11/94 (signed by Agencies on 05/23/96)

AR3.15 HEALTH AND SAFETY PLAN

· Document #: W7630-0003-ES-00
Title: Health and Safety Plan - Sludge Removal and Waste Solidification - - EBR-II Leach Pit
Author: Jannotta, D.
Recipient: ANL-W
Date: 08/16/93

AR3.16 CONTINGENCY PLAN

· Document #: W7630-0008-ES-00
Title: Contingency Plan for the EBR-II Leach Pit Sludge Removal Project at Argonne National- Laboratory - West
Author: Jenkins, S.L.
Recipient: N/A
Date: 08/25/93

AR10.3 PUBLIC NOTICE

· Document #: 5336
Title: Citizens Asked to Comment on Removal Action at Argonne National Laboratory - West (ANL-W)
Author: INEL Community Relations
Recipient: N/A
Date: 07/09/93

TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 12/03/97

FILE NUMBER

AR12.1 EPA COMMENTS

· Document #: 9597
Title: Review Comments - EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
Author: Jones, E.
Recipient: Green, L.
Date: 01/28/94

· Document #: 5742
Title: Review Comments - Argonne EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
Author: Jones, E.
Recipient: Green, L.
Date: 07/14/94

AR12.2 IDHW COMMENTS

· Document #: 10018
Title: Review Comments - EBR-II Leach Pit, Operable Unit 9-02 Track 2 Summary Report
Author: Rosenberger, S.
Recipient: Green, L.
Date: 05/05/95

AR12.4 REQUEST FOR EXTENSION

· Document #: AM/ERWM-RPO-279-92
Title: Request to Extend the Track 2 Investigation Summary Report Submittal Date for the Experimental Breeder Reactor (EBRH)-II Leach Pit, OU 9-02 at the INEL
Author: Lyle, J.L
Recipient: Pierre, W.; Nygard, D.
Date: 12/15/92

· Document #: 7551
Title: Request to Extend Track 2 Summary Report Date for the Experimental Breeder Reactor (EBR)-II Leach Pit, OU 9-02 at the INEL
Author: Pierre, W.

Recipient: Lyle, J.L.
Date: 12/31/92

TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-02 12/03/97

FILE NUMBER

AR12.4 REQUEST FOR EXTENSION (continued)

· Document #: 6092
Title: Approval to Extend the Track 2 Investigation Summary Report Submittal Date for the Experimental Breeder Reactor (EBR)-II Leach Pit, OU 9-02
Author: Nygard, D.
Recipient: Lyle, J.L.
Date: 01/11/93

· Document #: AM/ERWM-RPO-536-93
Title: Request For Further Extension of OU 9-02 Summary Report Target Date
Author: Lyle, J.L.
Recipient: Pierra, W.; Nygard, D.
Date: 08/19/93

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-03 ANL-W
09/29/97

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

· Document #: 5472
Title: ANL-05, ANL Open Burn Pits #1, #2, and #3, OU 9-03
Author: N/A
Recipient N/A
Date: 10/15/86

· Document #: 5495
Title, ANL-31, Industrial/Sanitary Waste Lift Station (Industrial Side Not Used), OU 9-03
Author: N/A
Recipient: N/A
Date: 10/22/86

· Document #: 5498
Title: ANL-34, Fuel Oil Spill by Building 755, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/14/86

ADMINISTRATIVE RECORD VOLUME II

AR3.1 SAMPLING AND ANALYSIS PLAN

· Document #: W7500-4234-NP-01, Rev. 1
Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
Author: Lee, S.D.
Recipient: Not specified
Date: 11/11/94

TRACK 2 INVESTIGATION OF OPERABLE UNIT 9-03 ANL-W 09/29/97

ADMINISTRATIVE RECORD VOLUME III
FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

· Document #: W7500-4244-NP-01, Vol. 1
Title: Revised Track 2 Summary Report for Operable Unit 9-03: Open Burn Pits (1, 2, and 3)Industrial/Sanitary Waste Lift Station, and the Fuel Oil Spill by Building 755,
Volume I
Author: Not specified
Recipient: Not specified
Date: 05/23/96

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMBER

· Document #: W7500-4244-NP-01, Appendix B, Section II
Title: Revised Track 2 Summary Report for Operable Unit 9-03: Open Burn Pit (1, 2, and 3), Industrial/Sanitary Waste Lift Station, and the Fuel Oil Spill by Building 755,
Volume II
Author: Not specified
Recipient: Not specified
Date: 05/23/96

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY OF OU 9-04 ANL-W
01/09/98

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITAL ASSESSMENT

· Document #: 5469
Title: ANL-01, Industrial Waste Pond and Cooling Tower Blowdown Ditches (3), OU 9-04
Author: N/A
Recipient: N/A
Date: 01/26/89

· Document #: 5470
Title: ANL-01A, Main Cooling Tower Blowdown Ditch, OU 9-04
Author: N/A
Recipient: N/A
Date: 01/26/89

· Document #: 5474
Title: ANL-09, ANL Interceptor Canal, OU 9-04
Author: N/A
Recipient: N/A
Date: 10/17/86

· Document #: 5499
Title: ANL-35, Industrial Waste Lift Station Discharge Ditch, OU 9-04
Author: N/A
Recipient: N/A
Date: 07/14/87

· Document #: 5501
Title: ANL-53, Cooling Tower Riser Pits, OU 9-04
Author: N/A
Recipient N/A
Date: 04/01/90

FILE NUMBER

AR3.1 SAMPLING AND ANALYSIS PLAN*

· Document #: W7500-4234-NP-01, Rev. 1
Title: Sampling and Analysis Plan for Operable Units 9-01, 9-03, and 9-04 at the Idaho National Engineering Laboratory: Track 1 Sampling, Track 2 Sampling, and RI/FS Screening Sample Collection
Author: Lee, S.D.
Recipient: Not specified
Date: 11/11/94

*This document can be found in OU 9-03, Volume II

ADMINISTRATIVE RECORD VOLUME II

AR3.3 WORK PLAN

· Document #: W75O0-0000-ES-03, Vol. I
  Title: Comprehensive RI/FS Final Work Plan for Waste Area Group 9
  Author: Lee, S.D.; Martin, C.J.; Rood, S.M.; VanHorn, R.L.; Hampton, N.L.
  Recipient: Not specified
  Date: 08/02/96

ADMINISTRATIVE RECORD VOLUME III

· Document #: W7500-0000-ES-03, Vol. II
  Title: Comprehensive RI/FS Final Work Plan for Waste Area Group 9
  Author: Lee, S.D.; Martin, C.J.; Rood, S.M.; VanHorn, R.L.; Hampton, N.L.
  Recipient: Not specified
  Date: 08/02/96

AR3.10 SCOPE OF WORK

· Document #: W7500-4248-ES-02, Rev. 2
  Title: Final Scope of Work for the Waste Area Group 9 Comprehensive Ramedial Investigation/Feasibility Study at the Idaho National Engineering Laboratory
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 11/09/95

REMEDIAL INVESTIGATION/FEASIBILITY STUDY OF OU 9-04 01/09/98

ADMINISTRATIVE RECORD VOLUME IV
FILE NUMMER

AR3.12 RI/FS REPORTS

· Document #: W7500-0000-ES-02, Rev. 2
  Title: Comprehensive Remedial Investigation/Feasibility Study for Argonne National Laboratory-West Operable Unit 9-04 at the Idaho National Engineering and Environmental Laboratory (FINAL), Vol. I
  Author: Lee, S.D.; Rohe, M.J.; Rood, A.S.; Stepan, I.E.
  Recipient: Not specified
  Date: 12/01/97

ADMINISTRATIVE RECORD VOLUME V

· Document #: W7500-0000-ES-02, Rev. 2
  Title: Comprehensive Remedial Investigation/Feasibility Study for Argonne National Laboratory-West Operable Unit 9-04 at the Idaho National Engineering and Environmental Laboratory (FINAL), Vol. II
  Author: Lee, S.D.; Rohe, M.J.; Rood, A.S.; Stepan, I.E.
  Recipient: Not specified
  Date: 12/01/97

AR4.3 PROPOSED PLAN

- Document #: 10441
  Title: Proposed Plan for Waste Area Group 9 - Argonne National Laboratory-West Idaho National Engineering and Environmental Laboratory
  Author: Lee, S.D.
  Recipient: Not specified
  Date: 01/01/98

NOTE: Sampling data can be examined at Argonne National Laboratory-West.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR
THE INITIAL ASSESSMENTS FOR THE ARGONNE NATIONAL LABORATORY-WEST WAG 9
08/16/93

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5469
  Title: ANL-01, Industrial Waste Pond and Cooling Tower Blowdown Ditches (3), OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5470
  Title: ANL-01A, Main Cooling Tower Blowdown Ditch, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 01/26/89

- Document #: 5471
  Title: ANL-04, ANL Sewage Lagoons, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- Document #: 5472
  Title: ANL-05, ANL Open Burn Pits #1, #2, and #3, OU 9-03
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- Document #: 5473
  Title: ANL-08, EBR-II Leach Pit (Radioactive), OU 9-02
  Author: N/A
  Recipient: N/A
  Date: 10/24/86

- Document #: 5474
  Title: ANL-09, ANL Interceptor Canal, OU 9-04
  Author: N/A
  Recipient: N/A
  Date: 10/17/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5475
  Title: ANL-10, Dry Wells Between T-1 and ZPPR Mound
  Author: N/A
  Recipient: N/A
  Date: 10/08/86

- Document #: 5476
  Title: ANL-11, Waste Retention Tank 783 (Never Used)
  Author: N/A
  Recipient: N/A
  Date: 09/09/86

- Document #: 5477
  Title: ANL-12, Suspect Waste Retention Tank 783 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/14/86

- Document #: 5478
  Title: ANL-14, Suspect Tank and Drain Fields (2) by 753 (Tank Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5479
  Title: ANL-15, Dry Well by 768
  Author: N/A
  Recipient: N/A
  Date: 09/15/86

- Document #: 5480
  Title: ANL-16, Dry Well By 759 (2)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5481
  Title: ANL-17, Dry Well By 720
  Author: N/A
  Recipient: N/A
  Date: 10/06/86

- Document #: 5482
  Title: ANL-18, Septic Tank and Drain Field by 789 (Removed 1979)
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5483
  Title: ANL-19, Sludge Pit W of T-7 (Imhoff Tank) (Filled in 1979), OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/21/86

- Document #: 5484
  Title: ANL-20, Septic Tank and Leach Field by 793
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5485
  Title: ANL-21, TREAT Suspect Waste Tank and Leaching Field (Non-Radioactive)
  Author: N/A
  Recipient: N/A
  Date: 10/02/86

- Document #: 5486
  Title: ANL-22, TREAT Septic Tank and Leaching Field
  Author: N/A
  Recipient: N/A
  Date: 1O/03/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5487
  Title: ANL-23, TREAT Seepage Pit and Septic Tank W of 720 (Filled 1980)
  Author: N/A
  Recipient: N/A
  Date: 10/05/86

- Document #: 5488
  Title: ANL-24, Lab and Office Acid Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5489
  Title: ANL-25, Interior Building Coffin Neutralization Tank
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5490
  Title: ANL-26, Critical Systems Maintenance Degreasing Unit
  Author N/A
  Recipient: N/A
  Data: 10/05/86

- Document #: 5491
  Title: ANL-27, Plant Services Degreasing Unit
  Author: N/A
  Recipient: N/A
  Date: 09/30/86

- Document #: 5492
  Title: ANL-28, EBR-II Sump (Regeneration), OU 9-01
  Author: N/A
  Recipient: N/A
  Data: 09/30/86

INITIAL ASSESSMENTS FOR ANL-W WAG 9 8/16/93

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5493
  Title: ANL-29, Industrial Waste Lift Station, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/23/86

- Document #: 5494
  Title: ANL-30, Sanitary Waste Lift Station, OU 9-01
  Author: N/A
  Recipient: N/A
  Date: 10/08/86

- Document #: 5495
  Title: ANL-31, Industrial/Sanitary Waste Lift Station (Industrial Side Not Used), OU 9-03

Author: N/A
Recipient: N/A
Date: 10/22/86

· Document #: 5496
Title: ANL-32, TREAT Control Building 721 Septic Tank and Leach Field (Present)
Author: N/A
Recipient: N/A
Date: 09/30/86

· Document #: 5497
Title: ANL-33, TREAT Control Building 721 Septic Tank and Seepage Pit (Removed 1978)
Author: N/A
Recipient: N/A
Date: 10/03/86

· Document #: 5498
Title: ANL-34, Fuel Oil Spill by Building 755, OU 9-01
Author: N/A
Recipient: N/A
Date: 10/14/86

INITIAL ASSESSMENTS FOR ANL-W WAG 9 8/16/93

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

· Document #: 5499
Title: ANL-35, Industrial Waste Lift Station Discharge Ditch, OU 9-04
Author: N/A
Recipient: N/A
Date: 07/14/87

· Document 5500
Title: ANL-36, TREAT Photo Processing Discharge Ditch, OU 9-01
Author: N/A
Recipient: N/A
Date: 07/21/87

· Document #: 5501
Title: ANL-53, Cooling tower Riser Pits, OU 9-04
Author: N/A
Recipient: N/A
Date: 04/01/90

AR6.1 COOPERATIVE AGREEMENTS

· Document #: ERD1-070-91*
Title: Pre-signature Implementation of the CERCLA Interagency Agreement

Action Plan
Author: EPA, Findley, C.E.
Recipient: DOE, Solecki, J.E.
Date: 04/19/91

· Document #: 3205*
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Data: 07/22/91

· Document #: 2919*
Title: INEL Action Plan For Implementation of the Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 07/22/91

INITIAL ASSESSMENTS FOR ANL-W WAG 9 8/16/93

FILE NUMBER

AR6.1 COOPERATIVE AGREEMENTS (continued)

· Document #: 1088-06-29-120*
Title: U.S. DOE INEL Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 12/04/91

· Document #: 3298*
Title: Response to Comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

· Document #: DOE/ID-10340(92)*
Title: Response to Comments on the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order
Author: N/A
Recipient: N/A
Date: 02/21/92

AR9.1 NOTICES ISSUED

· Document #: AM/SES-ESD-92-256*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Andrus, C.D.
Date: 07/07/92

· Document #: AM/SES-ESD-92-257*
Title: Natural Resource Trustee Notification
Author: Pitrolo, A.A.
Recipient: Polityka, C.
Date: 07/07/92

· Document #: AM/SES-ESD-92-258*
Title: Natural Resource Trustee Notification
Author: Pitrolio, A.A.
Recipient: Edmo, K.
Date: 07/07/92

INITIAL ASSESSMENTS FOR ANL-W WAG 9 8/16/93

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

· Document #: AM/SES-ESD-93-007*
Title: Invitation to Natural Trustee Representatives to Discuss Natural Resources and Environmental Restoration at the INEL
Author: Hinman, M.B.
Recipient: Addressee List
Date: 01/25/93

· Document #: AM/SES-ESD-93-097*
Title: Agenda for Meeting of Potential Natural Resource Trustees' on March 17, 1993
Author: Twitchell, R.L.
Recipient: Addressee List
Date: 03/02/93

· Document #: AM/SES-ESD-93-159*
Title: INEL Natural Resource Trustee Meeting "Group Memory" March 17, 1993
Author: Hinman, M.B.
Recipient: Addressee List
Date: 03/30/93

· Document #: AM/SES-ESD-93-162*
Title: Department of Energy Idaho Field Office (DOE-ID) Proposal for Consultation and Coordination between Natural Resource Trustees
Author: Hinman, M.B.
Recipient: Addresses List
Date: 04/02/93

· Document #: AM/SES-ESD-93-276*
Title: Department of Energy Idaho Field Office (DOE-ID) Action Item Report to Potential Natural Resource Trustees
Author: Hinman, M.B.
Recipient: Addressee List
Date: 06/16/93

· Document #: 5337*
Title: Natural Resource Trustee Representation Designation
Author: Andrus, C.D., Governor
Recipient: Pitrolo, A.A.
Date: 08/11/92

INITIAL ASSESSMENTS FOR ANL-W WAG 9 8/16/93

FILE NUMBER

AR9.1 NOTICES ISSUED (continued)

· Document #: 5338*
Title: Response to Natural Resource Notification
Author: Polityka, C.S.
Recipient: Pitrolo, A.A.
Date: 08/28/92

AR11.1 EPA GUIDANCE

· Document #: 5163, Revision 3*
Title: Administrative Record List of Guidance Documents
Author: EPA
Recipient: N/A
Date: 08/12/92

· Document filed In INEL Federal Facility Agreement and Consent Order (FFA/CO) Administrative Record Binder

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 09/28/1999
Operable Unit: 07
ROD ID: EPA/541/R-99/095

Text: Full-text ROD document follows on next page.

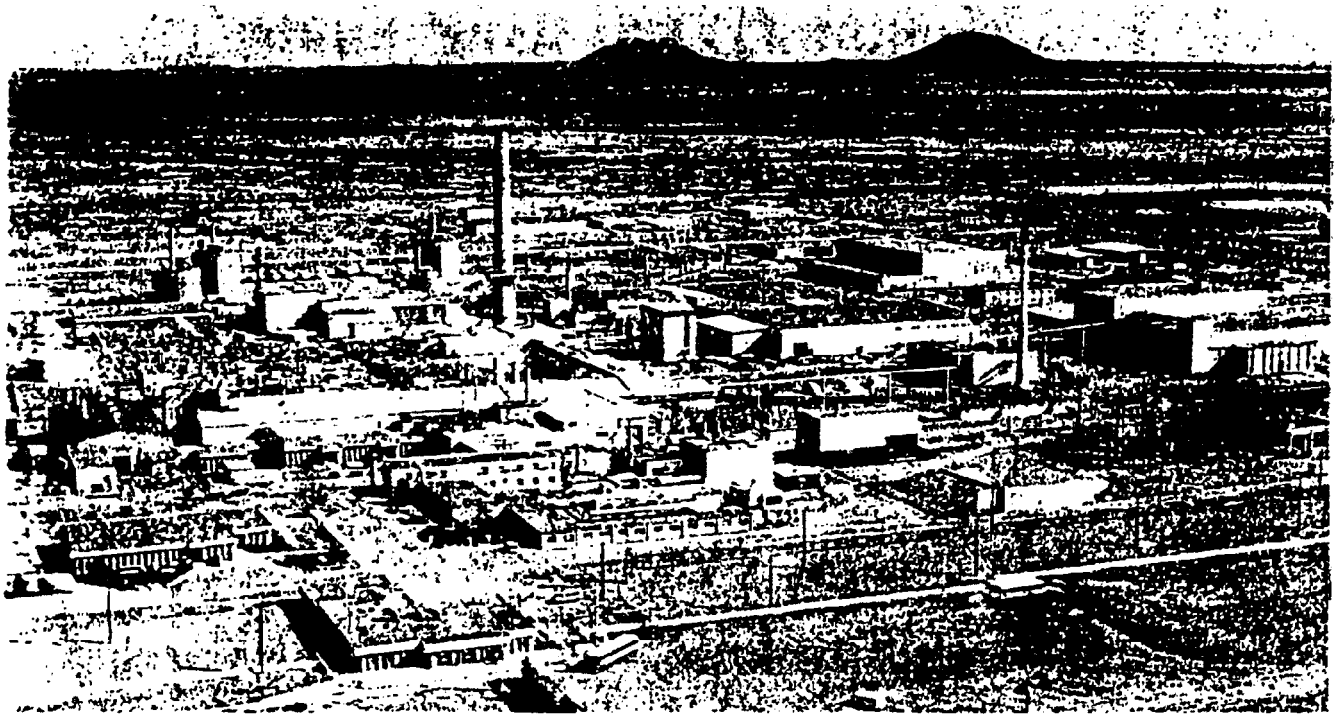
PB99-964606
EPA541-R99-095
1999

EPA Superfund
Record of Decision:

Idaho National Engineering Lab (USDOE)
OU 3-13
Idaho Falls, ID
9/28/1999

Final Record of Decision

Idaho Nuclear Technology and Engineering Center



Operable Unit 3-13
Idaho National Engineering and Environmental laboratory
Idaho Falls, Idaho

DOE/ID-10660
Revision 0

Final Record of Decision
Idaho Nuclear Technology and Engineering Center

September 1999

Operable Unit 3-13
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Idaho Nuclear Technology and Engineering Center, Waste Area Group 3
Operable Unit 3-13.
Idaho National Engineering and Environment Laboratory (CERCLIS ID 4890008952)
Idaho Falls, Idaho.

Statement of Basis and Purpose

The Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant) Waste Area Group (WAG) 3 is one of 10 Idaho National Engineering and Environmental Laboratory (INEEL) WAGs identified in the Federal Facility Agreement and Consent Order (FFA CO) by the U.S. Department of Energy Idaho Operations Office (DOE-ID), the U.S. Environmental Protection Agency (EPA) Region 10, and the Idaho Department of Health and Welfare (IDHW). Operable Unit (OU) 3-13 is listed as the "WAG 3 Comprehensive Remedial Investigation (RI) Feasibility Study (FS)" in the FFA/CO (DOE-ID 1991). The objective of the comprehensive RI/FS is to: (1) review previous WAG 3 Investigations, (2) investigate release sites not previously evaluated, (3) determine the risks posed by individual release sites and the overall risk posed by the WAG, and (4) identify, screen, and analyze remedial alternatives for release sites where risks are determined to be greater than allowable levels.

This Record of Decision (ROD) presents the disposition of 101 identified release sites including four newly identified sites. Sixty-one release sites were determined to exhibit unacceptable risks that if not addressed may present an imminent and substantial endangerment to human health and the environment. Appropriate remedies for 55 of the sites are described in this ROD, while the remaining six sites were judged to be more appropriately managed under other OUs, WAGs, or INEEL regulatory programs. Information is provided in this ROD to support the remedial action decisions for the 55 release sites where contamination presents unacceptable risks or poses a threat, and to support the "No Action" and “No Further Action” decisions for the other 40 sites. These remedial actions are chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The selected remedial actions are also intended to satisfy the requirements of the FFA/CO. These decisions are based on the Administrative Record for WAG 3, OU 3-13.

The DOE-ID is the lead agency for the remedy decisions under Executive Order 12580. The EPA approves the decisions, and along with the IDHW, has participated in the selection of the final remedies. The IDHW concurs with the selected remedies for the WAG 3 sites of concern, the "No Action" and “No Further Action” determinations, and the sites that will be administered under other INEEL regulatory programs. The basis for decisions are made in this ROD and documented in the Administrative Record for WAG 3. OU - 13. The DOE, EPA, and IDHW w ill be collectively referred to as the Agencies in this document.

Assessment of the Site

Fifty-five of the101 identified release sites within WAG 3 have actual or threatened releases of' hazardous substances that, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to human health and or the environment. Six other sites are identified in this ROD that will be managed under other OUs, WAGs, or INEEL regulatory programs. The response actions selected in this ROD are designed to reduce the potential threats to human health and or the environment to acceptable levels. The remaining 40 sites are designated as “No Action” or “No Further Action” sites. Thirty-four of these 40 sites are determined to have an acceptable risk to human health and or the environment, under current industrial and future potential residential land use, and are designated as "No Action" sites. The six other sites are identified as “No Further Action” and may present an unacceptable risk to human health if land use changes prior to 2095 or if future construction requires excavations below the assumed 3 m (10 ft) residential basement scenario.

Description of the Selected Remedies

The WAG 3 release sites were grouped according to shared characteristics or common contaminant sources. The seven groups include: (1) Tank Farm Soils, (2) Soils Under Buildings and Structures, (3) Other Surface Soils, (4) Perched Water, (5) Snake River Plain Aquifer (SRPA), (6) Buried Gas Cylinders, and (7) SFE-20 Hot Waste Tank System.. Because the release sites in each group have common characteristics or contaminants, a single remedy is selected for all release sites within each group. In addition, those sites classified as "No Further Action" sites require institutional controls to remain protective. Institutional Controls are also a part of the remedy for each of the seven groups described below. Institutional Controls will be established in accordance with the requirements set forth in the April 1999, EPA Region 10 Policy. The selected remedy for each group is described below.

Tank Farm Soils Interim Action (Group 1)

The Tank Farm Soils represent principal threat wastes due to direct radiation exposure to workers or the public, and due to potential leaching and transport of contaminants to the perched water or the SRPA, a sole source aquifer. A final remedy for the Tank Farm Soils release sites has been deferred pending further characterization and coordination of any proposed remedial actions with the Idaho High Level Waste (HLW) and Facilities Disposition (FD) Environmental Impact Statement (EIS), currently in preparation. A separate RI/FS, Proposed Plan, and ROD will be prepared for the Tank Farm Soils under OU 3-14. Interim actions were evaluated to provide protection until a final remedy is developed and implemented. The selected Tank Farm Soils Interim Action is Institutional Controls with Surface Water Control. The major components of this remedy include:

- Restrict access to control exposure to workers and prevent exposure to the public from soils at the Tank Farm until implementation of the final remedy under OU 3-14
- Accommodate a 1 in 25-year, 24-hour storm event with surface water run-on diversion channels
- Minimize precipitation infiltration by grading and surface sealing the Tank Farm Soils sufficient to divert 80% of the average annual precipitation falling on the Tank Farm Soils area
- Improve exterior building drainage to direct water away from the contaminated areas.

The Agencies believe this interim action w ill be protective of human health and the environment while the OU 3-14 RI/ FS is being performed and a final remedy is selected. The interim action will comply with applicable or relevant and appropriate requirements (ARARs), be cost effective, and is consistent with the expected final Tank Farm remedy or the HLW&FD EIS. The Tank Farm Soils group includes one new site, CPP-96 (Tank Farm Interstitial Soils). Site CPP-96 is a consolidation of all of the previously identified Tank Farm Soils sites and the intervening interstitial soils within the site CPP-96 boundary.

Soils Under Buildings and Structures (Group 2)

The major threats posed by Soils Under Buildings and Structures release sites are direct radiation exposure to workers or the public caused by intrusion into contaminated soils and potential soil contaminant leaching and transport to perched water or the SRPA. The purpose of the selected remedy is to minimize the potential for direct exposure to contaminated soils and to prevent or reduce the leaching of contamination from the soils to the perched water or SRPA.

Until the buildings and structures above these sites are closed, and decontamination and dismantlement (D&D) occurs, it is assumed that the building or structure limits infiltration of water through the contaminated soils and prevents direct exposure to the contaminated soils. The selected deferred action remedy for Soils Under Buildings and Structures is Institutional Controls and Containment. The major components of the selected remedy include:

- Implement institutional controls, including site access restrictions, and periodic inspections of buildings or structures to ensure that infiltration is limited and exposures to contaminated soil is prevented. Access to the Group 2 sites will be restricted through the use of warning signs. Notification of this restriction will be made to the affected local county governments, ShoBan Tribal Council, General Services Administration (GSA), U.S. Bureau of Land Management (BLM), and other agencies, as necessary.

- Assess completed D&D building or structure and release site configuration to determine if they prevent radiation exposures or limit contaminant migration to the SRPA, as would be achieved through meeting the substantive requirements of Idaho Administrative Procedures Act (IDAPA) 16.01.05.008 (40 Code of Federal Regulations [CFR 264.310). If the completed D&D configuration is assessed as inadequate for long-term protection of human health and the environment, then contaminated soils will be capped in conformance with the above referenced hazardous waste landfill closure requirements with an engineered barrier, or removed and disposed on-Site as discussed in the following section for Group 3 soils. Environmental monitoring and maintenance requirements will be included in the OU 3-13 post-ROD monitoring plan.

- The Waste Calciner Facility (WCF) has been closed under an approved Hazardous Waste Management Act (HWMA) closure plan and a post-closure monitoring and maintenance plan is required. In order to reduce the duplication of effort for monitoring and maintenance of the WCF, maintain consistency with the publicly-noticed WCF closure plan, and acknowledge the Resource Conservation and Recovery Act (RCRA)/CERCLA parity policv these requirements will be addressed under this ROD as ARARs. The WCF will be included during the CERCLA 5-year reviews with the Group 2 Soils Under Buildings and Structures sites and will address the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264-310). Additionally, these requirements will be incorporated into the post-ROD monitoring plan for OU 3-13.

Other Surface Soils (Group 3)

The Other Surface Soils release sites are also principal threat wastes due to potential external exposure of workers or the public to radionuclide-contaminated soils. The purpose of the selected remedy is to prevent external exposure to radionuclides at these sites and to allow these sites to be released for unrestricted use in the future. The selected remedy for Other Surface Soils is Removal and Onsite Disposal in the INEEL CERCLA Disposal Facility (ICDF). Those Group 3 release sites that, prior to excavation, are identified as part of the footprint of another program's closure activity and that, to the Agencies satisfaction, will be closed with equivalent protection to that afforded by the ICDF to groundwater and future users, will not be excavated but instead capped in place pursuant to the hazardous waste landfill closure substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310),

Major components of the selected remedy include:

- Remove contaminated soil and debris from Group 3 sites using the following conventional excavation methods:

  - Remove contaminated soils and debris above the 1×10^4 risk level based on an assumed future residential use in the Year 2095 and beyond and replace with clean soil, so that from the surface to a depth of 3 m (10 ft) the land can be released for future residential use. Contamination below 3 m (10 ft) may also be excavated at the discretion of the DOE, if determined to be more cost effective than maintaining necessary institutional controls, to prevent future drilling through deep contamination zones and transportation of contaminants to the underlying aquifer. In addition excavation activities below the 3 m (10 ft) depth that could cause the movement of contaminants either to the surface or to the underlying aquifer will also be controlled.

  - Dispose of contaminated soils and debris in the ICDF.

  - Survey and record contamination left in place at depths below 3 m (10 ft) for future institutional controls, as necessary.

  - Replace excavated soils with clean backfill and regrade.

- Construct the ICDF complex, which will include an engineered facility meeting RCRA Subtitle C, Idaho HWMA and polychlorinated biphenyl (PCB) landfill design and construction requirements. The ICDF will be located within the WAG 3 area of contamination (AOC). Design and operational requirements for the ICDF include:

  - Dispose only INEEL on-Site CERCLA wastes meeting agency-approved ICDF Waste Acceptance Criteria (WAC), to be developed during the remedial design, in the ICDF. An important objective of the WAC will be to assure that hazardous substances disposed in the ICDF will not result in exceeding groundwater quality standards in the underlying drinking water aquifer (SRPA), even if the ICDF leachate collection system were to fail after closure.

  - Design to have a total capacity of approximately 390,000 m^2 (510,000 yd^2).

- Engineer to meet IDAPA 16.01.05.008 (40 CFR 204.301) for hazardous waste. 40 CFR 761.75 for PCB, and DOE Order 435.1 for radioactive waste landfill design and operating substantive requirements.

- Locate in an area meeting hazardous waste, PCB waste, and low-level radioactive waste (LLRW) landfill siting requirements. Through a preliminary evaluation of all the relevant decision criteria, the Agencies have determined the "Study Area" for siting the ICDF to be CPP-67 Percolation Ponds and adjacent areas to the west. However, the specific ICDF cell locations will be determined through the completion of a comprehensive geotechnical evaluation of the entire Study Area, which shall be reviewed and approved by the Agencies. Siting criteria for the location of the ICDF included:

  - Outside the 100-year flood plain

  - Outside of wetland areas

  - Not in active seismic zones

  - Not in high surface erosion areas

  - Not in an area of high historic groundwater table.

- Construct and operate an ICDF supporting complex, including a waste Storage, Sizing, Staging, and Treatment (SSST) facility, in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subparts DD, I, J, and X) and IDAPA 16.01.05.006.01 and 16.01.05.006.02 (40 CFR 262.34[a][1]). It is anticipated that this facility will consist of a storage/staging building, an evaporation surface impoundment, a waste shredder, solidification stabilization tanks, and associated equipment. Operations at the facility will include chemical/physical treatment to prepare ICDF wastes to meet Agency-approved WAC and RCRA land disposal restrictions (LDRs).

- Use one or more remediation waste staging and storage areas to stage and handle remediation waste. Operate the storage areas in accordance with the substantive requirements of IDAPA 16.01.05.006.01 and 16.01.05.006.02 (40 CFR 262.34[a][1]).

- Manage and treat monitoring well construction and sampling wastes generated prior to construction of the ICDF and SSST (i.e., purge water, decontamination water, and drill cuttings) Using remediation waste staging piles and temporary treatment unit in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554). Accomplish treatment using mobile tankage and physical chemical treatment and comply with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subpart J. BB. and CC).

- Construct and designate an evaporation pond as a Corrective Action Management Unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.552 and 40 CFR 264 Subparts K and CC) for the purpose of managing ICDF leachate and other aqueous wastes generated as a result of operating the ICDF complex.

– Operate, close, and post-close the ICDF complex in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subparts G, F, and N), and maintain site access restrictions and institutional controls throughout the post-closure period.

Perched Water (Group 4)

The INTEC Perched Water does not currently pose a direct human health and or environmental threat. This perched water exists primarily as a result of facility water usage and subsequent discharge to percolation ponds at INTEC. It is not used as a source of drinking water and is expected to disappear when INTEC operations cease. However, perched water does pose a threat as a contaminant transport pathway to the SRPA. Contaminants already in the perched water are a potential source of SRPA contamination. The perched zone may impact SRPA groundwater quality because it is a contaminant transport pathway between contaminated surface soils and the SRPA. Although a future water supply well screened in the perched water is not capable of providing sufficient water for domestic use purposes, restrictions will be required to prevent any future attempts to use perched water after 2095 when INEEL-wide institutional controls are projected to end. A response action is necessary to minimize or eliminate the leaching and transport of contaminants from the perched water to the SRPA and to prevent future perched water use.

The selected remedy for the Perched Water is Institutional Controls with Aquifer Recharge Control. This remedy includes:

- Implement institutional controls (to include a DOE-ID Directive limiting access) to prevent perched water use while INTEC operations continue and to prevent future drilling into or through the perched zone (through noticing this restriction to local county governments, ShoBan Tribal Council, GSA, BLM, and other agencies as necessary).

- Implement remedies to control surface water recharge to perched water beneath INTEC by specifically taking the existing INTEC percolation ponds, which are estimated to contribute about 70% of the perched water recharge, out of service. Limiting infiltration to the perched water will minimize potential releases to the SRPA by reducing the volume of water available for contaminant transport. Design, construction, and operate replacement ponds outside of the INTEC perched water area following the removal of the existing INTEC percolation ponds from service. The replacement percolation ponds will be sited about 3,048 m (10,000 ft) southwest of the INTEC and will be operational on or before December 2003.

- In addition, minimize recharge to the perched water from lawn irrigation, and lining the Big Lost River segment contributing to the INTEC perched water zones, if additional infiltration controls are necessary. Implement additional infiltration controls if the recession of the Perched Water zone does not occur as predicted by the RI/FS vadose zone model within 5 years of removing the percolation ponds. If implementation of the additional infiltration controls is necessary, implement as a second phase to the Group 4 remedy.

- Measure moisture content and contaminant of concern (COC) concentration(s) in the perched water zones to determine if water contents and contaminant fluxes are decreasing as predicted. Also use these data to verify the OU 3-13 vadose zone model and determine potential impact to the SRPA.

Snake River Plain Aquifer (Group 5)

The major human health threat posed by contaminated SRPA groundwater is exposure to radionuclides via ingestion by future groundwater users. Based on the groundwater simulations presented in the FS (DOE-ID 1997a) and FS Supplement (FSS) (DOE-ID 1998a), removal of the existing percolation ponds from service will significantly reduce the concentrations of contaminants in SRPA groundwater by 2095. Additional remedial action may be necessary to meet the groundwater maximum contaminant levels (MCLs) of 4 mRem/yr for beta particle and photon-emitting radionuclides. Remedial action for the SRPA is bounded by the contaminant plume that exceeds Idaho groundwater quality standards or the federal MCLs for I-129, H-3, and Sr-90.

An interim action is selected for the SRPA. While the remediation of contaminated SRPA groundwater outside of the current INTEC security fence is final, the final remedy for the contaminated portion of the SRPA inside of the INTEC fence line is deferred to OU 3-14. As a result of dividing the SRPA groundwater contaminant plume associated with INTEC operations into two zones, the remedial action described herein is classified as an interim action. The selected interim action remedy for the SRPA is Institutional Controls with Monitoring and Contingent Remediation. The SPPA interim action remedy includes:

- Implement institutional controls over the area of the aquifer that exceeds the MCLs for H-3, I-129, and Sr-90 (to include a DOE-ID Directive limiting access) to prevent groundwater use while INTEC operations continue, and to restrict future groundwater use (through noticing this restriction to local county governments, ShoBan Tribal Council, GSA, BLM, etc.), including site access restrictions, drilling restrictions, and maintenance during DOE operations at INTEC.

- Implement institutional controls, including land use restrictions to prevent the use of SRPA groundwater over the area of the aquifer that exceeds the MCLs for H-3, I-129, and Sr-90, until drinking water standards are met, which are projected to be achieved by 2095.

- Construct new SRPA monitoring wells outside of the current INTEC security fence to assess whether MCLs will be exceeded after 2095.

- If observed COC(s) concentrations exceed their action levels at a sustained pumping rate of at least 0.5 gpm for 24 hours, implement pump and treatment remedial action. Extract contaminated SRPA groundwater from the zone of highest contamination and treat to reduce the contaminant concentrations to meet MCLs by 2095. The action level is the modeled maximum concentration predicted in the year 2000 so that the MCL will not be exceeded in 2095 (the projected end of the institutional control period).

- It is anticipated that standard pump and chemical,/physical treatment (which may include evaporation in the ICDF Complex surface impoundment) will be able to meet the aquifer restoration goal. Conduct treatability studies, which include a technical evaluation of treating the I-129 and other COCs, as part of this remedy. These studies may include valuation of the ability to treat and selectively withdraw contaminants from the aquifer. It s estimated that these studies will not extend more than 12 months and are limited to a total cost of $2 million.

- If the treatabillty studies indicate the presence of sufficient quantities of I-129 and other COCs, and contaminated groundwater can be selectively extracted and cost-effectively

treated to meet the drinking, water MCLs outside the current INTEC security fence by 2095, then implement active remediation.

- Either return treated water to the aquifer through land recharge in accordance with the Idaho Wastewater Land Application ARARs if a recharge impoundment is used; or in accordance with National Pollutant Discharge Elimination System (NPDES),State Pollutant Discharge Elimination System (SPDES) ARARs if the treated effluent is discharged to the Big Lost River, which recharges the aquifer downstream of the INTEC facility; or evaporate in the ICDF complex evaporation pond or equivalent.

Buried Gas Cylinders (Group 6)

The Buried Gas Cylinders pose a safety hazard to inadvertent intruders (i.e., backhoe operators or drillers). The cylinders are presumed to be pressurized and could burst during excavation. In addition, hydrofluoric acid, which may be present in the cylinders, is very corrosive, reacts violently with moisture, and can generate explosive concentrations of hydrogen gas. The selected remedy for the Buried Gas Cylinders is Removal, Treatment, and Disposal. This alternative includes:

- Remove the gas cylinders using a contractor specializing in gas cylinder removal
- Treat the cylinder contents, if necessary
- Recycle or dispose of the empty gas cylinder containers.

The Agencies may elect to pursue a contingent remedy of capping in place pursuant to the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310) if safety concerns with excavation and removal prevent implementation of the selected remedy.

SFE-20 Hot Waste Tank System (Group 7)

The major threat posed by the SFE-20 Hot Waste Tank System is leaching and transport of contaminants to the SRPA and subsequent exposure of future groundwater users to radionuclides via ingestion. The selected alternative for the SFE-20 Hot Waste Tank System is Removal, Treatment, and Disposal. This alternative includes:

- Remove and treat on-site the liquid and sludge contents of the tank.
- Excavate and remove the tank, vault, and associated structures.
- Land dispose treated waste, the tank, vault, and other debris. The preferred disposal site is the ICDF; however, if any residue or material fails to meet the ICDF WAC, an alternate Suitable disposal facility will be identified during the remedial design.
- Remove and treat off-site, if wastes found in the tank are alpha-LLW (i.e., exceed 10 nCi-g transuranic [TRU] constituents [alpha emitters with an atomic number greater than 92 and a half-life exceeding 20 years]) or TRU wastes (i.e., greater than 100 nCi g TRU).

“No Action” Sites

Ten sites were determined to be “No Action” sites with the signing of the FFA/CO. Twenty-four additional “No Action” sites have been determined in this ROD. These sites each represent less than 1 x 10^{-4} risk and a hazard index (HI) of less than 1 for the potential residential scenario, and could be available for current unrestricted use.

“No Further Action” Sites

Six of the 101 sites addressed in this ROD are classified as “No Further Action” sites and require only institutional controls to remain protective. These controls will ensure that the land use will remain industrial until at least 2095 at which time contaminant levels will be reduced sufficiently to be protective for residential use. Those sites with contamination at depths below traditional residential construction (i.e., 3 m [10 ft]), that do not require remedial action to safeguard the drinking water aquifer from future contaminant releases, will continue to require institutional controls to prevent excavation or drilling below 3 m (10 ft) to remain protective.

Closed and Closing RCRA/HWMA Sites

Sites being closed under RCRA/HWMA will be handled as previously described for the WCF. The WCF has been closed under an approved HWMA closure plan and a post-closure monitoring and maintenance plan is required. In order to reduce the duplication of effort for monitoring and maintenance of the WCF, maintain consistency with the publicity-noticed WCF closure plan, and acknowledge the RCRA/CERCLA parity policy, these requirements will be addressed under this ROD as ARARs. The WCF will be included during the CERCLA 5-year reviews with the Group 2 Soils Under Buildings and Structures release sites and will address the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310). Additionally these requirements will be incorporated into the post-ROD monitoring plan for OU 3-13.

Disturbances of OU 3-13 Sites

The INTEC facility is an operating facility. As such, periodic maintenance and upgrade activities will be conducted during the implementation of the remedial actions under this ROD. Prior to conducting any site disturbance activities, the Agencies will be notified to the extent of any disturbance, and will be provided a plan for their approval, including necessary corrective actions that will be performed to ensure that the remedies identified in this ROD remain operational and functional. A formal system for notification and approval of disturbances to OU 3-13 sites will be developed during the remedial design.

Sites Managed Under Other Operable Units, WAGs, or INEEL Regulatory Programs

Six of the release sites identified in WAG 3 are outside the scope of this ROD and, therefore, will be managed under other OUs, WAGs, or other INEEL regulatory programs. Site CPP-38 (asbestos in nine INTEC buildings) will be addressed by the INEEL Asbestos Management Program. Site CPP-65 (Sewage Treatment Plant Lagoons) will be addressed under the Idaho Wastewater Land Application Rules. Site CPP-66 (Steam Plant Fly Ash Pits) only presents a potential ecological risk and will be addressed under CERCLA OU 10-04, which focuses on INEEL-wide ecological risk concerns. Sites CPP-61, -81, and -82 will be further evaluated and addressed under the OU 3-14 RI/FS.

New Sites

Four new sites are identified in this ROD. Site CPP-96 (Tank Farm Interstitial Soils) is a consolidation of all of the previously identified Tank Farm release sites and the intervening interstitial soils within the site CPP-96 boundary. This site also includes three sites that were determined through the Track 2 process to be "No Action" sites. The final remedy for release site CPP-96 will be addressed in the OU 3-14 Tank Farm RI FS along with other Group 1 sites. Release site CPP-97 (Tank Farm Soil Stockpile), CPP-98 (Tank Farm Shoring Boxes), and CPP-99 (Boxed Soil) are added to this ROD to address soil stockpiles and wood construction debris that originated from the Tank Farm upgrade and or the building CPP-604 tunnel egress projects. These sites are included as part of the OU 3-13 Group 3 sites and will be remediated accordingly.

Statutory Determination

The selected remedy for each release site group, the "No Action" sites, and "No Further Action" sites have been determined to be protective of human health and/or the environment, to comply with federal and state regulations that are ARARs for the remedial actions, and to be cost-effective.

The selected remedies use permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected remedies for the Buried Gas Cylinder sites (Group 6) and the SFE-20 Hot Waste Tank System (Group 7) incorporate treatment, and the selected interim action remedy for the SRPA (Group 5) incorporates treatment if COCs in the aquifer outside the current INTEC security fence exceed action levels. However, treatment of radionuclide-contaminated soil and perched water was not found to be practicable for the other groups and, therefore, the selected remedies for the Soils Under Buildings or Structures (Group 2), Other Surface Soils (Group 3), and Perched Water (Group 4) do not satisfy the statutory preference for treatment as a principal element of the remedy. The EPA's preferred remedy for sites that pose relatively low, long-term threats, or where treatment is impracticable, is engineering controls, such as containment. The selected remedial alternatives for Soils Under Buildings or Structures (Group 2) and Perched Water (Group 4) will result in contaminants left in place at concentrations exceeding health-based concentrations for direct exposure, but the contaminants will not be available to present unacceptable risk to human health and/or the environment.

Because these remedies will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of the remedial actions to ensure that each remedy is, or will be, protective of human health and the environment. This review will also assess the need for continued long-term environmental monitoring, administrative controls, and institutional controls at each group and "No Further Action" site. Reviews will be held no less frequently than every 5 years thereafter to ensure that the remedies continue to be protective. These periodic reviews will be discontinued when the Agencies determine that the sites no longer pose an unacceptable risk to human health and/or the environment and site access or use restrictions are no longer required.

The 5-year reviews will evaluate factors such as contaminant migration from sites where contamination has been left in place, newly discovered sites, effectiveness of institutional control, and effectiveness of the remedial actions. For remedies incorporating institutional controls, it is assumed that institutional control will remain effectiveness until the year 2095. Additional institutional controls will apply to specific sites after 2095. This time period is consistent with the 100-year industrial land use assumption for the INTEC.

Sites for which "No Further Action" determinations were made, based on an industrial land use assumption through 2095, and residential thereafter, will be included in the 5-year reviews. These reviews will evaluate whether the "No Further Action" determination is still appropriate for the current and projected land uses at the time of the review.

Sites for which "No Action" determinations have been made based on no evidence of a source or release or where the risk is less than 1×10^{-4} or a HI less than 1 will not require institutional controls or 5-year reviews.

It is possible that new information will be discovered in the future during routine operations, maintenance activities, and/or D&D activities that will require additional remedial actions be taken at the sites listed in this ROD. Through the 5-year review process, the Agencies will evaluate new information to ensure that the selected remedy, including institutional controls, remain protective.

As INTEC is an operating facility, it is possible that changes in physical configuration of INTEC may uncover new sites or change the residual risk posed by those sites addressed under this ROD. Any planned disturbance at a site for which action is required under this ROD (including the "No Further Action" sites with institutional controls) will be preceded by appropriate planning documents to be submitted to and concurred on by the Agencies prior to implementation. Newly discovered sites will be subject to remedial action pursuant to the terms and conditions of the FFA/CO.

The following information is included in the decision summary section of this ROD; additional information can be found in the Administrative Record for WAG 3:

- COCs and their respective concentrations
- Baseline risks represented by the COCs
- Cleanup levels established for the COCs and the basis for the action levels
- Current and future land and groundwater use assumptions
- Land and groundwater use available at the site as a result of the remedy
- Estimated capital, operations and maintenance, and net present value costs, discount rate, and number of years over which costs are projected
- Description of alternatives
- Evaluation of the remedial action alternatives
- Decision factors that lead to selection of the remedies.

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 3-13, for the Idaho Nuclear Technology and Engineering Center, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Clarke

Chuck Clarke, Regional Administrator
Region 10
U.S. Environmental Protection Agency

9/28/99
Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 3-13, for the Idaho Nuclear Technology and Engineering Center, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

C. Stephen Allred, Administrator
Division of Environmental Quality
Idaho Department of Health and Welfare

10/7/99
Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 3-13, for the Idaho Nuclear Technology and Engineering Center, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Beverly A Cook

Beverly A. Cook, Manager
Idaho Operations Office
U.S. Department of Energy

9-30-99

Date

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ACRONYMS

ALARA	as low as reasonably achievable
AOC	area of contamination
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
BLM	U.S. Bureau of Land Management
CAB	Citizens Advisory Board
CFR	Code of Federal Regulations
COC	contaminant of concern
COCA	Consent Order and Compliance Agreement
COPC	contaminant of potential concern
cpm	counts per minute
CSM	conceptual site model
COPC	contaminant of potential concern
D&D	decontamination and dismantlement
DEQ	Division of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EBR	Experimental Breeder Reactor
EBSL	ecologically based screening level
EECA	engineering evaluation cost analysis
EIS	Environmental Impact Statement
EPA	U. S. Environmental Protection Agency

ERA	ecological risk assessment
ESRP	Eastern Snake River Plain
FFA CO	Federal Facility Agreement Consent Order
FD	facilities disposition
FR	Federal Register
FS	f'easibility study
FSS	feasibility study supplement
GSA	General Services Administration
HEPA	high-efficiency particulate air
HEU	Highly Enriched Uranium
HHRA	human health risk assessment
HI	hazard index
H-1	a designation for a sedimentary interbed located between the H and I basalt layers.
HLW	high-level waste
HLLW	high-level liquid waste
HQ	hazard quotient
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
ICPP	Idaho Chemical Processing Plant
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Heath and Welfare
IDW	investigation derived waste
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	Land Disposal Restrictions

LITCO	Lockheed Idaho Technology Company Inc.
LLW	low-level waste
LMITCO	Lockheed Martin Idaho Technologies Company
MCL	maximum containment level
MCP	Management Control Procedure
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
NSR	no surface risks
NWCF	New Waste Calcining Facility
O&M	operating and maintenance
OU	operable unit
OSWER	Office of Solid Waste and Emergency Response
PCB	polychlorinated biphenyl
PEW	Process Equipment Waste
PPE	personal protective equipment
R&A	relevant and appropriate
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD RA	remedial design remedial action
RfD	reference dose
RI	remedial investigation
RI BRA	remedial investigation baseline risk is assessment
ROD	Record of Decision

RWMC	Radioactive Waste Management Complex
SARA	Superfund Amendment Reauthorization Act
SCM	site conceptual model
SF	slope factor
SLERA	screening level ecological risk assessment
SNF	spent nuclear fuel
SRPA	Snake River Plain Aquifer
SSST	storage, stagings, sizing, and treatment
STP	sewage treatment plant
SVOC	semi-volatile organic compound
SWP	service waste percolation pond
TBC	to-be-considered
TCLP	toxicity characteristic leaching procedure
T E	threatened and or endangered
TRA	Test Reactor Area
TRU	transuranic
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TU	temporary unit
UCL	upper confidence level
UREP	Utility Replacement and Expansion Project
UTL	upper tolerance level
VOC	volatile organic compound
WAG	Waste area group

WCF	Waste Calcining Facility
WERF	Waste Experimental Reduction Facility
WINCO	Westinghouse Idaho Nuclear Company Inc.
WIPP	Waste Isolation Pilot Plant
WWP	Warm Waste Pond

Final Record of Decision
Idaho Nuclear Technology and Engineering Center
Operable Unit 3-13

1. DECISION SUMMARY

NOTE: *The Idaho Nuclear Technology and Engineering Center (INTEC) was formerly known as the Idaho Chemical Processing Plant (ICPP). The facility name was changed in 1998 to more accurately reflect the operational mission. The previously published supporting documents use the ICPP nomenclature.*

1.1 Site Name, Location, and Description

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE) located 5 1.5 km (32 mi) west of Idaho Falls, Idaho, and occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain (ESRP). The Idaho Nuclear Technology and Engineering Center (INTEC) is located in the south-central portion of the INEEL, as shown in Figure 1-1.

Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management. Surrounding areas are for multipurpose use and are managed by the U.S. Bureau of Land Management (BLM). The developed area within the INEEL is surrounded by a 1,295-km^2 (500-mi^{-2}) buffer zone used for cattle and sheep grazing. Communities nearest to the INTEC are Atomic City (south), Arco (west), Butte City (west), Howe (northwest). Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land. 45% is open land, and 10% is urban. Sheep, cattle, hogs, poultry, and dairy cattle are produced; and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. Private individuals or the U.S. Government own most of the land surrounding the INEEL, as shown in Figure 1-2.

Public access to the INEEL is strictly controlled by fences and security personnel. State Highways 22, 28,and 33 cross the northeastern portion of the INEEL approximately 32.2 km (20mi) from INTEC, and U.S. Highways 20 and 26 cross the southern portion approximately 8 km (5mi) from INTEC. A total of 145 km (90 mi) of paved highways pass through the INEEL and are used by the general public.

To better manage environmental investigations, the INEEL is divided into 10 waste area groups (WAGs). Identified contaminant release sites in each WAG were grouped into operable units (OUs) to expedite the investigations and any required remedial actions. The INTEC is designated as WAG 3, which was subdivided into 13 OUs that were investigated for contaminant releases to environmental pathways. Within these 13 OUs, 101 release sites were identified. This Record of Decision (ROD) applies to 55 of the 101 sites, which, on the basis of the comprehensive remedial investigation (RI) feasibility study (FS) for WAG 3 (OU 3-13), were identified posing a potential risk or threat to human health and or the environment. Of the 101 sites. 40 are recommended for "No Action" or “No Further Action.” The six remaining sites (CPP-65, CPP-38, CPP-66, CPP-61, CPP-81, and CPP-82 will be managed under other OUs, WAGs or INEEL regulatory programs.

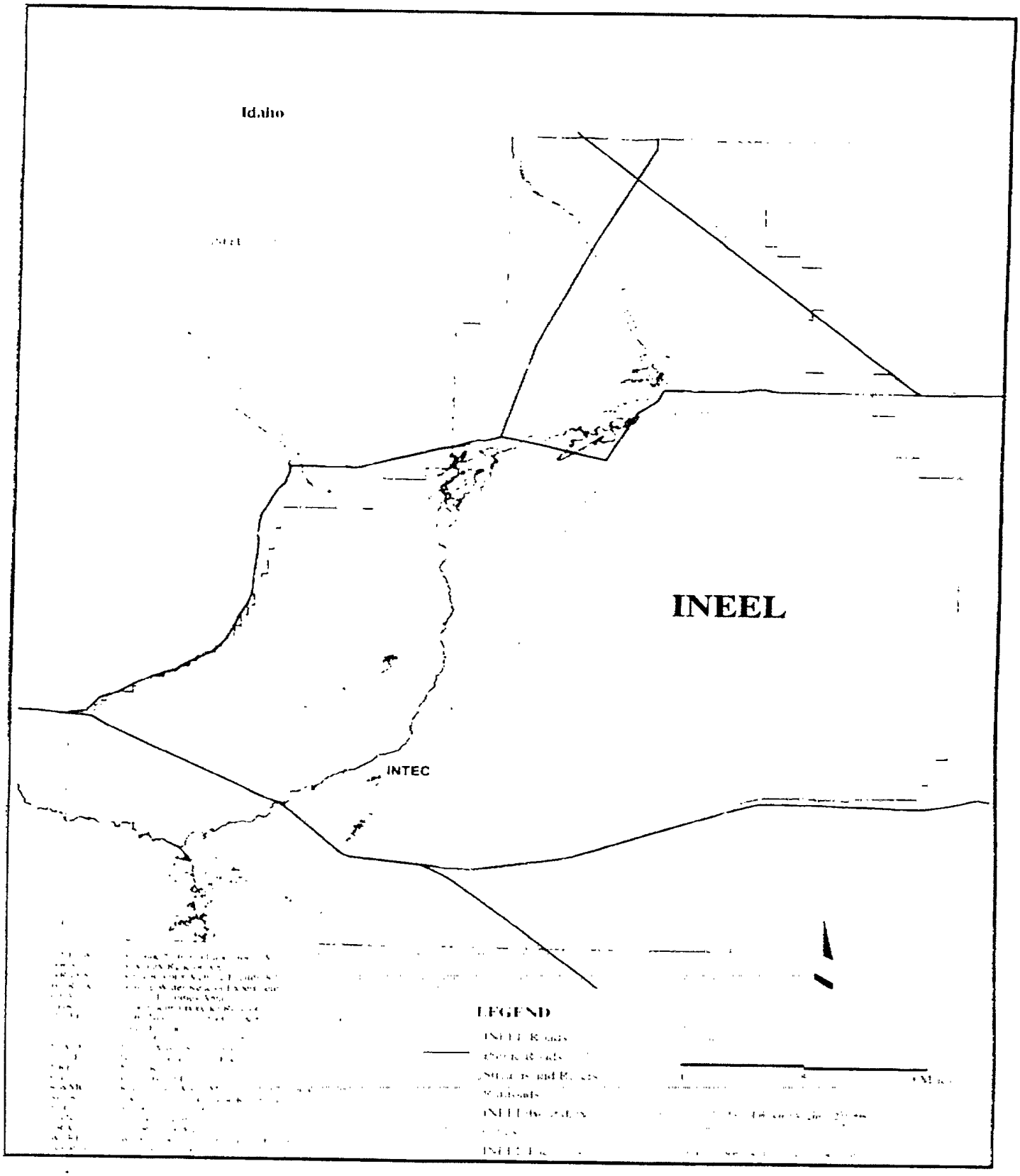

Figure 1-1. Location of the Idaho Nuclear Technology and Engineering Center

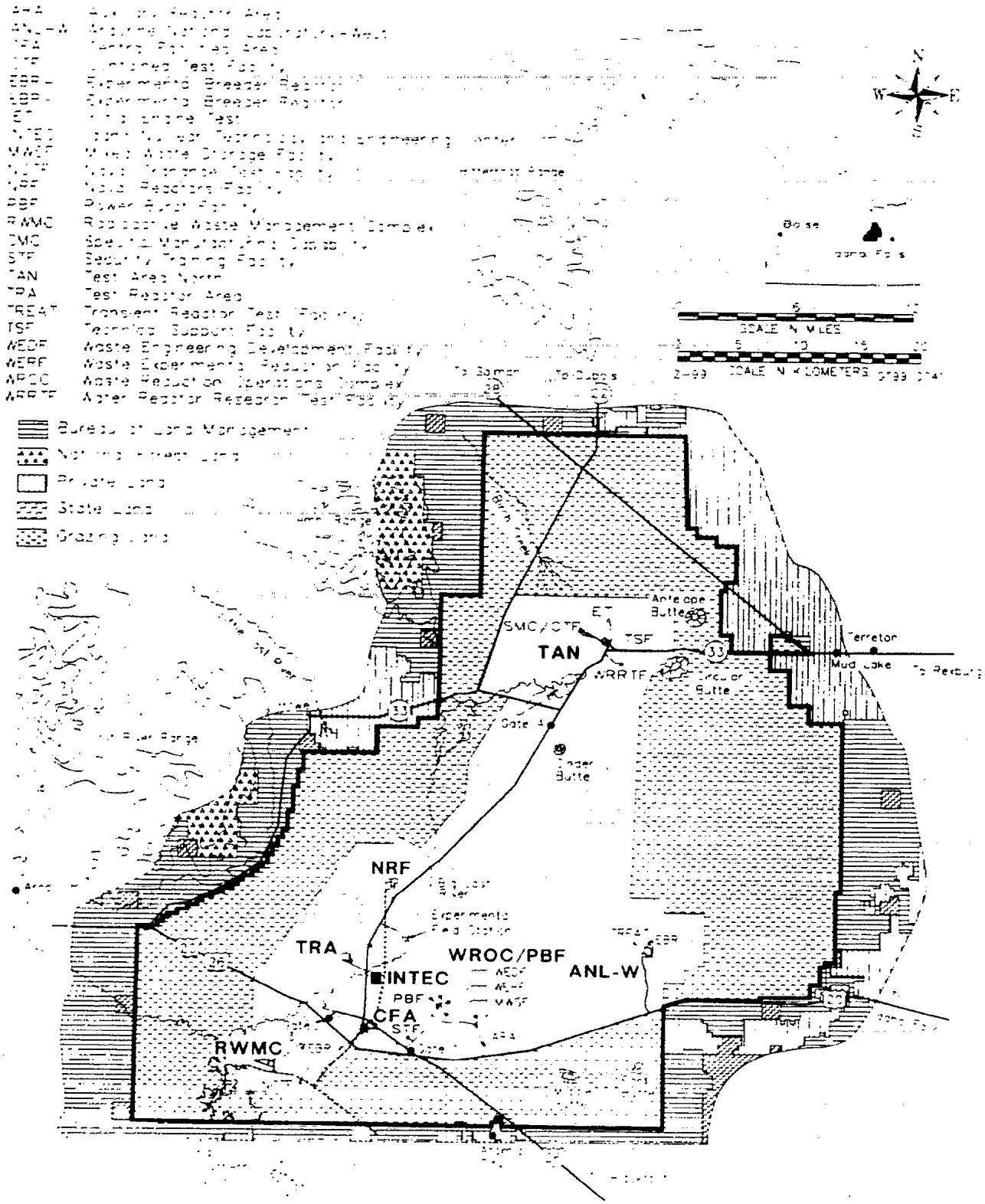

Figure 1-2. Land ownership distribution in the vicinity of INEEL and onsite areas open for permit grazing

The 55 release sites with identified risks greater than 1×10^{-4} or that pose a threat to human health and or the environment require remedial action to mitigate these risks or threats. The 55 sites were divided into seven groups based on similar media, contaminants of concern (COCs), accessibility, or geographic proximity. The seven groups are:

- Group 1: Tank Farm Soils
- Group 2: Soil Under Buildings and Structures
- Group 3: Other Surface Soils
- Group 4: Perched Water
- Group 5: Snake River Plain Aquifer
- Group 6: Buried Gas Cylinders
- Group 7: SFE-20 Hot Waste Tank System.

The locations of these groups are shown in Figures 1-3 through 1-9.

During the RI FS and subsequent remedy development, data gaps were identified. In some cases the missing data were important enough to prevent selection of final remedies. Because delays in restoration were undesirable, OU 3-14 was created. Where available information was insufficient to select a Final remedy in OU 3-13, interim actions were developed for implementation in the OU 3-13 ROD with the Final remedy relegated to OU 3-14. Specifically, Group 1, Tank Farm Soils, and Group 5, the Snake River Plain Aquifer (SRPA), are interim actions in this ROD and are included in OU 3-14 for final remedy selection.

To allow flexibility in managing the remediation of the various groups discussed above, an OU 3-13 area of contamination (AOC) was designated as shown in Figure 1-10. An AOC is an area of contiguous surface contamination that can be used for consolidation of remediation wastes without triggering Land Disposal Resolutions and other Resource Conservation and Recovery Act (RCRA) requirements.

Action sites and cleanup levels are based on a 1×10^{-4} carcinogenic risk. For Cs-137, contaminated soils will be cleaned up to below 23 pCi g for the future residential use scenario. The backround Cs- 137 activity is approximately 1 pCi g, which is equivalent to a 10^{-4} excess carcinogenic risk. The acceptable risk for cleanup to future residential standards for Cs- 137 is 1×10^{-4} by the year 2095. "No Further Action" sites are sites that represent a threat if land use was residential, but do not represent a threat under an industrial land use scenario.

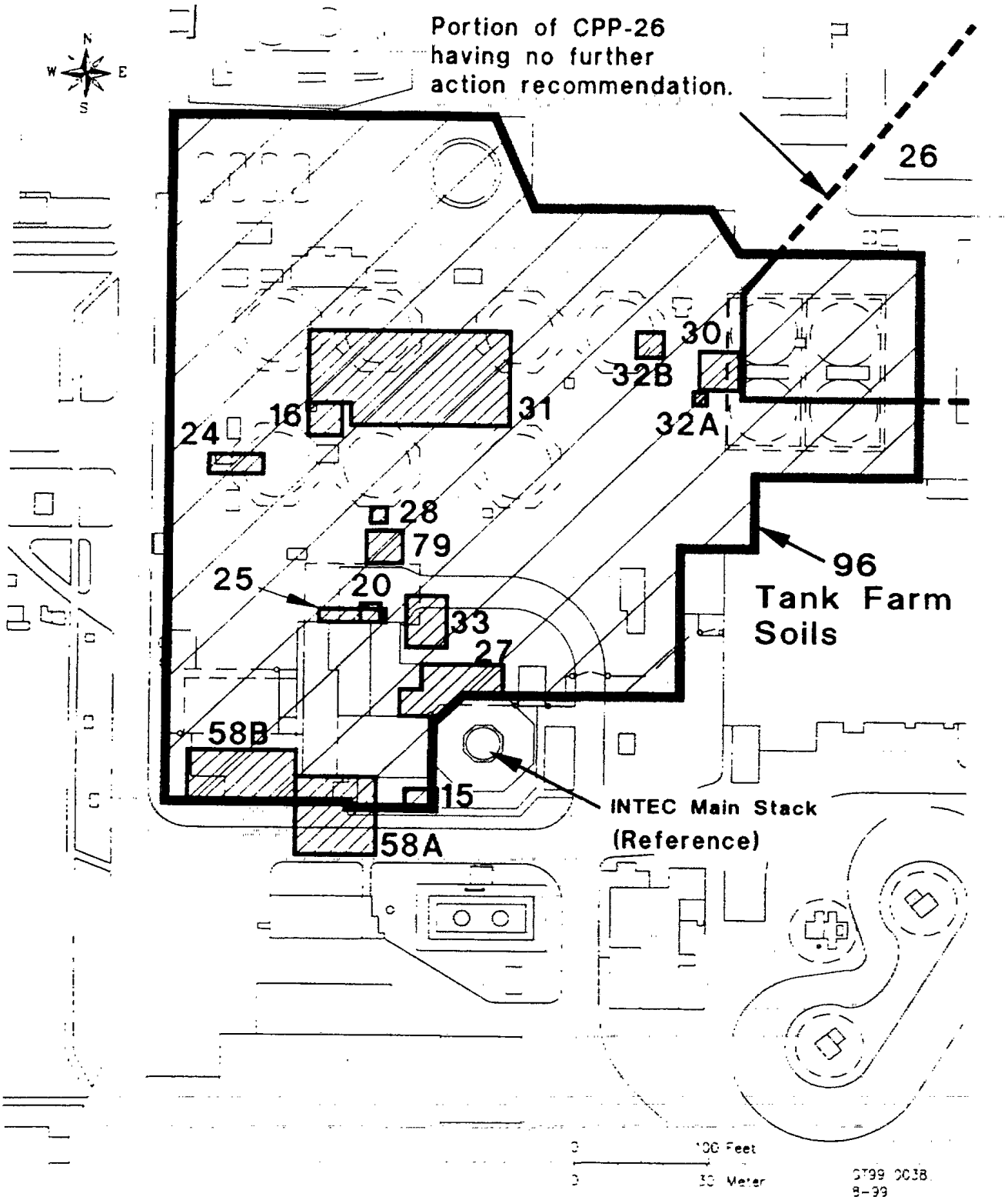

Figure 1-3. Group 1: Tank Farm Soils numbe4red release sites.

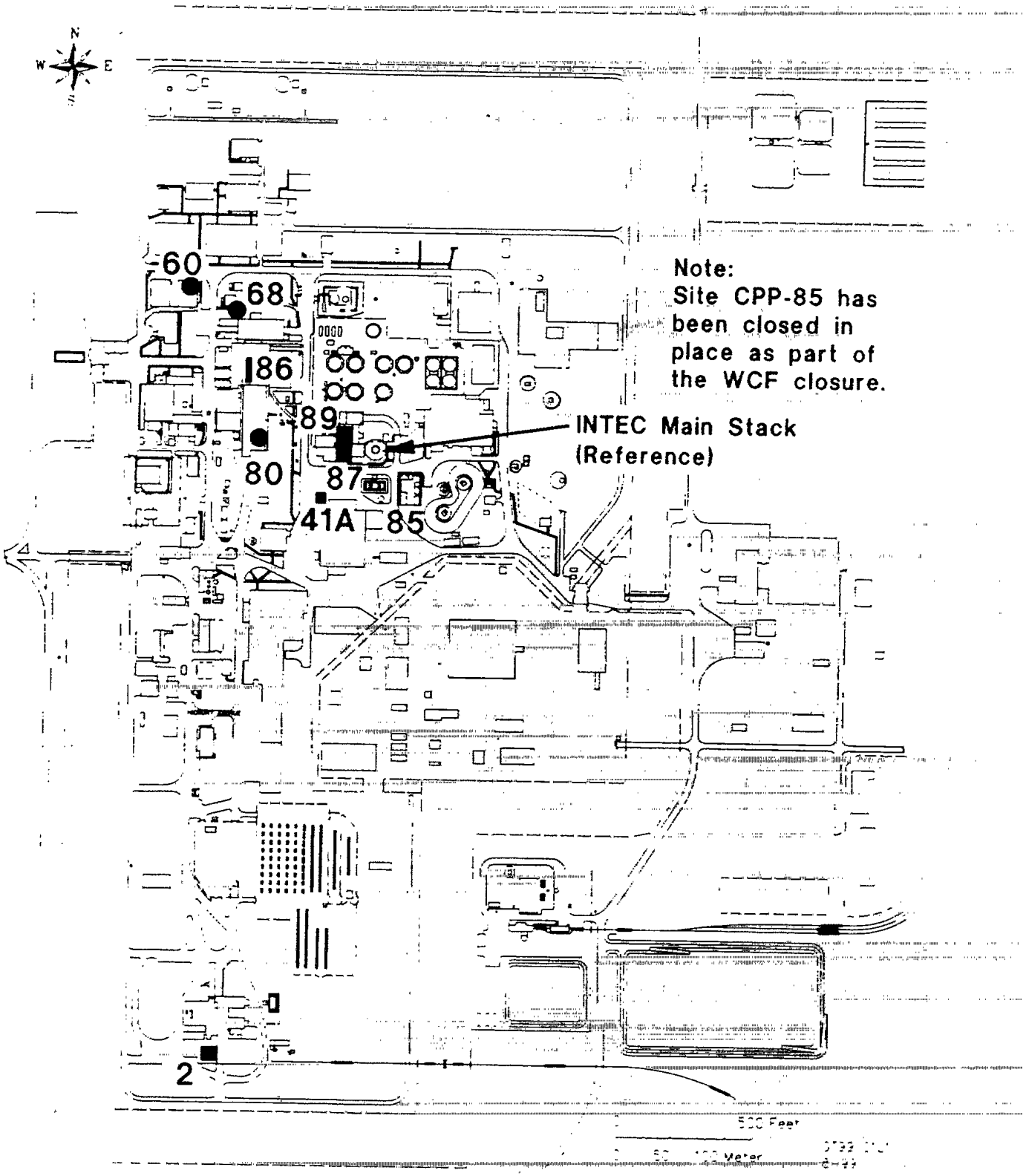

Figure 1-4. Group 2: Soils Under Building and Structures numbered release sites.

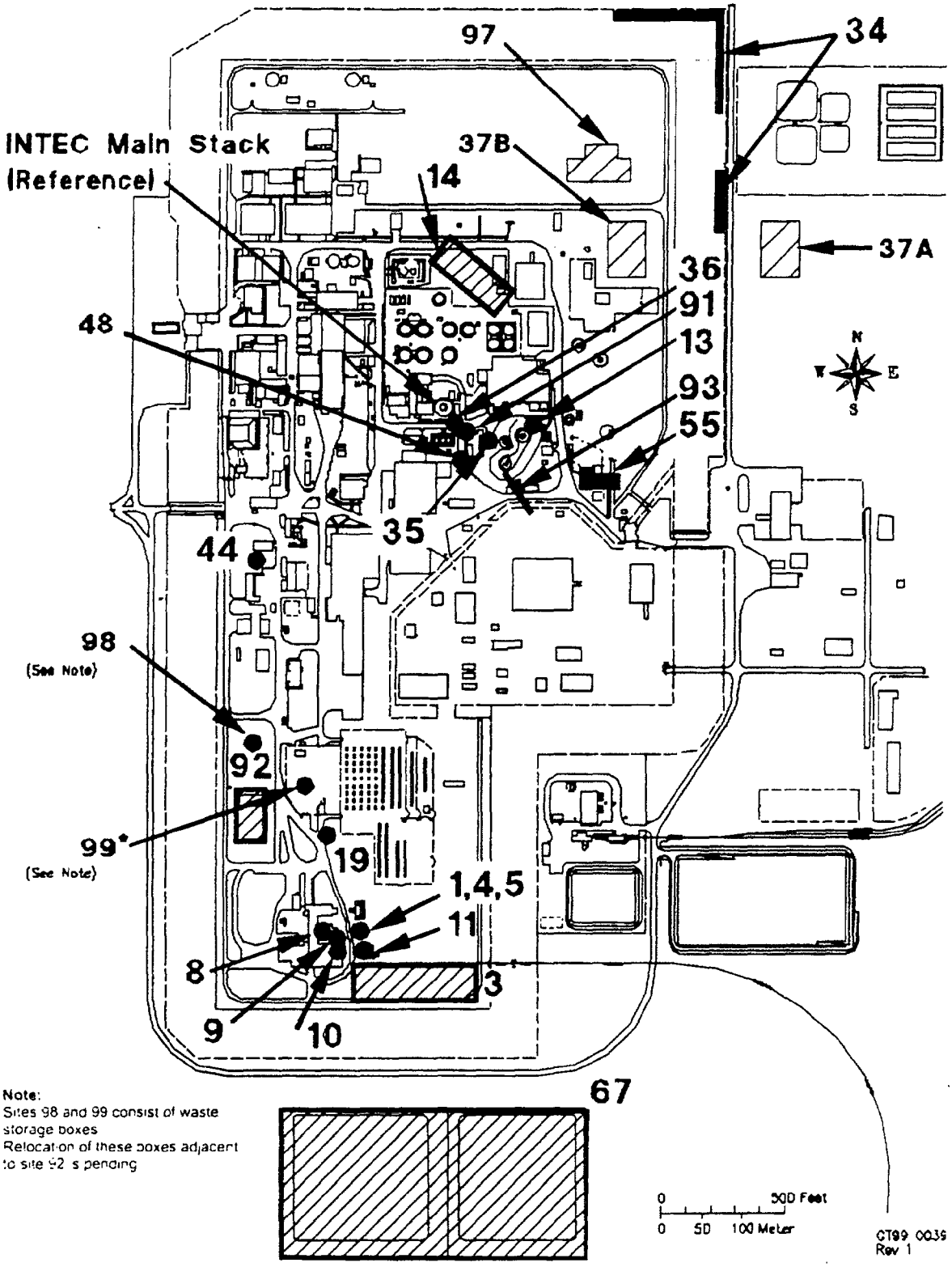

Figure 1-5. Group 3: Other Surface Soils numbered release sites.

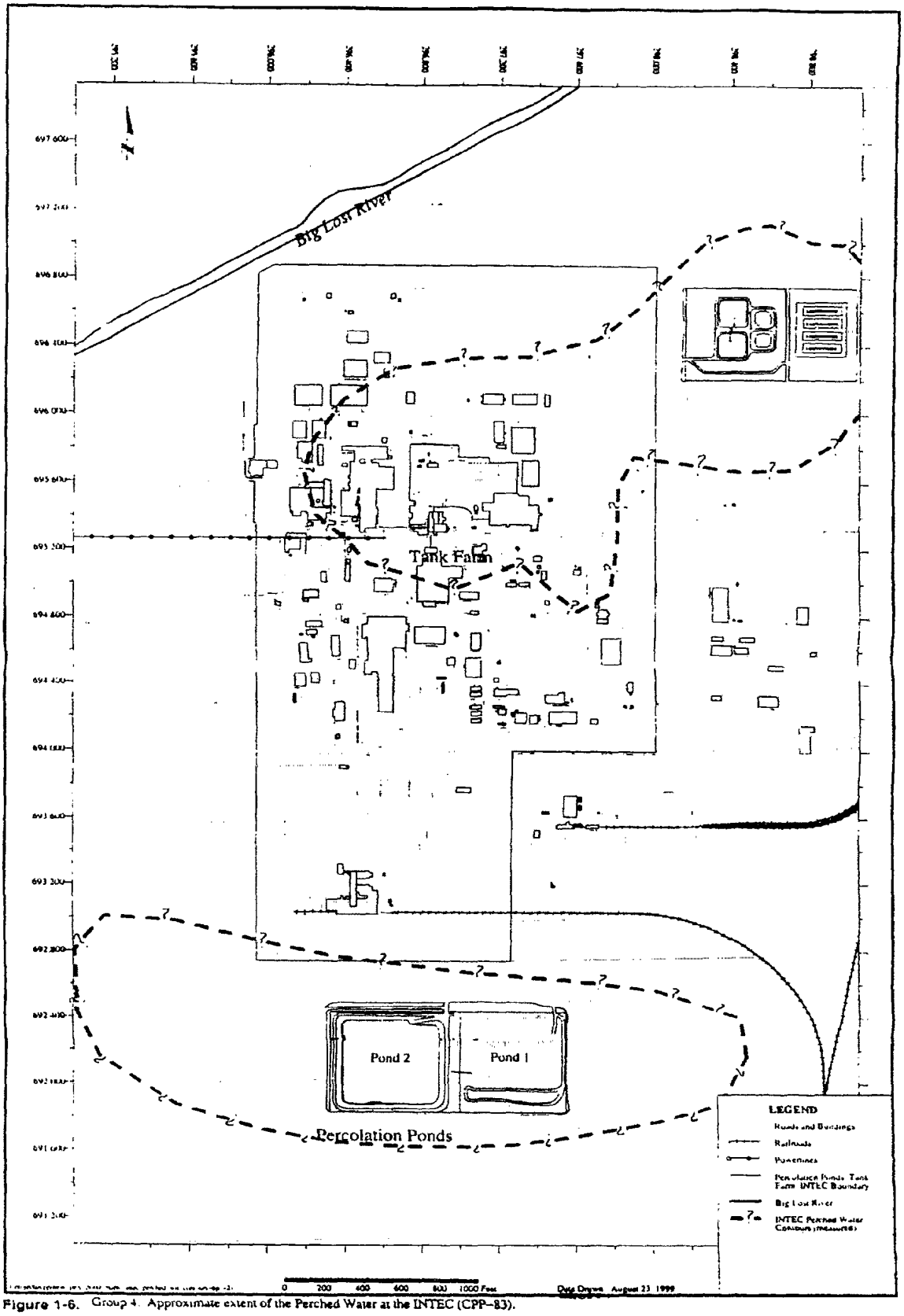

Figure 1-6. Group 4. Approximate extent of the Perched Water at the INTEC (CPP-83).

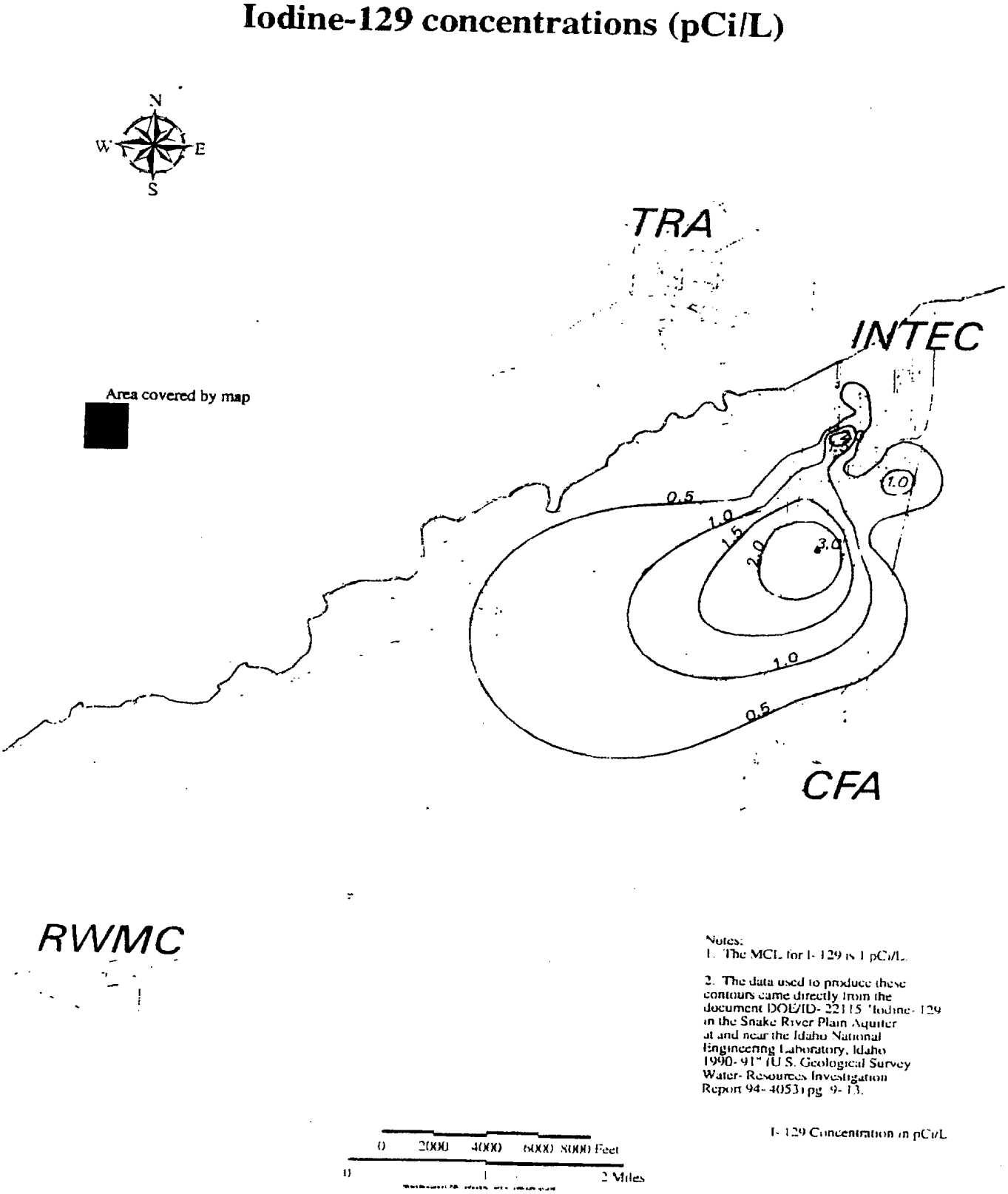

Figure 1-7. Group 5: Estimated extent of the I-129 plume in the Snake River Plain Aquifer (CPP-23)

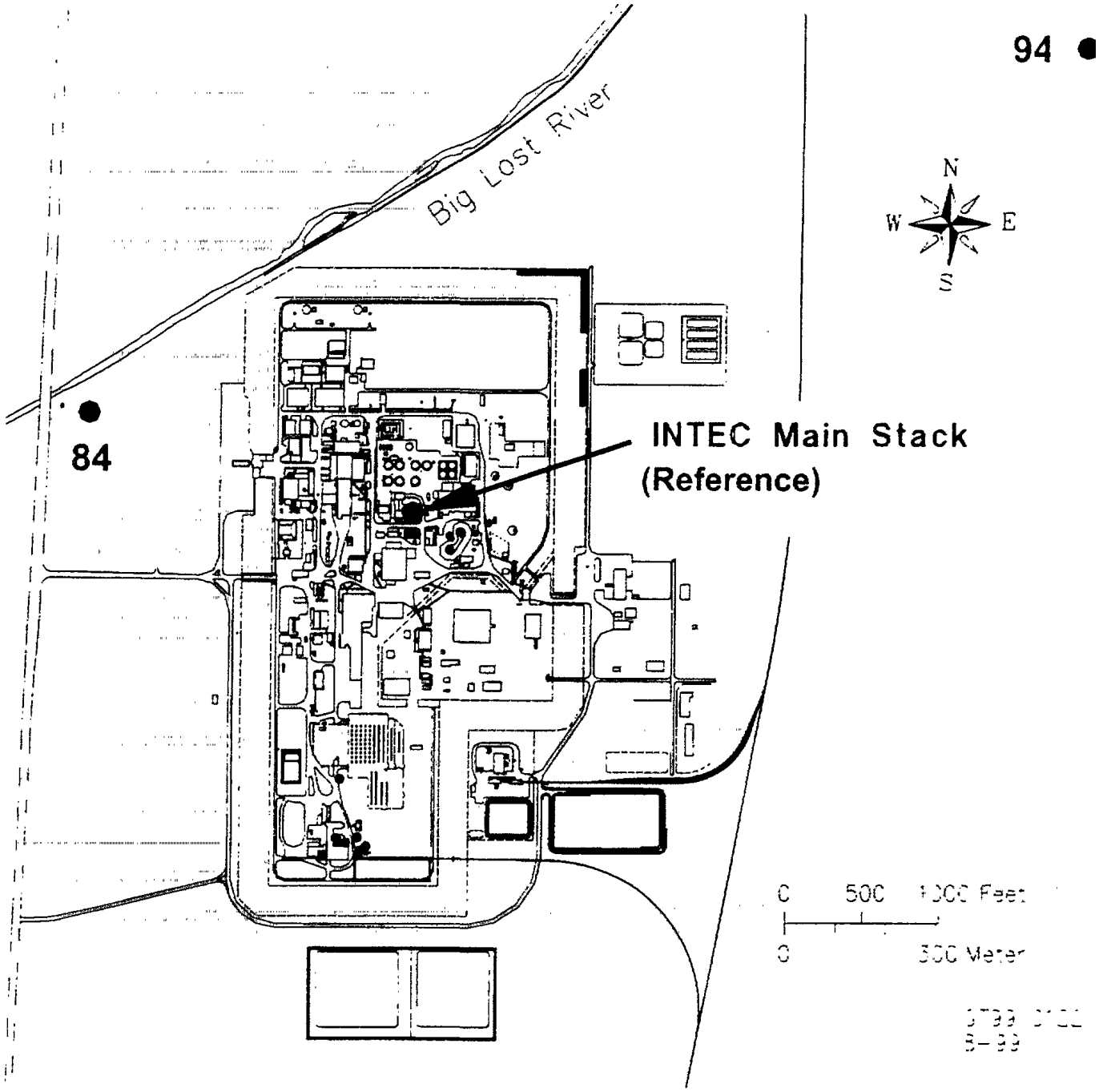

Figure 1-8. Group: Buried Gas Cylinders numbered release sites.

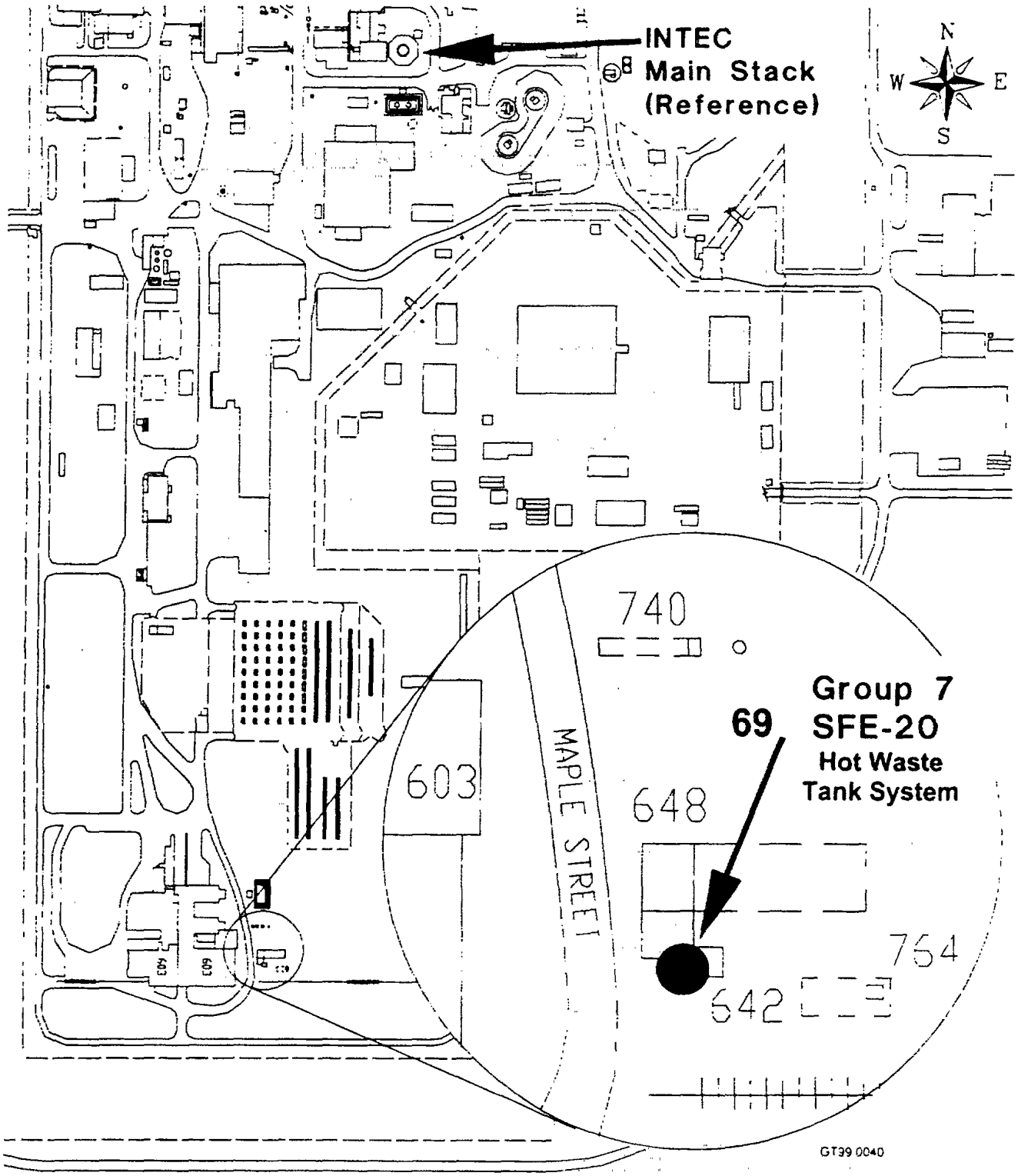

Figure 1-9. Group 7: SFE-20 Hot Waste Tank System numbered release sites.

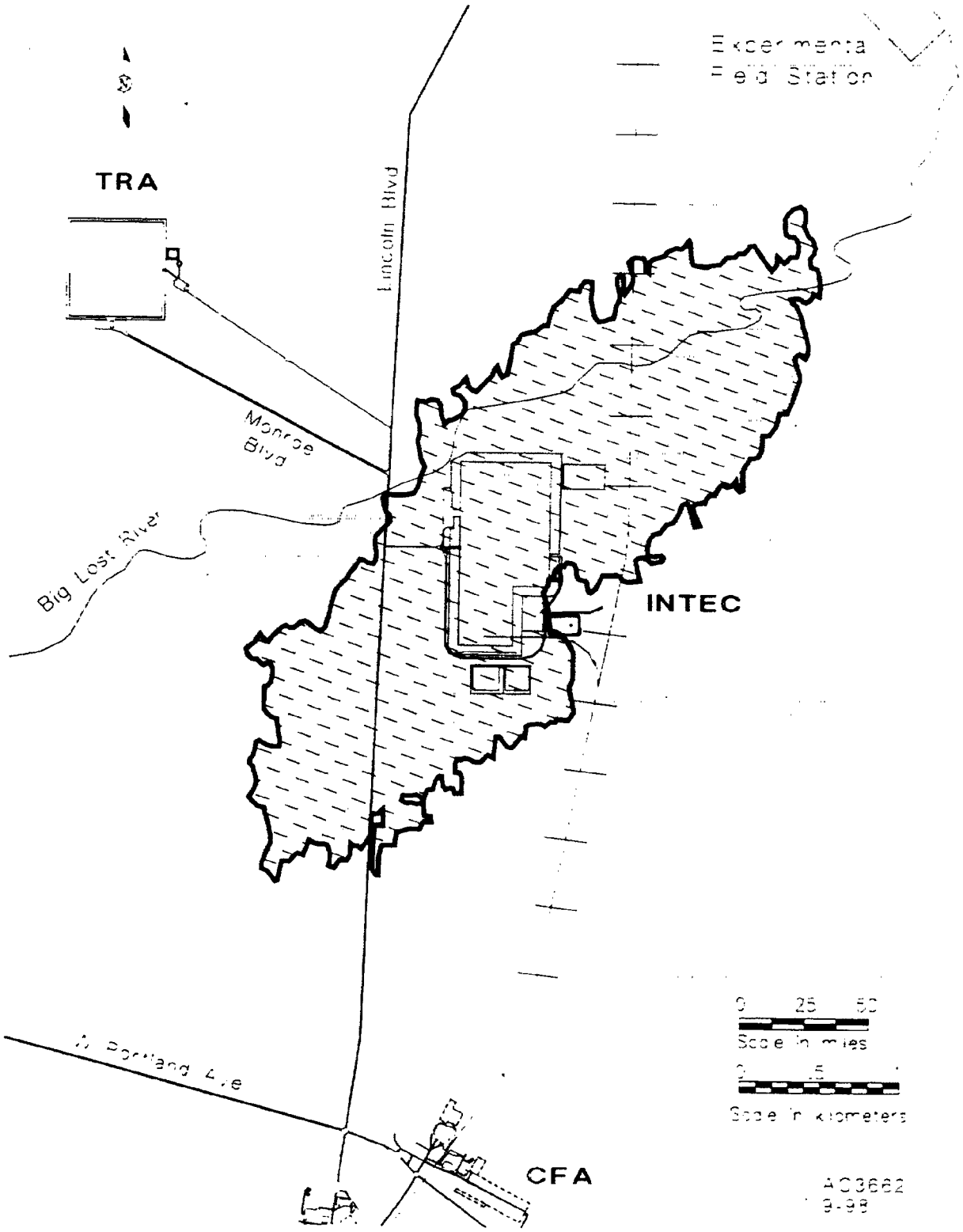

Figure 1-10. OU3-13 area of contamination (CPP-95)

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

In 1989, the U.S. Environmental Protection Agency (EPA) proposed listing the INEEL on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The EPA issued a final ruling that listed the INEEL as a NPL site in November 1989 (54 Federal Register [FR] 29820). As a result, the INEEL became subject to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Federal Facility Agreement and Consent Order (FFA/CO) and associated action plan (U.S. Department of Energy Idaho Operations Office [DOE-ID] 1991) were developed to establish the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA, the Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Action (HWMA). Under the FFA/CO, the INEEL was divided into 10 WAGs with the INTEC being listed as WAG 3

2.1 INTEC History

The INTEC began operating in 1952. The primary missions were reprocessing uranium for defense purposes, and research and storage of spent nuclear fuel (SNF). Irradiated defense nuclear fuels were reprocessed to recover unused uranium. In 1992, the reprocessing mission was phased out. The current INTEC mission is receiving and temporarily storing SNF and radioactive wastes for future disposition.

In addition to reprocessing spent nuclear fuel, INTEC stabilized high-level liquid waste (HLLW) from fuel reprocessing through a process known as calcination. That processing was conducted in a facility known as the Waste Calcining Facility (WCF) where radioactive HLLW was converted into a granular solid similar in consistency to sand. The liquid waste was drawn from underground storage tanks at the Tank Farm and sprayed into a vessel superheated by a mixture of kerosene and oxygen. Most of the liquid evaporates, while radioactive fission products adhere to the granular bed material in the vessel. The off-gases were treated and monitored before they were released to the environment. The calcined solids were transferred to large stainless steel structures encased in thick concrete vaults (bin sets). Calcining achieves an eight-to-one volume reduction from liquid to solid. Although processing of nuclear fuel was terminated in 1992, calcination of the HLLW continued until it was completed in February 1998. Sodium-bearing wastes are still being processed. The WCF was replaced in 1982, by another similar unit, the New Waste Calcining Facility (NWCF).

Releases of radioactive and hazardous materials to the environment have occurred over the past decades due to accidents and intentional operational releases, such as discharge of radionuclide-contaminated wastewater beneath the INTEC via the former injection well. Although these operational releases fail to meet contemporary standards, past intentional discharges did meet rules and standards of the times.

2.2 FFA/CO Implementation at INTEC

The action plan, presented in the FFA CO, identified 83 release sites within WAG 3. Eighteen additional sites, including an area of windblown contamination, have subsequently been identified. These sites were combined into 13 OUs based on similar waste streams and projected remedial actions. A “No Action” determination was made for 10 sites based on summarv assessments completed under the RCRA-based Consent Order and Compliance Agreement (COCA) before the FFA/CO was completed.

Following procedures identified in the action plan, preliminary scoping Track 1 and or Track 2 investigations were completed for all sites except the 10 "No Action" sites and 4 new sites, CPP-96, -97. -98, and -99, recently added to the FFA/ CO. A Track 1 investigation is a site evaluation using existing data to qualitatively determine if an actual or potential threat to human health or the environment exists. Track 1 investigations include very limited or no field characterization. A Track 2 investigation is a more detailed evaluation in which existing data and additional field characterization data are used to determine release site risks. Track 1 and Track 2 investigation identify if sufficient information exists to determine whether an unacceptable risk exists, and recommend steps to either: (a) conduct "No Action" or "No Further Action," b) conduct an interim action or removal action, or (c) conduct additional investigation under the RI/FS process.

Site CPP-95, the Windblown Area for INTEC, was evaluated in the OU 10-06 RI/FS, which became an engineering evaluation/cost analysis (EE/CA) for a removal action (Lockheed Idaho Technologies Company [LITCO] 1995a)

Four new sites were recently added to OU 3-13. Site CPP-96, is considered part of the Group 1 Tank Farm soils and will be addressed by both the Tank Farm Interim Action under OU 3-13 and the Final Action selected under OU 3-14. Sites CPP-97, CPP-98, and CPP-99 will be remediated under the selected remedy for OU 3-13 Group 3. The Agencies have determined that six other sites, CPP-38, CPP-61, CPP-65, CPP-66, CPP-81, and CPP-82 are more appropriately dispositioned under other OUs or regulatory programs other than CERCLA. Site CPP-38 will be administered and remediated, if necessary, under the INEEL Asbestos Abatement Program. Site CPP-65 will be handled under the Idaho Wastewater Land Application Rules. Site CPP-66 may pose an ecological risk and was transferred to OU 10-04 for further evaluation and remedy selection, if necessary.

In 1997, a remedial investigation/baseline risk assessment (RI/BRA) (DOE-ID 1997b) was conducted to determine the comprehensive risks posed by past releases at WAG 3. That document addressed all known release sites including those previously subject to Track 1 or Track 2 investigations. The final RI/BRA was issued in November 1997. Concurrently, an FS (DOE-ID 1997a) was written to determine and evaluate feasible remedial alternatives. During preparation of the FS, the need for additional information was identified. Because of the cost of the remedies recommended at the INTEC, review by the National Remedy Review Board was required. The Board recommended modifications to the Feasibility Study concerning the Snake River Plain Aquifer alternatives and the cost estimates. To support the board's recommendations, an FS supplement ,vas written and published in 1998 (DOE-ID 1998a).

Four CERCLA remedial actions have been completed to date at WAG 3. The contents of a buried acid pipeline were removed during the summer of 1993 at Site CPP-81. The pipe was cleaned but was left in place. A second removal action was performed until summer of 1993 on Calcine Bin Set 3 to prevent precipitation runoff from migrating through soil that was previously contaminated by a calcine spill. The contaminated soil was removed and disposed. A third removal action, completed in the fall of 1993, consisted of removing sludge from the Horizontal Filter Basin (CPP-740) and a dry well (CPP-301). The OU 3-13 RI BRA (DOE-ID 1997b) was performed after these three removal actions, and therefore, the source removal was accounted for in the BRA. The fourth removal action, completed in the fall of 1998, consisted of consolidating four Cs-137 contaminated soil stockpiles from INTEC into the Test Reactor Area (TRA) Warm Waste Pond (WWP) 1957 Cell. The stockpiles identified as Acid Recycle, New Control Room, Electrical Utility System Upgrade, and Irradiated Fuel Storage Facility, all contained low activity radionuclide-contaminated soil.

Four polychlorinated biphenyl (PCB) sites had undergone removal actions prior to the signing of the FFA/CO. These sites CPP-49, -50, -51, and -61 comprised OU 3-01. The sites were evaluated in a

Track 1 (Westinghouse Idaho Nuclear Company, Inc. [WINCO] 1992a) and were all determined to require "No Further Action" on the basis of available clean up and sampling information. In this ROD, the Agencies have determined that additional information is needed to make a final decision for site CPP-61 and have transferred it to OU 3-14 for further evaluation.

2.3 Other Regulatory Programs at INTEC

In 1992, the State of Idaho and DOE-ID entered into a Consent Order to resolve alleged violations contained in a Notice of Noncompliance issued in 1990 by the EPA. The Consent Order was modified in 1994 and again in 1998. The second modification, which supercedes the first modification, stipulated that by June 30, 2003, the DOE must cease use of high-level waste Tanks WM-182 through WM-l86; ceasing use means emptying the tanks to the heels. However, Tank WM-185 could be used as emergency storage until tank closure or until sufficient volume in other tanks became available. In addition, the second Consent Order modification stipulated that on or before December 31, 2012, the DOE must permanently cease use of the six other tanks known as WM-180, WM-181, WM-187, WM-188, WM-189, and WM-190 and their associated vaults. A closure plan must be submitted by December 31, 2000 for the first tank.

In 1995, the State of Idaho and DOE signed a settlement agreement that would guide waste storage and treatment at INTEC. The agreement is commonly known as the Batt Agreement. Among many other requirements, the Batt Agreement stipulated the following:

- The DOE shall complete the process of calcining all remaining nonsodium-bearing HLLW currently located at INEEL by June 30, 1998.
- The DOE shall treat all high level waste (HLW) currently at the INEEL so that it is ready for disposal outside of Idaho by a target date of 2035.
- The DOE shall commence negotiating a plan and schedule with the State of Idaho for calcined waste treatment (into a form suitable for transport to a permanent repository or interim storage) by December 31, 1999.
- The DOE shall commence calcination of sodium-bearing waste by June 1, 2001.
- The DOE shall complete calcination of sodium-bearing waste by December 31, 2012.
- The DOE shall submit to the State of Idaho an application for a RCRA Part-B permit by December 1, 2012 for the treatment of calcined waste at INEEL into a form suitable for transport to a permanent repository or interim storage.
- The DOE shall operate the HLLW evaporator as to reduce Tank Farm volumes by no less than 1,249,000 L (330,000 gal) by December 31, 1997. A fter December 31, 1997, efforts will continue to reduce the remaining volume of the Tank Farm liquid waste by operation of the HLLW evaportor.

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a. Letter from the State of Idaho's Brian R. Monson to Don Rasch, DOE-ID, on June 12, 1998. Attached was the "Second Modification to Consent Order," Idaho Code 39-4413. (No subject line or number were provided on the letter.)

- The DOE agrees to treat spent fuel, HLW, and transuranic (TRU) wastes in Idaho requiring treatment so as to permit ultimate disposal outside the State of Idaho.

Several RCRA-regulated units operate at the INTEC. Currently, the INTEC Process Equipment Waste (PEW) Evaporators. Tank Farm, NWCF, and Calcine Storage Facility operate under RCRA interim status. A RCRA Part-B permit application will be submitted to the Idaho Division of Environmental Quality (DEQ) at a future date. The Percolation Ponds 1 and 2 were initially under the RCRA interim status permit but were RCRA-closed in 1995. The ponds are currently operated under a wastewater land application permit issued by the State of Idaho. The DEQ has agreed that these ponds have met clean closure requirements. The radionuclide contaminants in the pond sediments and potential subsurface contamination were evaluated in the RI/BRA as Site CPP-67 in OU 3-13.[a]

The NWCF is a facility that converts radioactive liquid waste solutions into a granular solid calcine material. Liquid wastes are evaporated in a fluidized bed allowing the dissolved metals and fission products to be converted to salts and oxides which are subsequently stored in the calcine bin-sets. The NWCF operates under a Permit to Construct issued by the State of Idaho and Federal National Emission Standards for Hazardous Air Pollutants (NESHAPs) administered by EPA and the state of Idaho. Although the EPA has proposed to revise air emission and operational requirements for hazardous waste incinerators (EPA 1997), those regulations have not yet been promulgated.

By June 1, 2000, the DOE must also decide if the NWCF will be closed or continue to be operated. If the DOE chooses to close the NWCF, a closure plan must be submitted by June 1% 180 days. If DOE chooses to continue NWCF operations. DOE must submit a schedule for submission of a permit application by July 1, 2000.

The PEW evaporator system separates liquid radioactive waste into two fractions; one fraction is currently directed to the HLLW Tank Farm and the other fraction is directed to the Liquid Effluent Treatment and Disposal Facility. The PEW evaporator is included in the RCRA interim status document (DOE-ID 1997c), which includes a closure and post-closure plan that defines the closure and post-closure requirements and performance standards.

The WCF was taken out of service in 1981 after 18 years of operation. The WCF contains six units that are included in the INEEL RCRA Part-A permit application and are subject to the closure requirements for interim status treatment, storage, and disposal facilities (TSDFs). These units include four storage vessels, the WCF evaporator, and the high-efficiency particulate air (HEPA) filter storage area. Surface and subsurface releases of radionuclide-contaminated solutions from the WCF are addressed in the comprehensive OU 3-13 FS (DOE-ID 1997a), the Proposed Plan (DOE-ID 1998b), and this ROD. The WCF is not included in the FFA/ CO and therefore, the disposition of the six RCRA units and ancillary equipment will be performed in accordance with the WCF RCRA closure plan, which calls for closure of the WCF as a landfill with a RCRA-compliant cap. The WCF RCRA closure plan, was approved in August 1997. The closure consists of flushing the lines, isolating the structure, and grouting the six RCRA units in place, followed by collapsing the aboveground structures into the WCF lower levels and filling voids with concrete to act as a structural support for the cap. A concrete cap extending approximately 1.5 m (5 ft) beyond the WCF perimeter has been constructed. Final closure construction is expected to be completed by September 1999.

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b. Letter from the State of Idaho's Orville D. Green to Don W. Rasch, DOE-ID, on February 13, 1995. Attaches to the letter was the "State of Idaho Permit to Construct an Air Pollution Emmiting Source," Permit Number 023-00001. (INEL-ICPP Permit to Construct Amendment Request).

On October 15, 1995, the State of Idaho, DOE, and U.S. Navy agreed that the INTEC HLLW evaporator would continue to operate and would reduce the total liquid waste volume by at least 1,249,000 L (330,000 gal) by December 31, 1997. It was also agreed that the DOE would finish calcining all nonsodium- and sodium-bearing wastes by June 30, 1998 and December 31, 2012, respectively. All nonsodium-bearing waste has been processed.

The environmental impacts of disposition of the HLLW and calcined solids stored at INTEC will be addressed in the Idaho High Level Waste and Facilities Disposition Environmental Impact Statement (Idaho HLW & Facilities Disposition [FD] Environmental Impact Statement [EISI]). In accordance with the requirements of the National Environmental Policy Act (NEPA), the Idaho HLW & FD EIS Is being prepared to evaluate potential alternatives to disposition the HLW stored in the Tank Farm and elsewhere at INTEC. Potential alternatives to disposition of facilities associated with HLW will also be included in the Idaho HLW & FD EIS.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA § 113(k)(2)(B)(i-v) and so § 117, a series of opportunities for public information and participation in the RI/ FS and decision process for WAG 3 was provided from October 1994 through February 1999. The opportunities to obtain information and provide input included a "kick-off" fact sheet, w hich briefly discussed the status of the RI/FS, numerous *INEEL Reporter* newsletter articles (a publication of the INEEL's Environmental Restoration Program), four Citizens' Guide supplemental updates, five "update" fact sheets, a Proposed Plan, briefings and presentations to interested groups, and public meetings.

In October 1994, a "kick-off" fact sheet concerning the WAG 3 RI/FS was sent to about 6,200 individuals of the general public and to 340 INEEL employees on the Community Relations Plan mailing list. Included in the fact sheet was a postage-paid return mailer comment form. Comments were received from four members of the public. The comments were evaluated and considered in the preparation of the project work plan. This fact sheet also offered technical briefings to those interested in the WAG 3 comprehensive investigation. It was the initial opportunity for the public to be involved in determining how the investigation would be conducted. No one requested a briefing at the time, but briefings were held later in the investigation process.

The INTEC WAG 3 investigation was discussed during September and October 1997 media briefings with reporters from Idaho Falls, Pocatello, Twin Falls, and Boise. During these briefings, representatives from the DOE and the INEEL discussed the project and answered questions. Newspaper articles were generated as a result of these briefings and a story was distributed by the *Associated Press*. The investigation was also highlighted in two issues of a national environmental restoration newsletter and on an Idaho Falls radio talk show.

Additionally, two "update fact sheets" were distributed to approximately 700 citizens on the INEEL Community Relations Plan mailing list. The first update fact sheet was distributed in November 1997 and the second in September 1998. The purpose of these documents was to keep citizens appraised of developments during the RI/FS, to include a schedule of the investigation, and to announce the approximate dates when public meetings would take place. These fact sheets also offered technical briefings to those interested in the WAG 3 investigation.

Regular reports concerning the status of the project were included in bimonthly issues of the *INEEL Reporter* and mailed to those on the mailing list. Reports also appeared in four issues of the *Citizens' Guide to Environmental Restoration at the INEEL* (a supplement to the *INEEL Reporter*) in early 1995, 1996, 1997, and 1998.

The DOE-ID gave several briefings on the WAG 3 investigation to the Citizens' Advisory Board—INEEL. The advisory board is a group of 15 individuals, representing the citizens of Idaho, who make recommendations to DOE, EPA, and the State of Idaho regarding environmental restoration activities at the INEEL. On November 18, 1998, the board met to finalize and submit their formal recommendations on the Proposed Plan to DOE.

Briefings were also held in 1998 wth members of two environmental organizations, the Shoshone-Bannock (ShoBan) tribes, an economic development group, INEEL employees, several Idaho radio stations and newspapers, national publications, and four Idaho television stations.

Personal calls were made to stakeholders in the Pocatello and Moscow areas the week of November 1, 1998 to inform them of the upcoming public meetings and to see if a briefing was desired.

As a result, public meetings were held with the Shosone-Bannock tribes the morning of November 16, 1998. Meetings were also held with stakeholder groups in Idaho Falls on the afternoon of November 16, Twin Falls on November 17, Boise on November 18, and Moscow on November 19. A meeting was held with University of Idaho students in Moscow on November 19, 1998.

During the week of October 18, 1998, DOE-ID issued a news release to more than 100 media contacts concerning the beginning of a 30-day public comment period pertaining to the WAG 3 Proposed Plan. Although the period began on October 23, 1998, it was autornatically extended by the Agencies for an additional 30 days in anticipation of a large amount of public interest. The initial comment period ended on December 22, 1998, but at the request of United States Congresswoman Chenoweth (Idaho District #1), the comment period was extended until February 12, 1999. As a result of several news releases, a short note was placed in community calendar sections of newspapers and in public service announcements on radio stations. This note gave notice to the public that supportive WAG 3 investigation documents were available in the Administrative Record of the INEEL Information Repositories located in the DOE Public Reading Room at the INEEL Technical Library in Idaho Falls, the Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow.

Display advertisements announcing the availability of the Proposed Plan, the locations of public meetings, and the comment period extension, appeared in six regional newspapers during the week of October 18, 1998 located in Idaho Falls, Boise, Moscow, Fort Hall, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: *Post Register* (Idaho Falls), *Sho-Ban News* (Fort Hall), *Idaho State Journal* (Pocatello), *Times News* (Twin Falls), *Idaho Statesman* (Boise), and *Daily News* (Moscow). A follow-up advertisement ran in newspapers approximately 2 days before the public meetings in Idaho Falls, Twin Falls, Boise, and Moscow. Additionally, a post card was mailed to about 6,200 citizens on the INEEL mailing list informing them of the availability of the Proposed Plan, comment period, and upcoming public meetings. A note was also sent to all INEEL employees informing them of the same.

Copies of the Proposed Plan were mailed to about 700 members of the public on the INEEL Community Relations Plan mailing list the week of October 18, 1998, urging citizens to comment on the plan and to attend public meetings. Public meetings were held in Idaho Falls on November 16, Twin Falls on November 17, Boise on November 18, and Moscow on November 19, 1998. Prior to public meetings in each location, an availability session took place from 4 to 7 p.m. The public meetings began at 7 p.m.

For the general public, participation in the decision-making process included receiving and reviewing the Proposed Plan, attending the availability sessions before the public meetings to informally discuss the issues, with the Agencies remedial project managers and INEEL environmental restoration technical personnel, and submitting verbal and written comments to the Agencies during the public comment period.

Written comment forms (including a postage-paid business-reply form) were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. The reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to record transcripts of discussions and public comments. The meeting transcripts were placed in the Administrative Record for WAG 3 OU 3-13 in three INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the Proposed Plan.

A total of 55 people not associated with the project attended the public meetings. All comments received on the Proposed Plan were considered during the development of this ROD. The decisions for the actions selected in this ROD are based on the information in the Administrative Record for this OU.

The Idaho HLW and FD/EIS held scoping workshops in Idaho Falls on October 16, 1997 and in Boise on October 23, 1997. The public revised issues of coordination WAG 3 during these workshops. The scoping activity report (DOE-ID 1998c) provides references to these concerns.

A Responsiveness Summary has been prepared as part of this ROD and is presented in Appendix A. All formal verbal comments presented at the public meetings and all written comments received are also included in Appendix A and in the Administrative Record for the ROD. Those comments are annotated to cross reference the comment to the appropriate response in the Responsiveness Summary.

An index of the Administrative Record for OU 3-13 is included as part of this ROD in Appendix B. This index shows all of the documents that are contained in the Administrative Record for OU 3-13. As the ROD for OU 3-13 is making the decision for the disposition of the sites contained in OU 3-00 (FFA/CO "No Action" Sites) through OU 3-13, the index and Administrative Record includes these other OUs. The decisions made in this ROD are based on the information contained in the Administrative Record.

4. SCOPE AND ROLE OF OPERABLE UNITS AND RESPONSE ACTIONS

This comprehensive ROD addresses the known contaminant releases at WAG 3 resulting from SNF reprocessing, storage and research, and ancillary activities except for those releases associated with the Tank Farm. Closure of RCRA-regulated units and impacts associated with the closed RCRA units also is not included in this ROD. However, post-closure monitoring of closed units, such as the WCF, and past releases of hazardous substances from RCRA-regulated units are addressed. Similarly, closure or decontamination and dismantlement (D&D) of HLW units is not included, but past releases of hazardous substances from these units are addressed.

The INTEC is one of 10 WAGs at the INEEL. Each WAG contains a number of contaminant release sites grouped into OUs based on similarity of waste streams and projected remedial actions. Fourteen OUs have been defined for WAG 3.OU 3-01 through OU 3-13 are addressed in this ROD. OU 3-14 will address the final action for the Tank Farm Soils and SRPA inside the current INTEC security fence. The OU 3-13 RI/BRA determined that 51 release sites, including the perched water and the SRPA pose risks or threats to human health or the environment greater than allowable levels. Four new sites, recently added to OU 3-13, were not evaluated in the RI/BRA but are presumed to pose a risk or threat because of their origin and similar contaminants. During the OU 3-13 FS evaluation, the release sites and OUs were further categorized into seven groups relating to media, similar contamination, or geographic proximity. These groups are discussed and defined in the following sections. Table 4-1 lists each WAG 3 site, site description, and site grouping. The DOE, EPA and the IDHW have selected "No Action," "No Further Action," or a remedial alternative for each of the release site groups and the individual sites listed in the table, based on the comparative analyses of alternatives presented in the WAG 3 comprehensive RI/FS and other documents contained in the Administrative Record. In addition, four new sites recently added to OU 3-13 and their planned disposition are discussed in Section 4.9 and in Table4-1. Section 4.10 describes six other sites that will be dispositioned under another WAG or other regulatory programs, but will be reviewed by the CERLCA program during the 5-year review process.

4.1 Tank Farm Soils (Group 1)

The Tank Farm Soils (Figure 1-3) previously consisted of sites in OUs 3-06, 3-07, 3-08, 3-11, and 3-13. The sites are located in the area of the Tank Farm (Sites CPP- 16, -20, -24, -25, -26, -28, -30, -31, -32, and -79) and adjacent to the PEW evaporator building (Sites CPP- 15, -27, -33, and -58) are consolidated into Site-96. These sites consist of soil contamination that resulted from spills and pipeline leaks of radioactive liquids from plant liquid transfer operations. Distributed throughout the Tank Farm soils outside of the previously identified release sites are low concentrations of contaminants at varying locations and depths. New Site CPP-96 is a consolidation of all of the previously identified Tank Farm Soils sites and the intervening interstitial soils within the Site CPP-96 boundary. Contamination resulting from releases from waste transfer lines and valve boxes in the Tank, Farm area currently account for approximately 95% of the known contaminant inventory, in total curies of radioactive material.

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c. In addition, 10 "No Action Sites" were identified in the FFA/CO but were not given an operable unit number. See Section 4.8 for additional discussion

Table 4-1. WAG 3 CPP release sites and site grouping.

Site	Operable Unit	Description	Site Group	OU 3-13 ROD Decision
CPP-01	OU 3-09	Concrete settling basins and dry wells east of CPP-603	3	RD/RA
CPP-02	OU 3-09	French drain west of CPP-603	2	RD/RA
CPP-03	OU 3-09	Temporary storage area southeast of CPP-603	3	RD/RA
CPP-04	OU 3-09	Contaminated soil area around CPP-603 settling tank	3	RD/RA
CPP-05	OU 3-09	Contaminated soil around CPP-603 settling basin	3	RD/RA
CPP-06	OU 3-09	Trench east of CPP-603 fuel storage basin	none	"No Further Action"
CPP-07	OU 3-02	Soil contamination northwest of CPP-642	none	"No Action"
CPP-08	OU 3-09	CPP-603 basin filter system line failure	3	RD/RA
CPP-09	OU 3-09	Soil contamination at northeast corner of CPP-603 south basin	3	RD/RA
CPP-10	OU 3-09	CPP-603 plastic pipeline break	3	RD/RA
CPP-11	OU 3-09	CPP-603 sludge and water release	3	RD/RA
CPP-12	OU 3-02	Contaminated paint chips and pad south of CPP-603	none	"No Action"
CPP-13	OU 3-08	Pressurization of solid storage cyclone northeast of CPP-633	3	RD/RA
CPP-14	OU 3-05	Old Sewage Treatment Plant west of CPP-664	3	RD/RA
CPP-15	OU 3-08	Solvent burner east of CPP-605	1	RD/RA
CPP-16	OU 3-07	Contaminated soil from leak in line from CPP WM-181 to PEW Evaporator	1	RD/RA-OU 3-14[a]
CPP-17	OU 3-09	Soil storage area south of CPP Peach Bottom fuel storage area	none	"No Further Action"
CPP-18	OU 3-02	Gas storage building, current location of CPP-668	none	"No Action"
CPP-19	OU 3-09	CPP-603 to CPP-604 line leak	3	RD/RA
CPP-20	OU 3-07	CPP-604 radioactive waste unloading area	1	RD/RA
CPP-21	OU 3-02	Solid waste storage bin south of CPP-60l	none	"No Action"
CPP-22	OU 3-09	Particulate air release south of CPP-603	none	"No Further Action"
CPP-23	OU 3-02	CPP injection well (MAH-FE-PL-304)	5	RD/RA
CPP-24	OU 3-07	CPP Tank Farm area bucket spill	1	RD/RA-OU 3-14[a]

Table 4-1. (Continued).

Site	Operable Unit	Description	Site Group	OU 3-13 ROD Decision
CPP-25	OU 3-07	Contaminated soil in the Tank Farm area north of CPP-604	1	RD/RA
CPP-26	OU 3-07	Contaminated soil in the Tank Farm area from steam flushing	1	RD/RA
CPP-27	OU 3-08	Contaminated soil in the Tank Farm area east of CPP-604	1	RD/RA
CPP-28	OU 3-07	Contaminated soil in the Tank Farm area south of WM-181 by Valve Box A-6	1	RD/RA
CPP-29	OU 3-08	Contaminated soil north and west of the main stack (CPP-708)	none	"No Action"
CPP-30	OU 3-07	Contaminated soil in the Tank Farm area near Valve Box B-9	1	RD/RA-OU 3-14[a]
CPP-31	OU 3-07	Contaminated soil in the Tank Farm area south of Tank WM-183	1	RD/RA
CPP-32	OU 3-07	Contaminated soil in the Tank Farm area southwest and northwest of Valve Box B-4	1	RD/RA
CPP-33	OU 3-06	Contaminated soil in the Tank Farm area near WL-102, northeast of CPP-604	1	RD/RA
CPP-34	OU 3-06	Soil storage area (disposed trenches) in the northeast corner of the ICPP	3	RD/RA
CPP-35	OU 3-08	CPP-633 decontamination spill	3	RD/RA
CPP-36	OU 3-08	Transfer line leak from CPP-633 to WL-102	3	RD/RA
CPP-37a	OU 3-02	Gravel pit— outside INTEC fence	3	RD/RA
CPP-37b	OU 3-02	Gravel pit and debris landfill Inside INTEC fence	3	RD/RA
CPP-38	OU 3-04	Friable transite on CPP-601 through -606. -640, -644, and -648[c]	Closure under another program	
CPP-39	OU 3-13	CPP HF storage tank (YDB-l05) and dry well. OU 3-13 no Track 1 or Track 2.	none	"No Action"
CPP-40	OU 3-06	Lime pit at the base of the CPP-601 berm and french drain	none	"No Action"
CPP-4la	OU 3-02	Fire training pits between CPP-666 and CPP-663, under asphalt	2	R D/RA
CPP-41b	OU 3-02	Fire training, pits between CPP-666 and CPP-663	none	"No Action"
CPP-42	OU 3-10	Drainage ditch west of CPP-637	none	"No Action"

Table 4-1. (continued).

Site	Operable Unit	Description	Site Group	OU 3-13 ROD Decision
CPP-43	none	Grease pit south of CPP-637	none	"No Action" per FFA/CO
CPP-44	OU 3-10	Grease pit south of CPP-608	3	RD/RA
CPP-45	OU 3-11	CPP-621 chemical storage area spills	none	"No Action"
CPP-46	OU 3-10	CPP-637 courtyard pilot plant release	none	"No Action"
CPP-47	OU 3-06	Pilot plant storage area west of CPP-620	none	"No Action"
CPP-48	OU 3-13	French drain south of CPP-633	3	RD/RA
CPP-49	OU 3-01	PCB transformer yard (CPP-705)	none	"No Action"
CPP-50	OU 3-01	PCB transformer yard (CPP-731)	none	"No Action"
CPP-51	OU 3-01	PCB staging area west of CPP-660	none	"No Action"
CPP-52	none	Pickling shed east of CPP-631	none	"No Action" per FFA/CO
CPP-53	OU 3-02	Paint and paint solvent area south of CPP-697	none	"No Action"
CPP-54	OU 3-02	Drum storage area west of CPP-660	none	"No Action"
CPP-55	OU 3-02	Mercury-contaminated area south of CPP-T-15	3	RD/RA
CPP-56	OU 3-10	Nitric acid contamination south of CPP-734	none	"No Action"
CPP-57	OU 3-02	Sulfuric acid spills east of CPP-606	none	"No Action"
CPP-58	OU 3-11	CPP PEW evaporator overhead pipeline spills	1	RD/RA
CPP-59	OU 3-02	Kerosene tank overflow west of CPP-633	none	"No Action"
CPP-60	OU 3-02	Paint shop at present location of CPP-645	2	RD/RA
CPP-61	OU 3-01	PCB spill in CPP-718 transformer yard	none	OU 3-14 RI/FS[d]
CPP-62	OU 3-02	Mercury-contaminated area near CPP TB-4	none	"No Action"
CPP-63	OU 3-02	Hexone spill by CPP-710	none	"No Action"
CPP-64	OU 3-02	Hexone spill west of CPP-660	none	"No Action"
CPP-65	OU 3-02	CPP Sewage Treatment Plant lagoons	Closure under another program	
CPP-66	OU 3-02	CPP coal-fired steam generation facility Fly Ash Pit	WAG 10 RD/RA	
CPP-67	OU 3-03	CPP Percolation Pond #1 and #2	3	RD/RA
PP-68	OU 3-02	Abandoned gasoline tank CPP VES-UTI-652 (North of Building 6060	2	RD/RA

Table 4-1. (continued).

Site	Operable Unit	Description	Site Group	OU 3-13 ROD Decision
CPP-69	OU 3-09	Abandoned liquid radioactive waste storage Tank CPP VES-SFE-20	7	RD/RA
CPP-70	none	Septic tank east of CPP-655	none	"No Action" per FFA/CO
CPP-71	none	Seepage pits west of CPP-656	none	"No Action" per FFA/CO
CPP-72	none	CPP-758 cesspool east of CPP-651	none	"No Action" per FFA/CO
CPP-73	none	Leaching cesspool east of CPP T- 15	none	"No Action" per FFA/CO
CPP-74	none	Seepage pit and septic tank west of CPP-626	none	"No Action" per FFA/CO
CPP- 75	none	Septic tank and cesspool west of CPP-603	none	"No Action" per FFA/CO
CPP-76	none	Septic tank and cesspool west of CPP-659	none	"No Action" per FFA/CO
CPP-77	none	Seepage pit and cesspool north of CPP-662	none	"No Action" per FFA/CO
CPP-78	OU 3-09	Contaminated soil west of CPP-693, east of dry fuel storage area	none	"No Action"
CPP-79	OU 3-07	Tank farm release near Valve Box A-2	1	RD/RA
CPP-80	OU 3-12	CPP-601 vent tunnel drain leak	2	RD/RA
CPP-81	OU 3-12	Abandoned CPP-637-CPP-601 VOG line	none	OU 3-14 RI/FS[d]
CPP-82	OU 3-12	Abandoned line (3.8 cm [1.5in.]) PLA-766 west of Beech Street	none	OU 3-14 RI/FS[d]
CPP-83	OU 3-08	The entire perched water system at the INTEC	4	RD/RA
CPP-84	OU 3-13	Gas canisters (buried gas cylinders)	6	RD/RA
CPP-85	OU 3-13	Waste Calcining Facility, blower corridor	2	Part of WCF closure
CPP-86	OU 3-13	CPP-602 waste trench sump	2	RD/RA
CPP-87	OU 3-13	CPP-604 VOG blower cell SUMP and floor drain	2	RD/RA
CPP-88	OU 3-13	Radiologically contaminated soil	none	"No Further Action" Conduct 5-year review
CPP-89	OU-3-13	CPP-604-605 tunnel excavation	2	RD/RA
CPP-90	OU 3-13	CPP-709 ruthenium detection	none	"No Further Action" - Conduct 5-year review

Table 4-1. (Continued).

Site	Operable Unit	Description	Site Group	OU 3-13 ROD Decision
CPP-91	OU 3-13	CPP-633 blower pit drain	3	RD/RA
CPP-92	OU 3-13	Soil boxes west of CPP-1617	3	RD/RA
CPP-93	OU 3-13	Simulated calcine disposal trench	3	RD/RA
CPP-94	OU 3-13	Gas canisters (buried gas cylinders)	6	RD/RA
CPP-95	OU 3-13	Airborne plume (also shown in 10-06)	None	"No Further Action" - Conduct 5-year review
CPP-96	OU 3-13	Tank Farm interstitial soils	1	RD/RA
CPP-97	OU 3-13	Tank Farm soil stockpile	3	RD/RA
CPP-98	OU 3-13	Tank Farm shoring boxes	3	RD/RA
CPP-99	OU 3-13	Boxed soil	3	RD/RA

a. No action sites within the Tank Farm are consolidated into Site CPP-96. Because the sites are within the Tank Farm they will be subject to the Group 1 Interim Action and to the OU 3-14 RI/FS.

b. CPP-23 is a source for OU 3-13 Group 5 aquifer contamination outside the INTCE fence. The source will be remediated under OU 3-14.

c. CPP-38 is asbestos on roofs and walls of buildings. The site will be closed under the INEEL Asbestos Abatement Program.

d. Site moved to the OU 3-14 RI/FS because not enough data is available to make a risk based decision.

At the INTEC. No evidence has been found to indicate that any of the Tank Farm tanks have leaked. However, contaminants found in the interstitial soils are likely the result of accidental releases and leaks from process piping valve boxes or sumps, and cross-contamination from operations and maintenance excavations. Limited site investigations have been conducted at the Tank Farm sites because many of the spill areas are in operational and highly highly radioactive areas. The principle threats posed by contaminated Tank Farm soils are external exposure to radiation and leaching and transport of contaminants to the perched water or SRPA. SRPA groundwater contaminated by Tank Farm soils releases could be contained by future ground water users.

4.2 Soils Under Buildings and Structures (Group 2)

The Soils Under Buildings and Structures are comprised of release sites that occur beneath INTEC buildings or structures, and include Sites CPP-02, -41a, -60, -68, -80, -85, -86, -87, and -89 (Figure 1-4). These sites consists of soil contamination that resulted from past hazardous or radioactive liquid spills, leaks, and plant operations.

- Site CPP-02 is an old french drain that was abandoned and partially excavated in 1966 and is located beneath Building CPP-603.
- Site CPP-41a is an old fire-training pit that was covered by asphalt during construction of building CPP-633.
- Site CPP-60 is the soils that were beneath the former paintshop building. CPP-645 is now over this site.
- Site CPP-68 is the former location of an abandoned, 1,892 L (500 gal) underground gasoline storage tank.
- Site CPP-80 resulted from a hazardous, radioactive liquid condensate leak from the Building CPP-601 vent tunnel drain.
- Site CPP-85 is the WCF Blower Corridor. It has been closed in place as part of the WCF under an approved HWMA closure plan. The WCF will be included with the Group 2 Soils Under Buildings and Structures sites in the CERCLA 5-year reviews.
- Site CPP-86 is a waste trench that runs beneath CPP-602, which collects liquid waste for transfer to the PEW evaporator from various CPP-602 operations.
- Site CPP-87 is located beneath the vapor off-gas blower cell of Building CPP-604.
- Site CPP-89 is a tunnel excavation located beneath Buildings CPP-604 and -605.

Sites CPP-87 and CPP-89 are integrally related; the soil and contamination removed from CPP-87 is the same as that removed at CPP-89. Contaminated soils from the tunnel were partially excavated, boxed, and stored at the plant.

The major threats posed by Group 2 sites are external exposure to contaminants if the building or structure is removed and potential leaching and transport of soil contaminants to the perched water or SRPA. The existing building or structure currently provide an adequate radiation protection barrier and

serves to limit infiltration into the contaminated soils. Group 2 soils are not considered "principal threat" wastes because the levels of radionuclides present have not been directly measured.

4.3 Other Surface Soils (Group 3)

The Other Surface Soils consist of release sites located in the following areas.

- Building CPP-603
  (Sites CPP-01, -03, -04, -05, -08, -09, -10, -11, and -19)

- Building CPP-633
  (Sites CPP-36 and -91)

- Calcined Solids Storage Bins
  (Sites CPP-13, -35, and -93)

- Disposal Trenches
  (Site CPP-34)

- Old Sewage Treatment Plant (STP)
  (Site CPP-14)

- Grease Pit
  (Site CPP-44)

- Near Building CPP-1619
  (Site CPP-55)

- Near temporary Building TB-1

- Percolation Ponds that are situated south of the INTEC fence
  (Site CPP-67).

In addition. Group 3, also includes Sites CPP-37a, CPP-37b, and CPP-48. Site CPP-37a is a former gravel pit located outside of the current INTEC security fence, that is used to collect storm water from the Tank Farm. Site CPP-37b is a former gravel pit located inside the current INTEC security fence that was previously used for disposal of wastewaters from the old STP and subsequently used for disposal of construction debris. Site CPP-48 is all excess chemical dump tank located south of the old WCF (CPP-633) that was used as a french drain from 1975 to 1981. Figure 1-5 shows the location of the Group 3 sites. These sites generally consist of soil contamination that resulted from inadvertent spills and leaks of radioactive waste, decontamination solutions, spent fuel storage water, storage of radionuclide-contaminated equipment, and other plant-generated waste waters. Group 3 also includes Site CPP-92, which consists of 648 boxes of radionuclide-contaminated soils that were generated from a variety of INTEC activities. In addition, the new sites similar to Group 3 (CPP-97, -98, and -99) discussed in Section 4.9, consist of soils and other materials will be remediated as Group 3 soils.

The results of the RI/BRA (DOE-ID 1997b) indicate that the major threat posed by the Group 3 sites is external exposure to radionuclides. Additionally, three sites (CPP-35, -16, and -91) pose a risk to the SRPA.

4.4 Perched Water (Group 4)

Perched Water (Site CPP-83) occurs at depths ranging between 30 and 128 m (100 and 420 ft) in the basalts and the sedimentary interbeds beneath INTEC. Figure 1-6 shows the approximate extent of the perched water at INTEC. Perched water consists of variably saturated groundwater zones above the regional SRPA. The perched water zones result from local recharge from precipitation infiltration, the Big Lost River, the INTEC percolation ponds, the sewage treatment ponds, lawn irrigation, and other miscellaneous INTEC water sources. Perched water flow is primarily vertical, although some lateral flow occurs, and ultimately recharges the SRPA. Perched water has been contaminated by leaching and downward transport of contaminants, primarily Sr-90 and tritium from the overlying surface soils, and from two instances in which the INTEC injection well (CPP-23) collapsed and service wastewater was released to the perched zones.

The perched water does not pose a direct human health threat because it is not currently used for consumption and, in the absence of man-made recharge (e.g. from the percolation ponds), the perched water zones are not sufficiently productive to sustain permanent residence. A future water supply well located in the perched water would not be capable of providing sufficient water for domestic purposes. However, perched water does pose a threat as a contaminant transport pathway to the SRPA. Contaminants already in the perched water are a source of future SRPA contamination. Consumption of contaminated water from the SRPA is covered under Group 5. The primary man-made source of perched water recharge is the percolation ponds.

4.5 Snake River Plain Aquifer (Group 5)

The SRPA underlies the ESRP and has been designated by the EPA as a sole source aquifer for the region, The basalts and sedimentary interbeds underlying INTEC, where continually saturated, are part of the SRPA. The aquifer ties at a depth of about 137 m (450 ft) beneath the site. Regional groundwater flow is southwest at average estimated velocities of 1.5 m/day (5 ft/day). The average groundwater flow velocity at the INTEC is estimated at 3 m/day (10 ft/day) due to local hydraulic conditions. Hydraulic characteristics of the aquifer differ considerably from place to place depending on the saturated thickness and the characteristics of the basalts and sedimentary interbeds. The source of contamination in the SRPA originates primarily from the injection well (CPP-23). However, contaminated soils and perched water are predicted to contribute to future SRPA contamination. 1-129, Sr-90, and plutonium isotopes were determined to be the only contaminants that pose an unacceptable risk to a hypothetical future resident beyond the year 2095. The primary 1-129 source was the former injection well. The primary Sr-90 source(s) were the former injection well and the Tank Farm soils. The plutonium isotopes are primarily sourced from the Tank Farm. Figure 1-7 shows the estimated extent of the 1-129 plume, which currently exceeds 1 pCi/L, and contributes to an exceedance of the 4 millirem (mrem)/year beta-gamma emitting radionuclide maximum contaminant level (MCL) in the SRPA. The major human health threat posed by contaminated SRPA groundwater is exposure to radionuclides via ingestion by future groundwater users.

Due to the uncertainty associated with the contaminant source estimates and potential releases from the Tank Farm soils, the remedial measures taken for the SRPA under OU 3-13 are designated as an interim action. The actions selected for the SRPA outside the current INTEC security fence are final actions under this ROD. The evaluation and remedy selection for the SRPA inside the current INTEC securiy fence will occur under OU 3-14. The OU 3-14 decisions will also remediate, if necessary, residual contamination associated with the former injection well (CPP-23).

4.6 Buried Gas Cylinders (Group 6)

Sites CPP-84 and CPP-94 comprise the Buried Gas Cylinders group. Site CPP-84 is located outside the current INTEC security fence, east of Lincoln Boulevard and south of the Big Lost River (see Figure 1-8). The site consists of a buried trench where compressed gas cylinders were previously disposed. The cylinders at the burial site originated from INTEC and contain gases used for construction. The exact number and contents of the discarded cylinders is not known, but it is believed that 40 to 100 cylinders were disposed at the site. The gases in the cylinders may include acetylene, compressed air, argon, carbon dioxide, helium, nitrogen, or oxygen. These gases do not pose a human health risk but are considered a safety hazard because ruptures of the cylinders could lead to personal injury, fire, or explosion. DOE will evaluate the safety concerns of removing the cylinders versus capping them in place.

Site CPP-94 includes an area about 2.4 km (1.5 mi) northeast of the INTEC along the south side of a dirt security road (see Figure 1-8). Four exposed gas cylinders have been observed at the site and are believed to contain hydrofluoric acid. The safety hazards associated with CPP-94 are similar to those at Site CPP-84. The potential for cylinder over-pressurization and bursting is considered the most serious hazard at CPP-94. The buried gas cylinders pose a safety hazard to inadvertent intruders (i.e., back hoe operators or drillers). Hydrofluoric acid is very corrosive, reacts violently with moisture, and can generate explosive concentrations of hydrogen gas. Fluoride, a chemical residual of hydrofluoric acid reactions, is a potential human health and ecological hazard.

4.7 SFE-20 Hot Waste Tank System (Group 7)

The SFE-20 Hot Waste Tank System is also known as. Site CPP-69, which consists of a concrete vault containing an abandoned radioactive liquid waste storage tank. The top of the tank vault is located about 3 m (10 ft) below grade. The tank contains about 1.514 L (400 gal) of liquid and about 208 L (55 gal) of sludge (Figure 1-9). The tank system consists of the tank contents, tank, and associated structures located east of Building CPP-603. The SFE-20 Hot Waste Tank System was constructed in 1957 to collect liquid radioactive wastes from the south basin area of Building CPP-603 and the Fuel Receiving and Storage Facility. In 1976, the SFE-20 Hot Waste Tank System was taken out of service and the inlet pipe was disconnected and capped. Contaminated soil may have been used as backfill material for the excavation. The pump was also removed from the pump pit and the connections capped. A preliminary investigation conducted in 1984 indicated that the tank liquid and sludge contain elevated levels of Cs- 137, Cs-134, Co-60, Sr-90, and isotopes of europium, plutonium, and uranium. The concentration of plutonium indicates that the liquid is transuranic waste and that the sludge may be classified as transuranic waste. Previous spills within the tank vault and pump pit contained similar contaminants. No data exists to determine if contamination currently exists under SFE-20, however, when the vault is removed any contaminated soils will be excavated and disposed in the ICDF in a manner consistent with the Group 3 soils remedy.

The major threat posed by the SFE-20 Hot Waste Tank System is a potential release to the underlying soils and subsequent leaching and transport of soil contaminants to the perched water or SRPA.

4.8 “No Action” And “No Further Action” Sites

The Agencies have determined that “No Action” or “No Further Action” be taken under CE RCLA at 40 sites. In all cases, the determination applies to the soils only and not to overlying man-made structures. A “No Action” site is a site that has no contaminant source or has a minor contaminant source

with an acceptable risk level under a current residential exposure scenerio, i.e., the risk is less than 1 x 10^{-4} or hazard index (HI) <1 in the year 2000. A "No Further Action" site is a site that has a contaminant source or a potential contaminant source present that meets either of the following criteria:

- The site poses a current unacceptable residential risk, i.e., greater than 1 x 10^{-4} or HI <1 in the year 2000, but does not pose an unacceptable residential risk in the year 2095, i.e., less than 1 x 10^{-4} or HI <1. (Radioactive decay will allow many sites that are currently unacceptable to decay to acceptable risk levels by the year 2095.)

- The site has contamination that exists at depths greater than 10 ft bgs and does not have an exposure route available under current site conditions.

- The site has a minor contaminant source, as qualitatively determined, that exists under a building, structure, or asphalt.

Ten sites were designated as "No Action" sites with the signing of the FFA/CO, because it was determined that no hazardous substances were present or released. An additional 24 sites were determined to be "No Action" during the RI/BRA. Six sites were determined to be "No Further Action" sites through Track 1 or Track 2 investigations and RI/BRA analysis. Table 4-1 lists the 40 "No Action/No Further Action" sites. The technical basis for these decisions is contained in the Administrative Record.

All "No Further Action" sites will be reviewed during the CERCLA 5-year review process to ensure the protectiveness of the remedial actions taken under this ROD. Review of the "No Further Action" sites is necessary because continued operations of the INTEC may adversely impact these sites. Five-year reviews will also ensure that changes in the physical configuration of any INTEC facility or site where there is suspicion of a release of hazardous or radioactive substances (e.g.. D&D) will be managed to achieve remediation goals established in this ROD. The 5-year reviews will continue as long as contaminants exist at levels which result in restricted or limited site usage.

Each site for which a "No Action" or "No Further Action" determination has been made is briefly discussed below. Additional details can be found in the Administrative Record.

4.8.1 "No Action/No Further Action" Sites Determined in OU 3-13 ROD

4.8.1.1 CPP-06. CPP-06 consists of a trench near the southern border of the INTEC that was used to dispose of fuel storage basin water from Building CPP-603. The water discharged was reported to contain radionuclides at or near background concentrations. One soil sample was collected from the trench. A risk assessment performed using those data indicated acceptable risks in the year 2095 but unacceptable risks in the year 2000. Therefore, the Agencies have determined that Site CPP-06 is a "No Further Action" site (LMITCO 1995b).

4.8.1.2 CPP-07. Site CPP-07 is an area of approximately 35 m^2 (375 ft^2) that was contaminated by steam condensates resulting from a jet-pump transfer of liquid low-level radioactive waste from Tank SFE-20 to WL-102. The contamination incident was a one-time occurrence. The surface contamination was measured at 200 mrem/hr ß-*7*. The contaminated surface soils , were promptly removed and replaced with clean soil; no source remains at this site. The Agencies have determined that CPP-07 is a "No Action" site because the source was removed (WINCO 1992b).

4.8.1.3 CPP-12. Site CPP-12 was an area located south of Building CPP-603 where contaminated paint chips were found outside of a nearby radiation and contamination control area that was previously used for contaminated equipment storage. The paint chips originated from paint that was applied to a

storage pad; weathering caused the paint to fall off and was wind dispersed outside of the control area. The contaminated paint chips and storage pad were both removed. Subsequent surveys indicate that no contaminated surface soils exist at this site. The Agencies have determined that Site CPP-12 is a "No Action" site because the minor source was completely removed (WINCO 1992c).

4.8.1.4 CPP-17. CPP-17 consists of two areas near Building CPP-603. The site was used for storing piles of soil, asphalt, concrete, metal debris, and other items that reportedly came from a variety of construction and maintenance activities within the INTEC. In addition, sludge and liquid generated during CPP-603 fuel storage basin maintenance activities may have been deposited in these areas resulting in contamination of the underlying soils. The soil in CPP-17 was containerized in approximately 653 standard radioactive waste boxes. Three soil borings were sampled to characterize CPP-17. The results of the investigation and risk assessment, which are reported in Chapter 14 of the BRA, indicated that the risks to current onsite workers and hypothetical future residents is acceptable but the current residential risks are unacceptable. Therefore, the Agencies have determined that Site CPP-17 is a "No Further Action" (LITCO 1995b).

4.8.1.5 CPP-18. Site CPP-18 is an area that was used to store spent gas cylinders. Building CPP-668 is presently located on this site. In addition. excavation for, and construction of Building CPP-668 would have disturbed any minor contamination that may have existed at the site (WINCO 1992d). The Agencies have determined that Site CPP-18 is a "No Action" site because there is no documentation or other evidence of a release.

4.8.1.6 CPP-21. Site CPP-21 is an area south of CPP-601 that was used to store solid waste including paper, rags, and contaminated metal. The waste was contained in three dumpsters. A radiological survey of the area revealed no evidence of contamination. The Agencies have determined that Site CPP-21 is a "No Action" site because there is no evidence of a source or a release at this site (WINCO 1993b).

4.8.1.7 CPP-22. Site CPP-22 is the location of surface contamination associated with a 1958 air release that resulted from the failure of a HEPA filter. The HEPA filter was associated with the Fuel Element Cutting Facility. Contamination from this airborne release has most likely been removed or covered over with soil during the period from 1958 to the present as a result of construction activities that have disturbed the area. The area was extensively sun-eyed and three boreholes were drilled within Site CPP-22 at the locations surveyed to have the highest radiation levels above background. During the investigation, the peak concentration for Cs-137 was 14 pCi/g. The Agencies have determined that Site CPP-22 is a "No Further Action" site because the future risks are acceptable but the current residential risks are not acceptable (LITCO 1995b).

4.8.1.8 CPP-29. Site CPP-29 is the result of a release of small quantities of radioactive liquid at the base of the original ICPP stack in 1974. The original contaminated area was estimated to be 0.7 m^2(8 ft^2) and no more than a few inches thick. Since the release, the Main Stack Refurbishment Project completely excavated this site to a depth of 2.1 m (7 ft) (bls) and extended the concrete base of the new stack over the area of the release. The Agencies have determined that Site CPP-29 is a "No Action" site because the original area of contamination was completely excavated and covered with concrete (WINCO 1993c, DOE et al. 1994b).

4.8.1.9 CPP-39. Site CPP-39 consisted of a hydrofluoric acid storage tank, a concrete containment vault, and a 38-m (125-ft) tile line connected to the dry well. The storage tank was used as a makeup tank to provide hydrofluoric acid to the CPP-601 dissolution process. The tank was also used to receive off-specification hydrofluoric acid where it was either adjusted to meet specifications or neutralized and discharged to a dry well. The dry well and vault both contained limestone rock to neutralize the

hydrofluoric acid. No radioactive constituents were associated with this process. The system was used from 1967 to 1984 and was removed in 1990; the clay tile pipe was removed in 1993. Sampling results and subsequent risk analysis indicate that current residential risks are acceptable. Cumulative risks from all contaminants at all depths evaluated were below a HI of 1 or the 1×10^{-4} carcinogenic risk levels. The Agencies have determined that Site CPP-39 is a "No Action" site because the risks are considered acceptable (DOE-ID 1997b).

4.8.1.10 CPP-40. Site CPP-40 is the location of a historic acid neutralization pit and associated piping. It consisted of a 19-m (62-ft) long drain pipe, a neutralization pit (lime pit), and a discharge pipe. The drain pipe led from a drip pan in CPP-601 that collected spills of hydrofluoric acid and other miscellaneous chemicals. The discharge from CPP-601 was discontinued in 1985 but water continued to flow into the neutralization pit until 1990. The drain pipe, neutralization pit, and discharge pipe have been removed. No radionuclides were detected in the material removed. The analysis of samples collected could not confirm the presence of residual contamination because only two out of three samples measured Cs-137 at levels slightly above background and below the risk-based concentration.

The Agencies have determined that Site CPP-40 is a "No Action" site because no source remains at this site and the maximum measured Cs-137 concentration is 1.3 pCi/g which is below the 1×10^{-4} risk-based concentration (WINCO 1993d and DOE-IDe 1997b).

4.8.1.11 CPP-41b. Site CPP-41b consists of a pit where oils and organic materials were placed in metal drip pans and ignited for fire brigade practice, The training pit is no longer in use. CPP-41b has been totally excavated and partially covered by Building CPP-666. No samples were taken from this site; therefore, no quantitative risk assessment was performed. The Agencies have determined that Site CPP-41b is a "No Action" site because the site has been excavated and removed.

4.8.1.12 CPP-42. Site CPP-42 is a drainage ditch that is west of CPP-637 and was originally designed to handle precipitation run-off. It was suspected that some nonradioactive laboratory waste had been disposed to the surface soil at this site. The Agencies have determined that Site CPP-42 is a "No Action" site because the calculated HI was less than one (LMITCO 1994).

4.8.1.13 CPP-45. Site CPP-45 was a storage area for various acids (HCL, HNO_3, HF, and H_2SO_4) and aluminum nitrate. During the history of operation in the CPP-621 area, five releases were documented and other spills or releases were suspected. The samples collected and ensuing risk assessment indicated that the contaminant levels were all below an HI of 1. The Agencies have determined that Site CPP-45 is a "No Action" site because the calculated risks were acceptable (WINCO 1993e).

4.8.1.14 CPP-46. Site CPP-46 is an area that was contaminated by a 1,700L (450 gal) spill of simulated zirconium fluoride waste. This simulated zirconium fluoride waste was being used as a nonradioactive feed stock for process testing. Following the release, the waste was neutralized and contaminated soils were removed. Subsequent soil samples confirmed that most of the affected soils were removed. The highest Cs-137 concentration was 2 pCi/g. The only remaining soil that was clearly contaminated was later entirely removed during excavation for footings of the concrete slabs on which the tanks now sit. The Agencies have determined that Site CPP-46 is a "No Action" site because the source has been removed and the current residential risks are considered acceptable (LITCO 1994, and DOE-ID 1997b).

4.8.1.15 CPP-47. Site CPP-47 is an area used to store high molar hydrofluoric acid. One to three 208-L (5-gal) drums were stored on pallets. Sometime in 1984, a small spill (approximately 7.5 L

[2 gal]) was known to have occurred. The area was sampled and the analysis showed that although high f1uoride concentrations were observed, but they w ere below risk-based levels. The Agencies have determined that Site CPP-47 is a "No Action" site because the calculated HI is much less than 1 (WINCO 1992x).

4.8.1.16 CPP-49. Site CPP-49 is the site of soils underneath an active transformer yard that contained three PCB transformers. Visual evidence of leaks lead to sampling the concrete pads and surrounding soil. Sampling results indicate that the soil contained less than 0.1 ppm PCBs. One concrete pad sample contained 29.1 ppm PCBs. Subsequent sealing activities completed on the transformer pad have resulted in encapsulation of the pad within a larger resultant concrete pad structure. The Agencies have determined that Site CPP-49 and the soils under the transformer pad is a "No Action" site because the PCB concentrations observed in the soil were less than the CERCLA cleanup criteria for PCBs. In addition, the concrete pad was sealed and incorporated into a larger concrete pad (WINCO 1992a).

4.8.1.17 CPP-50. Site CPP-50 is the location of soils beneath a PCB transformer pad. The transformer contained 874 L (231 gal) of 400 ppm PCB oil. Leakage was noted during an inspection of the transformer in 1985. The leaked oil was isolated on the transformer concrete pad and did not impact the surrounding soil. The transformer was removed and disposed at an approved off-Site disposal facility. The Agencies have determined that Site CPP-50 is a "No Action" site because there is no evidence that contamination spread to the surrounding soil (WINCO 1992a).

4.8.1.18 CPP-51. Site CPP-51 is defined as the soil below a storage area for PCB-transformers, contaminated soil, debris, and concrete from the ICPP Utilities Replacement and Expansion Project. The storage area was unpaved. During the upgrade project, two transformers leaked onto plastic sheeting. The sheeting, transformers, and debris have been removed from the site. The PCB concentrations in the soil are less than the 1 ppm cleanup criteria specified by TSCA for unrestricted access areas (40 CFR 761.125 (c)(4)(v). Of the eight samples collected, the maximum PCB concentration observed was 0.120 ppm. The Agencies have determined that CPP-51 is a "No Action" site because the PCB contamination is below the TSCA cleanup standards (WINCO 1992a).

4.8.1.19 CPP-53. Site CPP-53 was an area used by a painting subcontractor for the storage of approximately 30 to 40 drums of paint and paint solvents. In 1983, the stored materials were removed to an EPA approved disposal facility and the area was covered with 61 to 76 cm (24 to 30 in.) of gravel. The area was subsequently used as a construction laydown area and vehicle parking. There are no documented releases at this site. Sample results did not indicate any contamination above detection limits. The Agencies have determined that Site CPP-53 is a "No Action" site due to the lack of an apparent source (WINCO 1992g).

4.8.1.20 CPP-54. Site CPP-54 is an area that was used to store approximately 30 to 40 drums of' organic solvent and used oil. There are no known releases from the drums. Analysis of soil samples collected did not reveal any contamination above risk-based levels. The Agencies have determined that Site CPP-54 is a "No Action" site due the lack of an apparent source (WINCO 1992h).

4.8.1.21 CPP-56. Site CPP-56 is an area where a nitric acid leak occurred in a transfer line in 1968. The nitric acid was neutralized prior to disposal and was nonradioactive. In 1986-87, the site was excavated to support construct ion of CPP-796. Any residual contamination would have been blended with backfill soil as part of construction of CPP-796. The Agencies have determined that Site CPP-56 is a "No Action" site because the HI was qualitatively determined to be less than 1, and the residual contamination was removed (LITCO 1994).

4.8.1.22 CPP-57. Site CPP-57 is a sulfuric acid tank. Approximately 189 L (50 gal) of sulfuric acid spilled on the ground in 1984, and 17,034 L (4,500 gal) spilled in 1985. The soil was neutralized and removed; any residual acid that was not removed would have been naturally neutralized by the soils. The Agencies have determined that Site CPP-57 is a "No Action" site because no source remains and the HI was qualitatively determined to be less than one (WINCO 1992i).

4.8.1.23 CPP-59. Site CPP-59 consists of soils within a containment berm surrounding two 75,708 L (20,000 gal) kerosene storage tanks. Contamination of CPP-59 occurred in two separate kerosene releases that occurred in 1983; the combined release was 984 L (260 gal) of kerosene. There is no documentation of cleanup following the two discharges. The kerosene most likely evaporated or infiltrated into the soil. Nine borehole samples were collected to characterize CPP-59. Xylenes were the only volatile organic compounds (VOCs) detected in the soils at concentrations ranged between 1 and 1 **F**g/kg. Risks were calculated to be less than 1×10^{-4} and an HI less than 1. The Agencies have determined Site CPP-59 is a "No Action" site because the risk and HIs are less than 1×10^{-4} and one respectively. (WINCO 1992j, WINCO 1994a.)

4.8.1.24 CPP-62. Site CPP-62 is an area where paint solvents were discarded to the soil. In 1985, a cleanup of this area was conducted in which 28 drums of contaminated soil were removed and shipped to a commercial hazardous waste facility. Subsequently, in 1987, the area was excavated for the construction of the 7th Calcined Solids Storage Vault. The Agencies have determined that Site CPP-62 is a "No Action" site because the source was removed and additional excavation has been conducted (WINCO 1992k).

4.8.1.25 CPP-63. Site CPP-63 is the site of a hexone spill in 1982. During excavation for cathodic protection maintenance or repair, a hexone line was cut by a backhoe; approximately 189 L (50 gal) was released. There were no reports indicating if the soil was removed after the spill. Three soil samples were collected along the length of the broken line. The samples were analyzed for VOCs including hexone. The VOC concentrations were less than the method detection limits. The Agencies have determined that Site CPP-63 is a "No Action" site because the HI is less than 1 (WINCO 1993f).

4.8.1.26 CPP-64. Site CPP-64 is the site of a hexone spill in which a forklift operator punctured a drum of hexone. About 208L (55 gal) of hexone leaked onto the asphalt. Vermiculite was used to absorb most of the hexone and the vermiculate was collected and disposed. Soil samples from five boreholes were analyzed and revealed that no hexone was detected significantly below risk-based concentrations. The other contaminants detected were below an HI of 1. The Agencies have determined that Site CPP-64 is a "No Action" site because the initial spill was small, the source was removed, and the analytical results indicate acceptable risks (WINCO 19921).

4.8.1.27 CPP-78. Site CPP-78 consists of a 2.3 m^2 (25 ft^2) area of potentially radioactively-contaminated soil located west of building CPP-693 and east of the Dry Fuel Storage Area. Contamination was discovered during excavation activities. The origin of the contamination is not known but is presumed to have resulted from a surface spill. Two soil borings were drilled and soil samples collected and analyzed. The analysis of the samples showed that the radiation levels barely exceeded background values and are below 1×10^{-4} residential risk-based concentrations. The Agencies have determined that Site CPP-78 is a "No Action" site because no discernable source could be found and the risk levels are acceptable (LITCO 1995).

4.8.1.28 CPP-88. Site CPP-88 consists of the radioactively-contaminated soils within the current INTEC security fence that have not been attributted to another specific release site. Investigation of CPP-88 included extensive document reviews and analysis of samples collected from 16 boreholes from various INTEC locations. The maximum Cs-137 concentration was 36.6 pCi/g and the 95% UCL for

Cs-137 was 14.1 pCi/g. The Agencies have determined that Site CPP-88 is a "No Further Action" because it is above the current 1 x 10^{-4} residential risk range and below the year 2095 1 x 10^{-4} residential risk range (DOE-ID 1997b).

4.8.1.29 CPP-90. Site CPP-90 consists of soil contaminated by leaks in service waste transfer lines between Building CPP-709 and the CPP-23 injection well. The original concrete pipeline was replaced in 1959-1960 with a vitrified clay line. The vitrified clay line was replaced in 1969 with a stainless steel line that was partially replaced in 1982 with another stainless steel line. In 1986, the line was permanently taken out of service and abandoned in place. Three soil borings were drilled to support the BRA. Soil analytical data from those borings indicate a maximum Cs- 137 concentration of 7.5 pCi/g and a 95% UCL for Cs-137 of 7.5 pCi/g. The Agencies have determined that Site CPP-90 is a "No Further Action" site because the future residential risk is acceptable but the current residential risk is not acceptable. (DOE-ID 1997b). This site will be reviewed under the CERCLA 5-year review to ensure that if this pipe is removed in the future, any contamination discovered will be properly addressed.

4.8.1.30 CPP-95. Site CPP-95 is the wind-blown plume and consists of areas outside the current INTEC perimeter fence that are potentially contaminated as a result of wind dispersion of radionuclides from facility operations. The area delineated as Site CPP-95 (i.e., the WAG 3 AOC) is shown in Figure 1-10. Surveys and soil sampling were conducted as part of the 10-06 RI and EE/CA. The 95% upper confidence level (UCL) 95% concentration for Cs-137 within the AOC is 5.9 pCi/g. Site CPP-95 is a "No Further Action" site , because it is above the current 1 x 10^{-4} residential risk range and below the year 2095 1 x 10^{-4} residential risk range (DOE- ID 1997b).

4.8.2 "No Action" Sites Designated in the FFA/CO

4.8.2.1 CPP-43— Grease Pit South of CPP-637 This pit was used for the disposal of an unknown quantity of oil and grease. The site occupies an area of 141 m^2 (1,520 ft^2). The site was filled, and a building (CPP-651) was constructed on the site in the mid-1970s. A "No Action" decision documentation package was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991a).

4.8.2.2 CPP-52. Site CPP-52 was a pickling shed used to treat piping and other structural materials with mineral acids during the original construction of the ICPP. The site involved an area of 13.4 m^2(144 ft^{-2}). The building was a temporary structure located east of CPP-631. Spent pickling solutions were disposed in liquid waste storage tanks; there are no records of spills or leaks. The building was demolished in 1954. A "No Action" decision documentation package was placed in the Administrative Record in September 1991; in December 199 1, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991b).

4.8.2.3 CPP-70. Site CPP-70 is a septic tank located east of CPP-655. This septic tank was used to treat sanitary waste generated at the craft shop and warehouse building. Operations in the building included equipment maintenance and repair, welding, and carpentry. There are no drains located in the work areas and there is no evidence hazardous constituents were disposed in the septic system. A "No Action" decision documentation package was placed in the Administrative record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991c).

4.8.2.4 CPP-71. Site CPP-71 consists of the seepage pits west of CPP-656. These pits were used in conjunction with the septic tank located east of CPP-655 (CPP-70). There are no records of hazardous constituent releases. A "No Action" decision documentation package was placed in the Administrative

Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991c).

4.8.2.5 CPP-72. Site CPP-72 consists of the CPP-758 cesspool east of CPP-65 1. Site CPP-72 used to treat sanitary sewage from temporary office trailers, The trailers have been disconnected and the system is no longer in use. Because the septic system was only connected to office restrooms, it is unlikely hazardous constituents were disposed in the system. A "No Action" decision documentation package was placed in the Administrative Record in September 199 1; in December 1991, the Agencies formerly determined that this site is a "No Action" site in the FFA/CO (WINCO 1991d).

4.8.2.6 CPP-73. Site CPP-73 is a cesspool located east of and connected to temporary building CPP-T-5, which was used as a lunch/break room by a construction contractor. No hazardous materials have been stored at this location, and no hazardous wastes are reported to have been disposed into the unit. A "No Action" decision documentation package was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (W I NCO 1991e).

4.8.2.7 CPP-74. Site CPP-74 is a seepage pit and septic tank located west of Building CPP-626. This septic system was constructed in the early 1970s and is used to treat sanitary waste from the fuel receiving and storage building and storage basin change room. The building contains a cafeteria, restroom facilities, showers, and office space. No operations involving hazardous materials are known to have occurred in the building and it is unlikely hazardous wastes have entered the system. The Summary Assessment recommending "No Action" for this site was approved in 1988. A "No Action" decision documentation package was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991f).

4.8.2.8 CPP-75. Site CPP-75 consists of the septic tank west of Building CPP-603. It was built in the early 1950s and received sanitary wastes before operation of CPP-74. The system was connected to a restroom facility, which was physically isolated from hazardous materials operations. The primary hazardous materials used in operations that might have been associated with this unit were mineral acids. The Summary Assessment recommending "No Action" for this site was approved in 1988. A "No Action" decision documentation package was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991g).

4.8.2.9 CPP-76. Site CPP-76 consists of the septic tank and cesspool west of Building CPP-659 which was used to treat sanitary wastewater from the old calcining facility, built in 1960. There are no records of hazardous wastes entering the system. The septic tanks are currently being removed in support of the NO Abatement Facility construction. The Summary Assessment recommendation "No Action" for this site was approved in 1988. A "No Action" documentation package was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991h).

4.8.2.10 CPP-77. Site CPP- 77 is a seepage pit and cesspool located north of Building CPP-662. There are no known records that indicate hazardous materials ever entered this system. The Summary Assessment recommending "No Action" for this site w as approved in 1988. A "No Action" documentation package for this site was placed in the Administrative Record in September 1991; in December 1991, the Agencies formally determined that this site is a "No Action" site in the FFA/CO (WINCO 1991i).

4.9 New Soil Release Sites

The Agencies have added four release sites (CPP-90, -97, -98, and -99) to the FFA/CO action plan list of sites for OU 3-13, Site CPP-96 is a consolidation of all of the previously identified release and the intervening Interstitial soils within the CPP-96 boundary. Sites CPP-97, -98, and -99 consist of soil and debris that originated from the Tank Farm upgrade project or the Building CPP-604 egress tunnel project, both of which were performed between 1993 and 1995. Previously, this material was managed as low-level radioactive waste, however, recent discussions between the Agencies has resulted in a realization that because the Tank Farm waste may be RCRA listed and the contaminated soil and debris may also be RCRA listed.

Site CPP-96, is considered part of the Group 1 Tank Farm Soils sites and will be addressed by both the Tank Farm Interim Action under OU 3-13 and the final action selected under OU 3-14. Sites CPP-97, CPP-98, and CPP-99 will be remediated under the selected remedy for Group 3 other surface soils in this ROD.

4.9.1 CPP-96— Tank Farm Interstitial Soils

Site CPP-96 is a consolidation of all of the previously identified release and the intervening interstitial soils within the CPP-96 boundary. Previously, the INTEC Tank Farm area included 14 known release sites. However, the arbitrary boundaries of each release site did not include all of the contaminated soils in the Tank Farm area; contamination was present outside of the initial known release sites. Site CPP-96 includes all of the interstitial soils within the Tank Farm area

4.9.2 CPP-97— Tank Farm Soil Stockpiles

Site CPP-97 consists of two tarp-covered soil stockpiles that originated from the Tank Farm upgrade project. One pile contains approximately 1,093 m^3 (1,430 yd^3) of radionuclide-contaminated soils. Radiation measurements at the time of generation ranged between 0 and 3 mR/hr. The second soil stockpile contains approximately 53 m^3 (70 yd^3) of radionuclide-contaminated soils with 3 to 50 mR/hr radiation readings. These soils will be included in Group 3 soils for disposal at the ICDF.

4.9.3 CPP-98— Tank Farm Shoring Boxes

The Tank Farm upgrade project used wooden shoring during excavation. Because the soil was contaminated, the shoring also became contaminated. The contaminated shoring was placed into 118 wooden radioactive waste boxes that have been managed as low-level radioactive waste. These soils and shoring will be included in Group 3 soils for disposal at the ICDF.

4.9.4 CPP-99— Boxed Soil

In addition to the aforementioned waste, the Tank Farm upgrade and CPP-604 tunnel egress projects generated 59 boxes of radionuclide-contaminated soil that have been managed as low-level radioactive waste. These boxed soils will be included in Group 3 for disposal at the ICDF.

4.10 Sites Addressed Under Other WAGs or Regulatory Programs

Six sites, CPP-38, CPP-61, CPP-65, CPP-66, CPP-81, and CPP-82, listed under the FFA/CO as part of WAG 3 are not included in the aforementioned seven groups. These sites were investigated as

part of the WAG 3 RI/ FS process. The Agencies have determined that these sites are most appropriately dispositioned outside OU 3-13, either in other programs or under other CERCLA OUs.

4.10.1 CPP-38–Asbestos in Nine INTEC Buildings

Site CPP-38 is part of OU 3-04 and consists of what was believed to be friable transite asbestos on the roof and walls in nine buildings at INTEC. A Track 1 decision document determined that the asbestos is a nonfriable form, thus representing a low risk to human health and the environment and poses no threat of release until building D&D occurs (WINCO 1993g). Therefore, the Agencies decided that this site would be more appropriately administered and remediated (if necessary) under the INEEL Asbestos Abatement Program rather than the FFA/CO. INEEL asbestos management is conducted in accordance with NESHAPS.

4.10.1.1 CPP-61. Site CPP-61 is an area within the CPP-718 transformer yard where a PCB oil spill occurred in the early 1980's. Approximately 1,510 L (400 gal) of PCB oil was spilled. The PCB concentration in the oil was 179 ppm. Most of the spill was contained, however, some spilled oil that contaminated the surrounding soil. In 1985, the spill area was cleaned up; approximately 40 drums of soil and debris were removed. A new transformer and concrete pad have been installed over the site. Three soil boring were drilled and soil samples analyzed for radionuclides. The radionuclides found were below risk-based soil concentrations (WINCO 1992a). The Agencies have determined that CPP-61 will be transferred to OU 3-14 for further evaluation because of the uncertain amount of PCB contamination that may remain under the concrete pad.

4.10.2 CPP-65–Sewage Treatment Plant Lagoon

Site CPP-65 is the lagoons for the INTEC Sewage Treatment Plant (STP). The plant treats sanitary waste from 31 INTEC facilities. The STP began operation in 1984 and is currently in use. The lagoons include four infiltration/percolation trenches that are used to dispose of treated sanitary wastewater. The lagoons were investigated as part of the RI/BRA (DOE-ID 1997b, Section 9.3).

The STP does not contain COCs in concentrations that present a threat to human health and the environment either through surface exposure or via transport to the Snake River Plain Aquifer. The Agencies have decided that final closure of the STP lagoons will be most appropriately handled under the Idaho Wastewater Land Application Rules (Idaho Administrative Procedures Act [IDAPA] 16.01.02); this decision was based on the low concentration of contaminants observed in lagoon water and the continued use of the lagoons.

4.10.3 CPP-66–Steam Plant Fly Ash Pit

Site CPP-66 is the coal-fired Steam Generation Facility Fly Ash Pit located southeast of the INTEC. The pit has been used for the disposal of fly ash produced by the INTEC Steam Generation Facility since 1984. The ash in the pit contains natural radionuclides and metals derived from coal and limestone. Site CPP-66 was evaluated using the Track 1 process in 1993 and recommended for “No Further Action” based on a human health risk evaluation. More specifically, the measured concentrations of radionuclides and inorganics the fly ash are sufficiently to low as to pose a negligible risk under both residential and occupational scenarios. Furthermore, the low permeability of the dried ash and low rainfall at the INEEL provide little driving force for leaching of ash constituents to the groundwater (WINCO 1993h). Subsequently, an ecological risk screening was performed during the OU 3-13 RI BRA, which suggested that a risk to environmental receptors may exist from the metals present in the ash. The Agencies have determined that the site will he transferred to OU 10-04 for further evaluation and remediation, if necessary.

4.10.3.1 CPP-81. Site CPP-81 is an abandoned line from the 30-cm (12-in.) Calciner Pilot Plant. The line, located approximately 0.6- to 0.9-m (2- to 3-ft) b1s, contained simulated calcine that became plugged in the line following a test run. During the fall of 1993, the line was cleaned as part of a time-critical removal action. The line was flushed with hot acid to remove the simulated calcine. No leaks were observed during the removal action indicating that no previous release to the environment had occurred. The final water rinse was analyzed and found to not contain contaminants above toxicity characteristic leaching procedure (TCLP) limits. The Agencies have determined the Site CPP-81 will be transferred to OU 3-14 for further evaluation because of the lack of sufficient data to make a final decision.

4.10.3.2 CPP-82. Site CPP-82 is the location of three waste water spills (designated Sites A, B, and C) caused by rupturing of previously abandoned underground lines. The lines were ruptured during excavation activities. In the spill associated with Site A, an estimated 9.4 L (2.5 gal) of low-level radioactive waste escaped, the abandoned line and contaminated soil associated with the leak were removed and disposed. Sites B and C are associated with spills of nonradioactive, nonhazardous waste water; these spills occurred during the repair activities associated with Site A. The Agencies have determined the Site CPP-82 will be transferred to OU 3-14 for further evaluation because of the lack of sufficient data to make a final decision.

5. SUMMARY OF SITE CHARACTERISTICS

5.1 Physiography, Geology, and Hydrology

The INEEL is located on the northeastern portion of the Eastern Snake River Plain (ESRP), a volcanic plateau that is primarily composed of silicic and basaltic volcanic rocks with interspersed sedimentary material. In this region, the climate is characterized as semidesert with hot summers and cold winters. Normal annual precipitation is 22.1 cm (8.71 in.). Within the ESRP, the INEEL is located in a topographically closed drainage basin. Natural sources of surface recharge in the basin include Birch Creek, the Little Lost River, and the Big Lost River. The Big Lost River channel is typically dry because of the and climate, high infiltration rates through the alluvium, and active upstream irrigation and flood control diversions. Other natural sources of surface water include occasional heavy precipitation or snowmelt. which results in surface water runoff into natural drainage areas, usually in January through April of each year. The surface water serves as a recharge source to the underlying SRPA, which occurs at depths of 61 to 154 m (200 to 500 ft) b1s. In the SRPA, regional groundwater flow is to the southwest at average estimated velocities of 1.5 m/day (5 ft/day), with significant local deviation due to local hydraulic influences and variability in saturated thickness and the characteristics of the basalts and sedimentary interbeds. The northern portion of the INTEC lies within the Big Lost River 100-year floodplain (Figure 5-1). The SRPA was designated a sole-source aquifer under the Safe Drinking Water Act on October 7. 1991 (55 FR 50634).

The INEEL contains valuable historic, cultural, and biological resources. To protect these resources, surveys will be performed prior to implementing field work to ensure that no cultural artifacts, threatened or endangered species will be impacted by any remedial action.

5.1.1 Conceptual Model of Water Sources and Hydrogeology at WAG 3

The INTEC is located in the south-central portion of the INEEL. Average elevation at INTEC is 1,498 m (4,917 ft). The facility's northwest corner is approximately 46 m (150 ft) southeast of the Big Lost River channel, which flows along the northwest border of the INTEC facility boundary. As with much of the Big Lost River on the INEEL, the channel is typically dry at INTEC, however, the Big Lost River flowed during most of 1997 and 1998. At land surface, as much as 18.2 m (60 ft) of surficial alluvium is composed of gravelly, medium -to-coarse-grained sediment. This alluviual material overlies a series of basalt/sediment units where the basalt is very transmissive, and the sediment units are relatively thin, much less transmissive, and laterally discontinuous. Below a depth of roughly 137 m (450 ft), the basalts are more massive, with one primary sedimentary interbed (H-I interbed) occurring at a depth of roughly 198 m (650 ft). These deeper units comprise the SRPA under and southwest of the INTEC. Regional groundwater flow in the area of INTEC is affected by local recharge as well as by locally high permeability basalts. The average groundwater flow velocity beneath the INTEC is about 3 m/day (10 ft/day).

As an operating facility, there are several sources of aquifer recharge at INTEC that include natural sources such as precipitation infiltration and intermittent flows of the Big Lost River, as well as anthropogenic water sources including the INTEC percolation ponds, sewage treatment ponds, lawn irrigation, and other miscellaneous sources. As this water infiltrates downward through the alluviurn and the underlying transmissive basalts it is impeded by lenses of low permeability sediments and potentially, by low permability basalt flows, creating local areas of higher water saturation or moisture content. In some instances, enough water is present in or on top of the sedimentary interbeds to form local perched water bodies. A hydrologic cross-section showing the conceptualization of this water/basalt/sediment system is shown in Figure 5-2. The water shown on this cross-section is based on water level measurements. Therefore, it does not depict saturated sediments or fractured basalt seepage paths beneath surface water features like the percolation ponds and the Big Lost River. In the simplified used for contaminant transport modeling the sedimentary interbeds were grouped into three or four general units

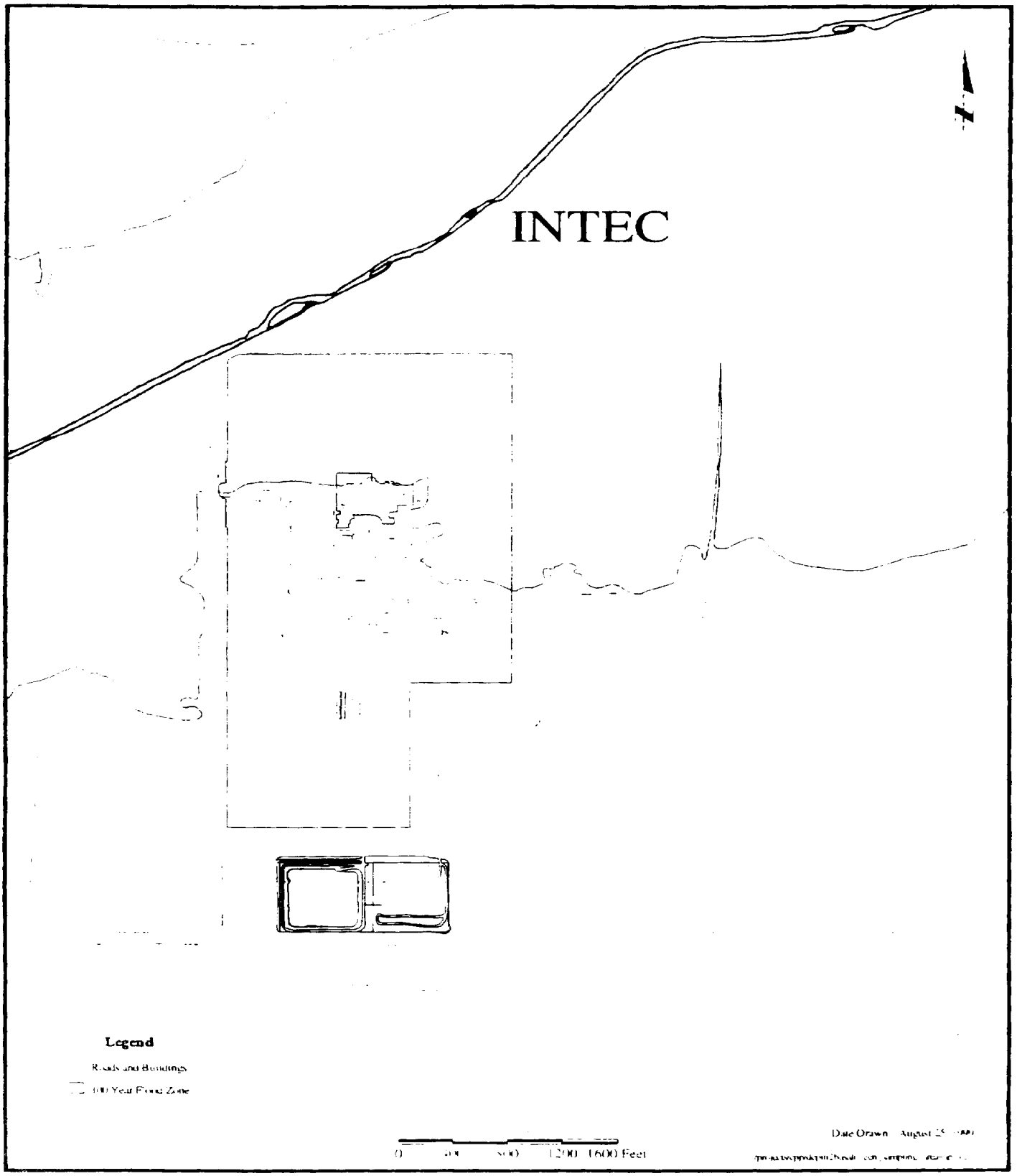


Figure 5-1. 100-year floodplain map at INTEC (USGS 1998).

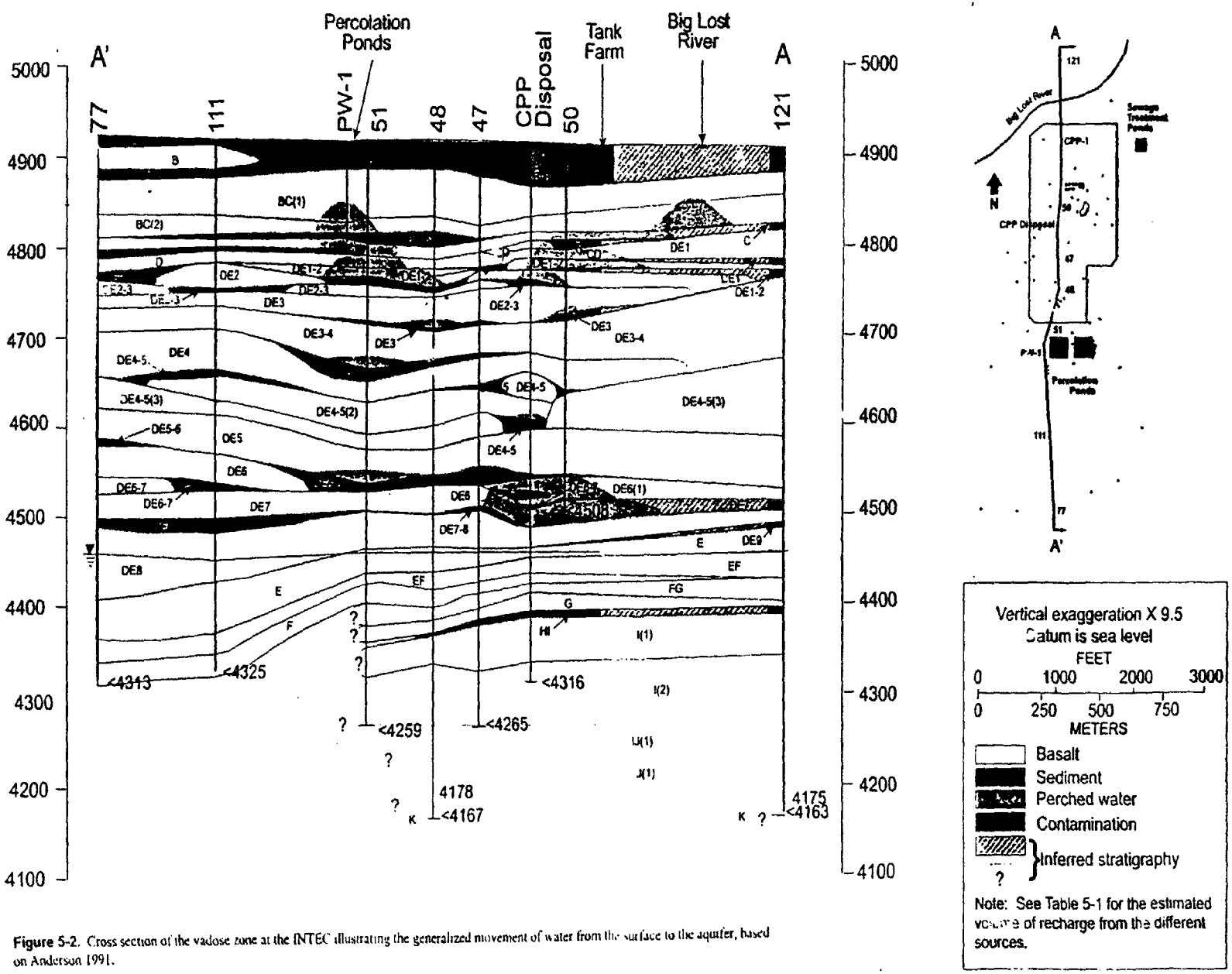


Figure 5-2. Cross section of the vadose zone at the INTEC illustrating the generalized movement of water from the surface to the aquifer, based on Anderson 1991.

based on drilling logs. Each modeled interbed zone consists of multiple noncontiguous sedimentary units that were lumped together to preserve total sediment thickness.

5.1.1.1 Recharge Sources. Perched water bodies are known to exist beneath the INTEC. Perched water bodies are present beneath the percolation ponds and the INTEC plant facilities, including the Tank Farm. The uppermost perched water zone identified at the INTEC occurs within the Big Lost River alluvium above the basalt. The source of water creating these perched water zones include both natural and man-made features. Natural perched water recharge sources at the INTEC include precipitation and the Big Lost River. Man-made perched water recharge sources include the INTEC percolation ponds (service wastewater ponds), water system leaks, sewage treatment ponds, landscape irrigation, unlined surface water drainage ditches, steam condensate, and CPP-603 basins. Table 5-1 provides the estimated volume of water recharging the per,:hed water bodies at INTEC from the various sources. Figure 5-2 illustrates the occurrence of the interbeds beneath the INTEC and the associated perched water zones. The largest perched water body in the southern INTEC results from percolation pond infiltration.

The percolation ponds and the Big Lost River are the primary sources of recharge to perched water. comprising about 91% of the total recharge at the INTEC. The percolation ponds contribute about 70% of the total perched water recharge. Percolation Ponds 1 and 2 are located outside the INTEC southern security fence, southeast of CPP-603. The percolation ponds are unlined wastewater disposal ponds that were excavated in the surficial alluvium in 1982 and 1985. The Big Lost River contributes about 21% of the total perched water recharge.

5.2 Conceptual Model of Contaminant Distribution and Transport at WAG 3

Figure 5-3 is a conceptual drawing showing the main contaminant sources and transport mechanisms at WAG 3. Water infiltrating from the surface transports contaminants between contaminated surface soils and the SRPA. Contaminants present in the recharge water and perched water in the upper portion of the vadose zone are primarily Sr-90 and tritium. Contamination in the lower portion of the vadose zone is different in composition and concentration than the upper zone. The lower vadose zone perched water was influenced and partially contaminated as a result of two events during which the INTEC injection well (CPP-23) collapsed and service wastewater was released into the vadose zone above the lower sediment units. Additional contamination in the lower perched water zone is the

Table 5-1. Estimated volume of water recharging the perched water bodies at INTEC

Source	Volume (gal/yr)	Volume Percent
Service wastewater (percolation ponds)	690,000,000	70.4
Sewage treatment ponds	14,974,228	1.5
Water system leaks[a]	3,973,202	0.4
Landscape irrigation[a]	1,299,470	0.1
Precipitation infiltration	64,957,269	6.6
Steam condensate	1,668,327	0.2
CPP-603 Basins	49,275	<0.1
Big Low River	202,564,301	20.7
Total	979,486,072	100

a Estimate based past leaks and irrigation and irrigation practices Actual loss from piping leaks is not known

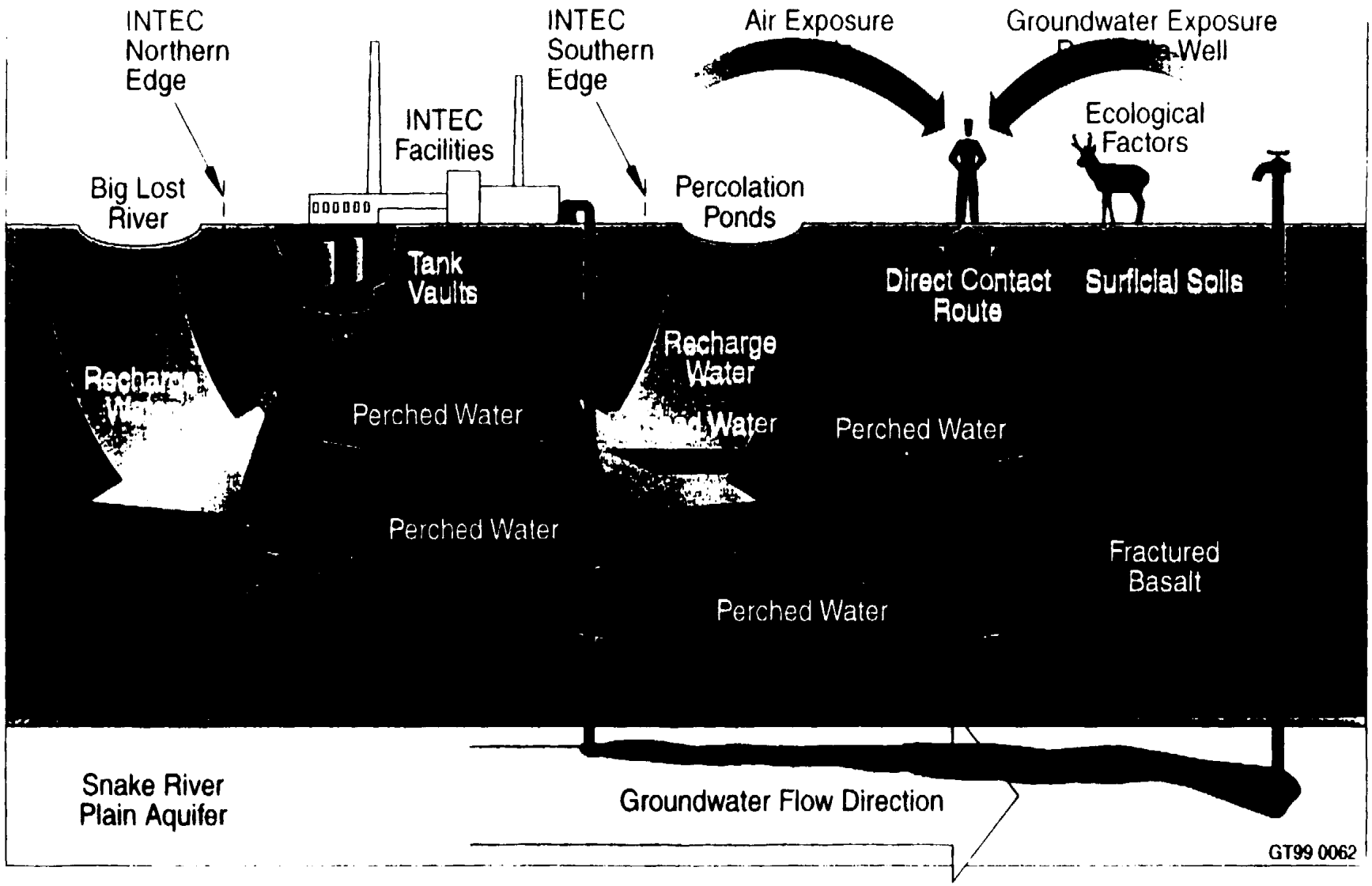


Figure 5-3. INTEC site conceptual model.

result of the transport of contaminants from the alluvial soils and upper perched water contamination. The lower vadose zone contamination includes Cs-137, Sr-90, plutonium, I-129 and mercury. Although contaminants are locally present in perched water, they are generally not available for consumption because of limited availability of that water. There are no water supply wells in the perched zone. Wells installed in the perched zone would not be capable of sustaining the pumping rates needed for future domestic water supplies. Furthermore, following this ROD's perched water remedies, the elimination and absence of man-made recharge will greatly reduce the primary recharge sources of perched water. As such, the perched water does not pose a direct human health threat, but impacts aquifer groundwater quality because it is a contaminant transport pathway between the contaminated surface soils and the SRPA.

The SRPA has been contaminated by historical INTEC operational waste disposal activities. Release site CPP-23 (OU 3-02) consists of the former INTEC injection well, which was the primary means of disposing of service wastewater from 1952 to 1984 and is the primary source of contamination in the SRPA at INTEC. In 1984, the well was removed from routine service and wastewater was subsequently discharged to the percolation ponds. After 1984, the well was used for emergency purposes in 1986, and was permanently sealed in 1989.

Radionuclides that were introduced into the aquifer from the former injection well include Pu-238. Pu-239, Pu-240, Sr-90,I-129, and tritium. Of these, tritium was the most common, comprising about 96% of the contaminant activity. At the time of injection, the radionuclides were generally below federally regulated levels. The injected wastewater also contained other (nonradioactive) chemicals including arsenic, chromium, mercury, and nitrates at concentrations below federal and state groundwater quality standards. Mercury, however, is estimated to exceed groundwater quality standards in the immediate vicinity of the former injection well but has not been detected in downgradient wells.

Subsequent migration of these contaminants has produced several overlapping groundwater contaminant plumes, containing tritium, Sr-90, and I-129 currently occurring in groundwater beneath INTEC and extending downgradient for several miles (Figures 5-4, 5-5, and 1-7). Short-lived (<30 year half-life) radionuclides, such as tritium, do not pose a long-term risk. Strontium is predicted to persist tn the aquifer beyond 2095 at levels above the MCL if no action is taken. I-129 has a very long half-life and is predicted to persist in the aquifer at concentrations exceeding MCLs.

Leaching and transport of Tank Farm soil contaminants poses an additional future risk to the aquifer from Sr-90 and other contaminants (see Section 7). An evaluation of these risks and possible remedial actions for the Tank Farm soils is the focus of the OU 3-14 RI/FS.

The human health and environmental threat posed by the contaminated aquifer is groundwater ingestion. Based on the groundwater simulations presented in the RI/FS, the contaminant plume is not expected to migrate beyond the INEEL boundary at concentrations exceeding MCLs. The plume does not present a threat to off-INEEL drinking water users. The remedial action objectives will assure that the aquifer meets MCLs within the INEEL boundary by 2095. As the plume gets further from INTEC. it becomes more dilute, and by the time it reaches the INEEL boundary the MCLs are no longer exceeded.

The aquifer beneath the INTEC fenceline will be evaluated in OU 3-14. The focus of OU 3-14 will address aquifer contaminants from the injection well (CPP-23) and the Tank Farm. Other sources of aquifer contamination inside the INTEC fence will also be investigated as part of OU 3-14, as necessary.

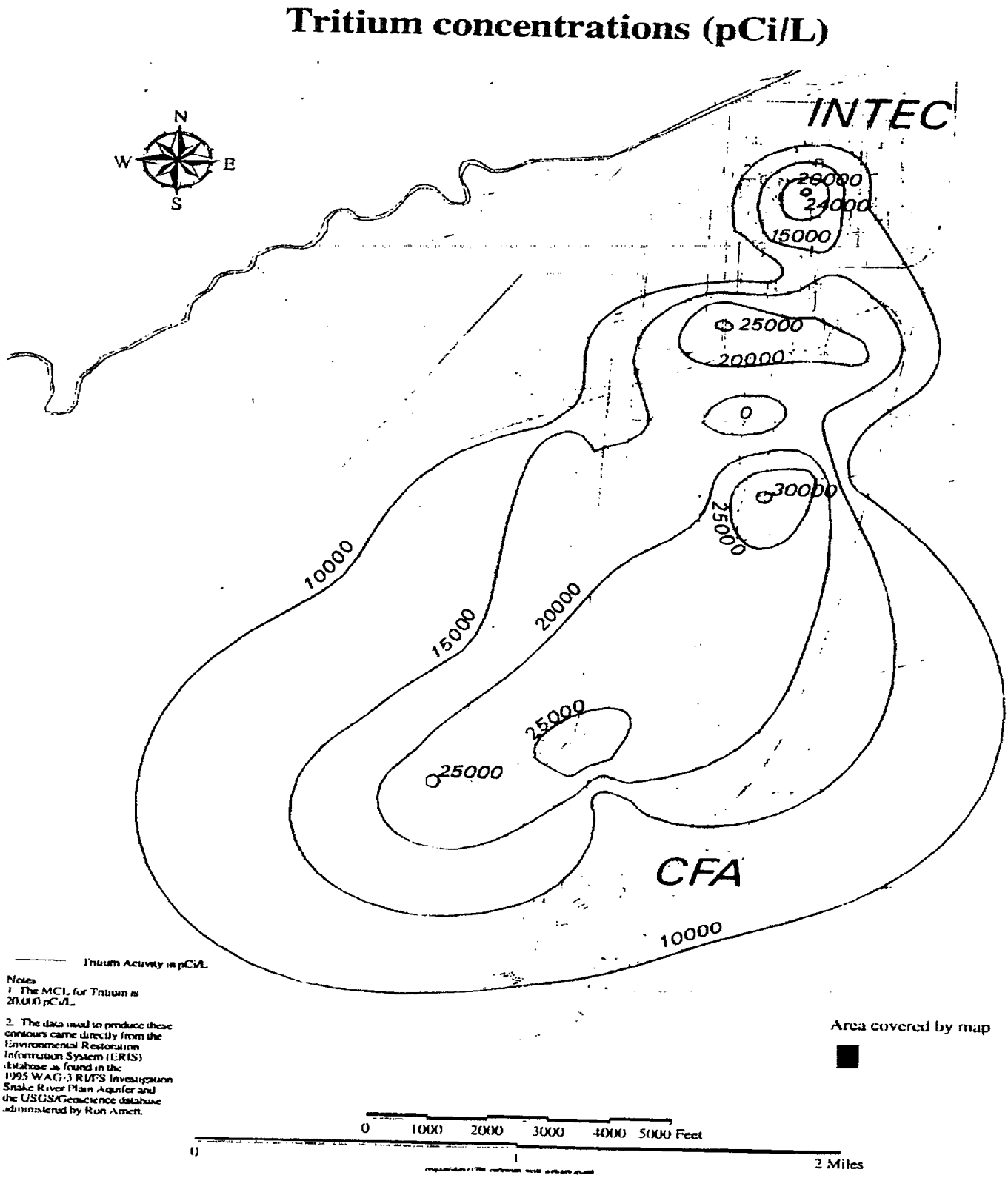


Figure 5-4. SRPA tritium plume (1995 data).

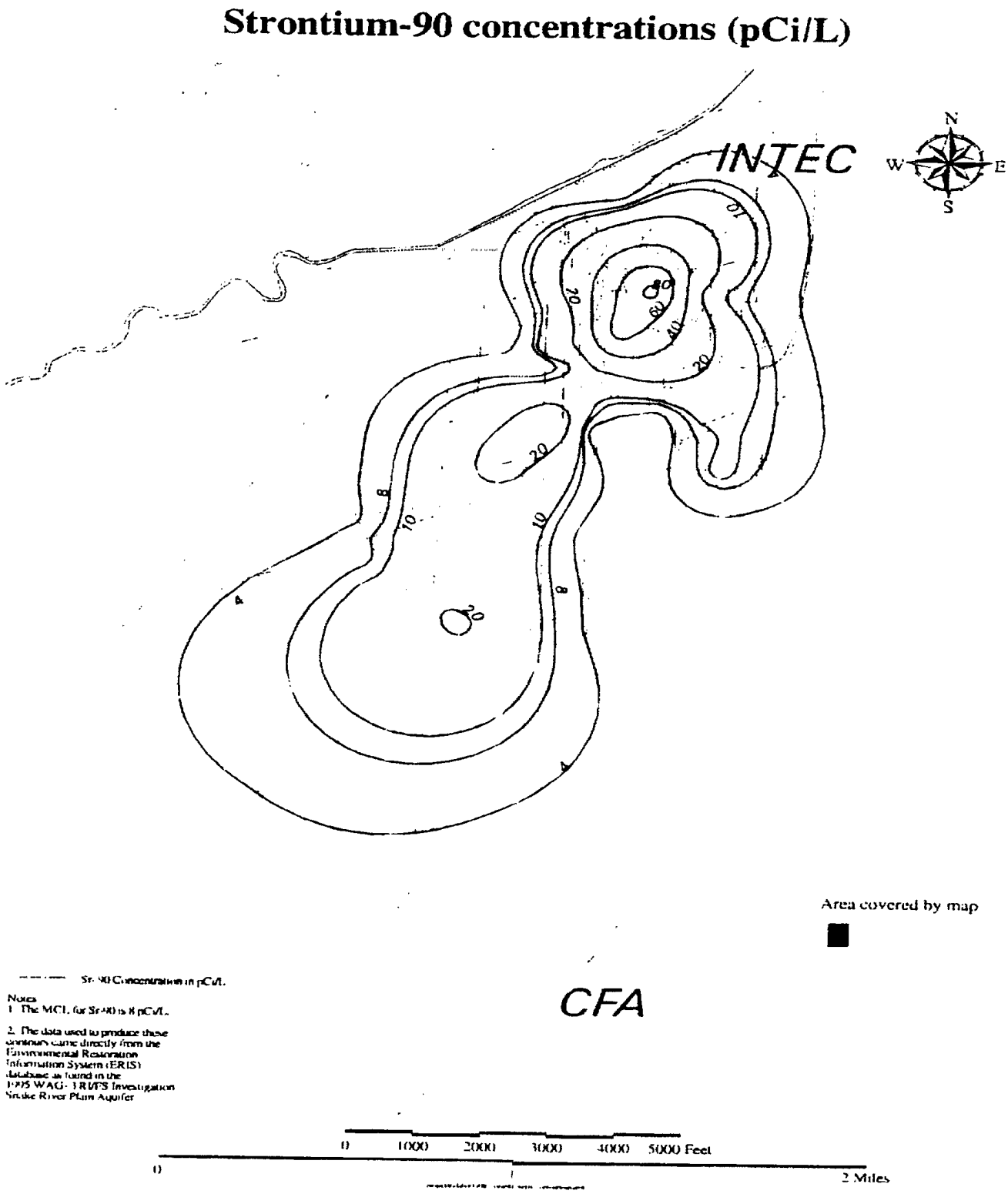


Figure 5-5. SRPA Sr-90 plume (1995 data).

5.3 Nature and Extent of Contamination

The nature and extent of contamination at the WAG 3 release sites determined to present an unacceptable risk or threat to human health or the environment are described below, by site group, These sites have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in this ROD, may present imminent and/or substantial endangerment to public health, welfare, and/or the environment. The detected contaminants of potential concern for each group or site are summarized.

5.3.1 Tank Farm Soils (Group 1)

Based on the results of drilling and sampling at previously identified release sites, the horizontal extent of contamination is generally localized at the site of the spill or leak, but, in some cases, contamination has been found to extend vertically to the soil/basalt interface at approximately 14 m (45 ft) bgs. Contamination has also been found along gravel lenses within the Tank Farm. Some spills and releases were cleaned up and excavated soils were replaced with contaminated backfill. Contaminants released to the soils are suspected to have migrated into the underlying basalt and the SRPA. Because current information regarding the nature and extent of Tank Farm contamination is inadequate to support selection of a final remedy, a separate RI/FS for the Tank Farm is underway. The OU 3-14 RI/FS will further investigate contamination at the Tank Farm and develop alternatives for a final remedy. An interim action for the Tank Farm soils is presented in this ROD. Soil contamination at the Tank Farm is summarized in Table 5-2 except data from sites CPP- 16, CPP-24, and CPP-30 which are classified as "No Action" sites. All the Tank Farm sites are shown in Figure 1-3. The Tank Farm soils are considered principal threat wastes.

The major radionuclide contaminants in the Tank Farm soils are Am-241, Sr-90, Cs-137, Eu- 154. Pu-238, Pu-239/240, Pu-241, and U-235. Nonradionuclide contaminants include mercury and nitrate.

Tank Farm sites with wastes derived from spills associated with the INTEC liquid waste treatment system will be assigned four EPA listed waste codes (F001, F002, F005, and U134). The wastes will also be evaluated to determine if they exhibit hazardous characteristics. The results of the investigations performed to date indicate that the principal threats posed by the Tank Farm Soils sites are from external exposure to surface and near-surface radionuclides and from future ingestion risks from leaching and transport of radionuclides to the SRPA. In addition, nonradionuclide constituents may be present in Tank Farm soils; the presence of such contamination will be addressed in the OU 3-14 RI/FS. Known releases to the Tank Farm include a number of separate documented release sources as follows:

5.3.1.1 CPP-15. The solvent burner at Site CPP- 15 began operation in the late 1950s and was dismantled in 1983. Before the solvent burner, a stack preheater was located at this site. Waste solvent primarily kerosene and tributyl phosphate degradation products contaminated with low levels of radionuclides, were held in the tank and piped to the solvent burner for disposal. Demolition of the solvent burner occurred in late 1983 including removal of the furnace/burner unit, furnace duct, control shed, piping, valves and controls within the shed, and piping penetrating the shed. In addition, an unknown amount of contaminated soil was removed along with the solvent tank. In September 1995, LMITCO construction personnel encountered elevated radiological readings while conducting an excavation in the western half of the site. Six soil samples were collected in the area of the contaminated footing. Based on this sampling, contaminants of potential concern (COPCs) identified for this site include thallium, zirconium, Am-241, Cs-137. Eu-154, Np-237, Pu-238, Pu-239/240, Tc-99, and U-2335.

Table 5-2. Summary sampling results statistics for Tank Farm (Group 1) soil contaminants[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Numbers of Samples Greater than Background
Ag	2.804-01 B	1.15E+00 J	6.54E-01	1.78E-01	1.01E+00	50	35	70%	0.00E+00	35
As	2.80E+00 J	6.80E+00 J	4.25E+00	9.25E-01	6.10E+00	50	47	94%	5.80E+00	3
Ba	4.45E+01	1.93E+02 J	9.06E+01	4.39E+01	1.78E+02	50	50	100%	3.00E+02	0
Be	2.45E-02	4.50E-01	2.84E-01	1.49E-01	5.82E-01	16	15	94%	1.80E+00	0
Cd	2.20E-01 B	1.12E+01 J	3.84E+00	3.39E+00	1.06E+01	83	53	64%	2.20E+00	34
Co	1.86E+00	4.40E+00 B	3.33E+00	6.47E-01	4.62E+00	16	16	100%	1.10E+01	0
Cr	1.00E+00 J	1.13E+02 J	2.05E+01	2.07E+01	6.19E+01	58	58	100%	3.30E+01	10
Cu	7.38E+00	1.28E+01	9.92E+00	1.81E+00	1.35E+01	16	16	100%	2.20E+01	0
Hg	2.00E-02 J	4.44E+00	3.03E-01	6.32E-01	1.57E+00	95	59	62%	5.00E-02	53
Pb	4.80E+00	3.17E+01 J	1.17E+01	6.82E+00	2.53E+01	50	50	100%	1.70E+01	10
Mn	9.15E+01	1.18E+05	5.08E+03	2.42E+04	5.35E+04	24	24	100%	4.90E+02	1
Ni	1.34E-01 J	1.94E+01 J	1.35E+01	4.03E+00	2.16E+01	24	24	100%	3.50E+01	0
Se	5.10E-01 J	8.00E-01 B	6.97E-01	1.62E-01	1.02E+00	34	3	9%	2.20E-01	3
Sr	3.61E+03	3.61E+03	3.61E+03	NA	NA	1	1	100%	NA	NA
Th	4.85E+00	4.85E+00	4.85E+00	NA	NA	16	1	6%	4.30E-01	1
V	9.10E+00 B	1.85E+01	1.47E+01	2.77+01	2.02E+01	17	17	100%	4.50E+01	0
Zn	3.20E+01	5.55E+01	4.18E+01	6.98E+00	5.58E+01	16	16	100%	1.50E+02	0
Zr	5.13E+00	1.40E+00	8.61E+00	3.55E+00	1.57E+01	5	5	100%	NA	NA
Fluoride	5.30E-01	6.72E+00	1.70E+00	1.14E+00	3.98E+00	41	40	98%	NA	NA
Nitrate	3.50E-01	8.10E+00	1.68E+00	1.54E+00	4.76E+00	54	51	94%	NA	NA

Table 5-2. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Numbers of Samples Greater than Background
Methylene Chloride	5.90E-03 JB	9.10E-03 JB	8.08-03	1.31E-03	1.07E-02	5	5	100%	NA	NA
Toluene	1.00E-03 J	2.00E-03 J	1.14E-03	3.78E-04	1.90E-03	22	7	32%	NA	NA
Trichloroethane	1.00E-03 J	4.60E-03 J	2.80E-03	2.55E-03	7.90E-03	6	2	33%	NA	NA
AM-241	6.00E-02	1.66E+04 J	6.25E+02	3.08E+03	6.79E+03	64	29	45%	1.1E-02	29
Ce-144	1.44E+01	1.44E+01	1.44E+01	NA	NA	12	1	8%	NA	NA
Co-60	9.00E-02	2.27E+04	1.81E+03	6.28E+03	1.44E+04	41	13	32%	NA	NA
Cs-134	1.30E-01	7.55E+04	5.40E+03	2.02E+04	4.58E+04	41	14	34%	NA	NA
Cs-137	4.78E-02	1.02E+08	1.31E+06	1.02E+07	2.17E+07	119	111	93%	8.2E-01	99
Eu-154	1.54E-01 J	5.65E+05	1.65E+04	9.54E+04	2.07E+05	45	35	78%	NA	NA
H-3	2.49E+04	2.49E+04	2.49E+04	NA	NA	1	1	100%	NA	NA
Np-237	1.00E-01 J	1.63E+00	5.12E-01	4.94E-01	1.50E+00	46	14	30%	NA	NA
Pu-238	2.99E-02	2.76E+05	8.25E+03	4.73E+04	1.03E+05	64	34	53%	4.90E-03	34
Pu-239/240	2.58E-02	1.26E+04	1.08E+03	3.35E+03	7.78E+03	70	26	37%	1.00E-01	17
Pu-241	1.05E+06	1.05E+06	1.05E+06	NA	NA	1	1	100%	NA	NA
Pu-242	3.20E+01	3.20E+01	3.20E+01	NA	NA	1	1	100%	NA	NA
Ru-106	6.66E-02	5.41E+01	2.71E+01	3.82E+01	1.04E+02	31	2	6%	NA	NA
Sr-90	1.60E-01	5.68E+07	7.02E+05	5.97E+06	1.26E+07	93	91	98%	4.90E-01	85
Tc-99	9.00E-01	3.67E+01	4.40E+00	1.02E+01	2.48E+01	12	12	100%	NA	NA
U-234	7.00E-02	2.12E+01	9.85E-01	2.75E+00	6.49E+00	63	61	97%	1.44E+00	3
U-235	2.03E-02	9.00E+03	7.70E+02	2.17E+03	5.11E+03	53	19	36%	NA	NA
U-236	7.55E-01	7.55E-01	7.55E-01	NA	NA	1	1	100%	NA	NA

Table 5-2. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Numbers of Samples Greater than Background
U-238	4.51E-02	1.39E+00	5.42E-01	4.31E-01	1.40E+00	63	58	92%	14E+00	0
Gross Alpha	5.20E+00	1.20E+01	7.35E+00	2.19E+00	1.17E+01	11	11	100%	NA	NA
Gross Beta	3.60E+01	6.89E+02	1.62E+02	1.86E+02	5.34E+02	11	11	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results used in the table are taken from Appendix G of the OU3-13 RI/FS Part A (DOE-ID, 1997b) for Group 1 Sites: CPP-15, -20, -25, -26, -27, -28, -31, -32A, -32B, -33, -58A, -58B and -79.
- Only those constituents that were identified above detection limits are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Al, Ca, Fe, Mg, K, Na and K-40.
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995)

B - The analyte reported value is <RDL, but>IDL.

J - The analyte was identified in the sample but the numerical result may not be accurate.

NA - Not Applicable

RME = Reasonable Maximum Exposure

5.3.1.2 CPP-16. CPP-16 consists of soil contaminated by a single release of low-level radioactive water that was spilled during a transfer between Tank WM-181 and the PEW Feed Tank WL-102. The water transferred between theses two tanks typically contained very low-level levels of radioactivity; an estimated 1.2 Curies of Cs-137 was released. The soil at the spill site was reportedly removed as part of the ICPP Radioactive Waste System Project during a valve box replacement. (WINCO 1993a, DOE et al 1994a).

5.3.1.3 CPP-20. Site CPP-20 is the location of the Radioactive Waste Unloading Area north of building CPP-604, which was used before 1978. Waste from INEL facilities were transported to the unloading area at the ICPP where it was unloaded at this location via transfer hoses. The liquids were transferred to an underground storage tank before concentration in the Pew Evaporator. It is known that the liquid contained radioactive contaminants and was required to have a pH of less than 2. It has been reported that occasional spills occurred during the unloading process as a result of leaks in the hoses. The spills were reportedly cleaned up as they occurred.

The entire area was excavated in 1982 and 1983-1984 during Phase 1 and 2 of the Fuel Processing Facility Upgrade Project. During Phase I, the entire area was excavated down to 12.2 m (40 ft). Based upon personnel interviews, the first 3.1 m (10 ft) of soils were backfilled with 5 mR dirt that was then covered with 9.1 m (30 ft) of clean fill. The source of the clean fill is unknown. During Phase II, portions of the area were excavated again. Based on personnel interviews, soils were excavated down to 12.2 m (40 ft) in the eastern sections of sites CPP-20 and CPP-25. Only at the location of valve box C-30 were soils found to be contaminated and subsequently removed. The excavated soils were stockpiled and contaminated soils separated and later placed in trenches in the northeast corner of the ICPP outside of the security fence (Site CPP-34). Materials used to backfill the excavation consisted of 3 mR soil placed in the bottom 3.1 m (10 ft) and clean soils placed in the upper 9.1 m (30 ft). The source of the clean fill material included soils excavated from a sand and gravel pit located at the CFA.

No soil sampling data were collected at the CPP-20 site due to the area being excavated during the Phase 1 and 2 Fuel Processing Facility Upgrade Project Although there are no records to verify the cleanup of this area, the radiological survey of this area in 1990-1991 did not detect surface radiation levels above background.

Contaminated soils at Site CPP-20 are believed to be confined to soil with gross radiation readings of 3 to 5 mR placed at depths between 9.1 to 12.2 m (30 to 40 ft) during upgrade projects in the 1980s. Soil above a depth of 9.1 m (30 ft) was reportedly clean fill. Because of the lack of confirmatory soil sampling in the area, soil concentrations from previously excavated Tank Farm soil were assumed representative of the soil beneath both sites (CPP-20 and CPP-25). This assumption was made even though the fill soil is believed to be uncontaminated because it was common practice to use backfill containing trace quantities of radioactivity during the 1980s.

5.3.1.4 CPP-24. Site CPP-24 is located in the Tank Farm and consists of an area of approximately 1.7 m^2 (18 ft^2). In 1954, approximately 38 L (1 gal) of radioactively-contaminated solution was spilled from a bucket onto the ground while work was being conducted at Tank WM-180. The logbooks indicate that the spilled material was removed. Although the exact location of this spill is not known, radiation surveys in the area revealed no radiation levels above background (WINCO 1993a, DOE et al 1994a).

5.3.1.5 CPP-25. Site CPP-25 is the location of a ruptured transfer line that released an unknown quantity of liquid waste adjacent to the north side of building CPP-604.

The eastern portion of Site CPP-25 overlaps the area of Site CPP-20. The transfer line that was being used to transfer liquid waste from WC-119 to WL-102, ruptured on August 28, 1960 contaminating

the soil adjacent to the building. According to direct radiation readings at the time of the incident, the soil was initially contaminated to levels of 2 x 1004R/hr. Approximately 7 m^3(9 yd^3) of contaminated soil was removed and taken to the RWMC for disposal. No records exist to verify the effectiveness of these cleanup activities. However, during 1981 and 1983 the entire site was excavated during Phases I and II of the Fuel Processing Facility Upgrade Project, This excavation included the eastern portion of sites CPP-20 and CPP-25 as discussed above. Fill materials placed back into the excavation consisted of 3 mR material in the bottom of the excavation and clean soils in the upper 9.1 m (30 ft).

Contaminated soils at Site CPP-25 are believed to be confined to soil with gross radiation readings of 3 to 5 mR placed at depths between 9.1 to 12.2 m (30 to 40 ft) during upgrade projects in the 1980's. Soil above a depth of 9.1 m (30 ft) was reportedly clean fill. Because of the lack of confirmatory soil sampling in the area, sample results from previously excavated Tank Farm soil will be assumed, for the purposes of the BRA, to be representative of the soil beneath both sites CPP-20 and CPP-25.

5.3.1.6 CPP-26. CPP-26 consists of soil potentially contaminated by a 1964 release of radioactive steam that was inadvertently released to the air through a faulty hose coupling on the decontamination header. The volume of radioactively-contaminated steam that was released at Site CPP-26 is unknown. The release is assumed to have contaminated the land surface of approximately 13 acres to the northeast of building CPP-635. However, in an approved Track 2 NFA recommendation, the scope of the CERCLA investigation was limited to that portion of the site inside the Tank Farm. The original land surface at the time of the release (prior to membrane installation) is now located at a depth of 0.7 m (2.5 ft) bgs.

5.3.1.7 CPP-27 and CPP-33. Sites CPP-27 and CPP-33 consist of contaminated soil associated with subsurface releases of HLLW from the Tank Farm transfer system near the northeast corner of building CPP-604. These sites were determined to be related to releases from the same source and, therefore, are being addressed as a single release site. Following cleanup, it was estimated that 25 mCi of radioactivity in soil remained in place (WINCO 1993i).

In 1983, additional contaminated soil was discovered. This additional contamination, thought to be the result of a separate release from the same transfer line, was designated CPP-33. Cleanup efforts in 1983 removed approximately 10,710 m^3 (14,000 yd^3) of contaminated soil, Of this total, approximately 1,530 m^3 (2,000 yd^3) exceeding 30 mR/hr of beta-gamma radiation was removed and placed in trenches. The soil in these trenches is addressed separately as Site CPP-34 (Section 18). After the 1983 excavation. the CPP-33 area was backfilled and trace amounts of radioactively contaminated soils were reportedly left in place below, and lateral to the excavated area (WINCO 1993i). It appears that the majority of contamination is located in the southwest portion of the site where levels as high as 30 mR/hr were measured below a depth of 6.1 m (20 ft).

5.3.1.8 CPP-28. The contamination at Site CPP-28 was discovered in 1974 during the installation of a cathodic protection electrode in the Tank Farm area. Soil with radioactive contamination up to 40 R/hr was encountered at a depth of about 1.8 m (6 ft) bgs. The leak was later determined to be from a 0.3 cm (1/8 in.) diameter hole inadvertently drilled through one side of the 7.6-cm (3-in.) diameter stainless steel pipe during original construction in 1953. The HLLW consisting of first-cycle raffinate most likely leaked through secondary containment to the surrounding soil. In late 1974, approximately 45 m^3(56 yd^3) of contaminated soil having an estimated 3,000 Ci of gross radioactivity was removed from the area above the pipeline leak. No contaminated soil was removed from below the pipe encasement due to high levels of radioactivity in the soil. The excavated area was subsequently backfilled.

5.3.1.9 CPP-30. Site CPP-30 was a 6 - 6 m (20 - 20 ft) area of surface soil contamination near Tank Farm Valve Box B-9. The area vas contaminated during a one-time preventative maintenance activity in which residual decontamination solution from the &or of the value boxes contaminated personnel clothing, and equipment. The contaminated soil was removed and disposed at the Radioactive Waste Management Complex (RWMC) (WINCO 1993a, DOE et al 1994a).

5.3.1.10 CPP-31. In November 1972, HLLW was released to the surrounding soil during a transfer between tanks WM-181 and WM-180. The release was caused by a failure of a 8-cm (3-in) diameter carbon steel waste transfer line where it was speculated that the highly acidic HLLW corroded the transfer line. This transfer line is located about 2 ft below grade. Estimated radionuclide concentrations include Cs-137 (at up to 2,190,000 pCi/g), Sr-90 (up to 710,000 pCi/g), Pu-239/Pu-240 (up to 1,500 pCi/g), and U-235 (up to 9,000 pCi/g). Other radionuclides estimated to be present at lesser concentrations are Co-60, Cs-134, and Ru-106.

5.3.1.11 CPP-32. Site CPP-32E is an area of contaminated soil southwest of valve box B-4. This area is approximately 0.7 m^2 (8 ft^2) and about 0.3 m (1 ft) deep with radiological contamination up to 2 R/hr. The contaminated soil appeared to have originated from the stand pipe (air vent tube and view port pipe) that extended out of the valve box. It is likely that the contamination from the stand pipe at this site was the result of condensation of humidity in valve box B-4. CPP-32W is located about 15 m (50 ft) northwest of valve box B-4 and consists of soil contaminated to 2 R/hr covering an area of about 0.6 m^2(6 ft^2) to a depth of about 0.3 m (1 ft). The contaminated material apparently originated from a 5. 1-cm (2-in.) diameter aboveground line. The line was used to pump water from tank sumps to the PEW Evaporator. It is likely that the contaminated area was the result of a leak that occurred from this line during a transfer of water that contained radionuclides.

5.3.1.12 CPP-58. Site CPP-58W consists of soil affected by a release of PEW condensate in 1954. Site CPP-58E consists of soil affected by a leak of PEW condensate in 1976. The results of the gamma analysis detected only Cs-137 and K-40. Contamination is estimated to be present from 2 to 14 m (6 to 46 ft) below grade.

5.3.1.13 CPP-79. CPP-79 was originally defined as soil contaminated by the releases of waste solutions in July and August of 1986 due to an obstruction in a transfer line. A second, deeper zone of contamination at this site is believed to be related to the release of HLLW at Site CPP-28.

The releases occurred when the liquid waste was obstructed in the transfer line and backed up through an open drain line and into valve box A-2. Approximately 9,500 L (2,500 gal) of low-level radioactively contaminated liquid leaked. A second. deeper zone of contamination was discovered during the drilling of boring CPP-79-1 at a depth of 9.1 m (30 ft) bgs. This deeper zone of contamination has much higher concentrations of radionuclides than the shallower zone and appears to be related to the known release of HLLW at Site CPP-28. It is believed that the HLLW released at Site CPP-28 migrated to the south to the deep soil with high radionuclide concentrations encountered in boring 79-1.

5.3.2 Soils Under Buildings or Structures (Group 2)

Because of the inaccessibility of most of these sites, only limited soil characterization data are available. Knowledge of the associated processes and waste streams at these sites and an estimate of the potential leak or spill volume provided the basis for determining the types and quantities of contaminants that may be present at these sites. The soils at Sites CPP-87 and -89 have been sampled and analyzed. The results of the RI BRA indicate that the primary threats posed by these sites are external exposure to the soils, should they be available for exposure and continued leaching of contaminants to the SRPA. The

external exposure threat is currently an incomplete pathway and the leaching is being controlled by the presence of the building, which limits infiltration.

The Soils Under Buildings or Structures group is comprised of release sites in OUs 3-09, 3-12, and 3-13 that occur beneath INTEC buildings or structures, and includes Sites CPP-02, -41A, -60, -68, -80, -85, -86, -87, and -89 (Figure 1-5). These sites consist of soil contamination that resulted from past hazardous or radioactive liquid spills, leaks, and plant operations and are considered low-level threat wastes.

The individual release sites comprising Group 2 include:

5.3.2.1 CPP-02, French Drain West of Building CPP-603: 14,000,000 L (3,698,408 gal) of basin water was disposed per year. An estimated 493 Ci was released with the major isotope being tritium. The Graphite fuel storage building was constructed over this site. The site has not been sampled. If not for the depth of release and the presence of the graphite fuel storage building, this site would pose a threat due to external exposure. Modeling performed during the RI FS indicated that this site presents a groundwater risk. Currently the leaching of contamination is being controlled by the building limiting infiltration. Should the building be removed this contamination will present a direct exposure risk and increased groundwater risk.

5.3.2.2 CPP-41A. Site CPP-41A is one of two pits where oils and organic materials were placed in metal drip pans and ignited for fire brigade practice. The training pits are no longer in use. CPP-41A is a pit that has been covered with asphalt and, because it is close to building CPP-663, it is suspected of having been excavated and removed during construction of CPP-663.

5.3.2.3 CPP-60. Site CPP-60 is a small cinder block building commonly referred to as a paint shop but was actually used to house hazardous materials. It was suspected that during paintbrush cleaning, solvents were discharged to the surrounding soil. The building was removed in the 1970's and CPP-645, an office building, is now located over the area. No samples were collected to confirm the existence or absence of contamination at this site (WINCO 1992f).

5.3.2.4 CPP-68. Site CPP-68 is the former location of an abandoned 1,892 L (500 gal) underground gasoline storage tank. Use of the tank was discontinued in 1983 and the tank was removed in 1986. During exhumation of the tank, there was no visual evidence to suggest that the tank leaked. There are no operating records prior to 1983 or records of spills associated with the operation of this tank. A single sample of the tank bed soil was analyzed and found to contain only traces of gasoline range organic constituents that did not exceed risk-based levels. In addition, visual examination of the tank bed soil did not suggest tank leakage (WINCO 1993g).

5.3.2.5 CPP-80, Building CPP-601 Vent Tunnel Drain Leak: Soil contamination resulted from leakage of corrosive condensate from a cast iron underground line. No soil sampling was performed due to the inaccessibility of the site. Approximately 397,468 L (105,000 gal) of condensate containing 550 Ci of radionuclides were estimated to have been released to the soil between 1983 and 1989. The leaked contaminants have been observed in the 34 m (110 ft) perched water. Due to the depth of the release and the presence of Building CPP-601 this site only presents risks via the groundwater exposure pathway. Modeling performed during the RI FS indicated that this site presents a minor groundwater risk. For purposes of groundwater modeling, the inventory for this site was presumed to be equal parts Cs-137 and Sr-90. Currently the leaching of contamination is being controlled by the building limiting infiltration. Should the building be removed, this contamination will present a direct exposure risk and increased groundwater risk. Should the building be removed this contamination would pose an external exposure risk and a minor increased groundwater risk.

5.3.2.6 CPP-85. Site CPP-85 is the WCF blower corridor, which was used to vent gases from the WCF hot cells to the blower pit and subsequent HEPA filtration prior to atmospheric discharge. The WCF blower corridor is a 46 to 60 cm (18 to 24 in.) vitrified clay pipeline surrounded by a poured square concrete envelope. No samples were taken from inside the corridor, but samples collected from the blower pit downstream showed the presence of various fission products including Cs-137 at 49,600 pCI/g. Video inspection of the corridor interior taken in 1994 did not show any evidence of deterioration of the pipeline, therefore, there is no evidence of contamination on, or migration of, contaminants from the CPP-85 blower corridor (DOE-ID 1997b).

5.3.2.7 CPP-86. Site CPP-86 is a waste trench that runs underneath CPP-602, which is a laboratory and office building that also houses a liquid product denitrator. The trench, which lies approximately 3 m (10 ft) bls, collects liquid waste from various CPP-602 operations. The waste is subsequently routed to the PEW evaporator system. During modification of the trench in 1990, mercury was found in a sample of sludge and dirt that originated from the base of the trench (DOE-ID 1997b).

5.3.2.8 CPP-89 and CPP-87, Building CPP-604/605 Tunnel Excavation: This site consists of contaminated soil encountered while excavating an emergency fire exit from the basement area of Building CPP-604/605. The excavation included an area immediately south of CPP-604, as well as beneath the building. Contaminated soil adjacent to two deteriorated carbon steel pipes was excavated as part of the piping removal. The excavated soil was placed in boxes and is currently stored at CERCLA Site CPP-92. No effort was made to remove all of the contaminated soil. Soils remaining in place at CPP-89 have not been sampled. The boxed soil (CPP-92) from CPP-89 was sampled and the results are summarized in Table 5-3. The contaminants identified in these samples are consistent with soil contamination resulting from release of service waste and PEW evaporator condensates that typically include nitric acid, mercury, plutonium, Cs-137, and Sr-90. Modeling performed during the RI/FS indicated this site presents a groundwater risk. Currently the leaching of contamination is being controlled by the building limiting infiltration. Should the building be removed, this contamination will present a direct exposure risk and an increased groundwater risk.

5.3.3 Other Surface Soils (Group 3)

The Other Surface Soils group consists of release sites located in areas near Building CPP-603 (Sites CPP-01, -03, -04, -05, -08, -09, -10, -11, and - 19), Building CPP-633 (Sites CPP-36 and -91), the calcined solids storage bins (Sites CPP- 13, -35, and -93), disposal trenches (Site CPP-34), the old STP (Site CPP- 14), the grease pit (Site CPP-44) near Building CPP- 1619, Site CPP-55 near temporary Building TB-1, the percolation ponds (Site CPP-67) situated south of the INTEC fence CPP-37a, gravel pit east of the INTEC fence CPP-37b, an old construction landfill within the fence, and CPP-48, site of the former dump tank. In addition, Site CPP-92 is included in Group 3 and consists of 653 boxes of radionuclide-contaminated soils that were generated as a result of a variety of INTEC activities. Figure 1-6 shows the location of the Group 3 sites. These sites generally consist of soil contamination that resulted from inadvertent spills and leaks of radioactive waste, decontamination solutions, spent fuel storage water, storage of radionuclide-contaminated equipment, and other plant-generated wastewaters. The soils at the Group 3 sites are identified as low-level threat wastes.

Investigations conducted at these sites have determined the extent of soil contamination. Based on the results of drilling and sampling, the contamination generally occurs in the upper few feet of the soils; however, some sites (CPP-36 and CPP-91) have contamination that extends to the surface soil,/basalt interface, at a depth of about 12 m (40 ft). The results of the RI/BRA indicate that the primary threat posed by these sites is external exposure to radionuclides.

Table 5-3. Summary sampling results statistics for soil contaminants at Site CPP-89 (excavated soil was placed into boxes that are currently stored in site CPP-92).[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Numbers of Samples Greater than Background
As	1.60E+00 B	5.90E+00	4.11E+00	1.25E+00	6.61E+00	15	15	100%	5.80E+00	1
Hg	6.00E-02 B	1.04E+01	1.49E+00	2.90E+00	7.29E+00	17	15	88%	5.00E-02	15
Se	2.10E-01 B	.10E-01 B	3.20E-01	1.00E-01	5.20E-01	16	4	25%	2.20E-01	3
Am-241	2.00E-02	2.36E+01	2.83E+00	6.58E+00	1.60E+01	14	14	100%	1.10E-02	14
Co-60	3.90E+00	3.90E+00	3.90E+00	NA	NA	1	1	100%	NA	NA
Cs-134	2.30E+00	2.30E+00	2.30E+00	NA	NA	1	1	100%	NA	NA
Cs-137	1.40E-01	7.73E+03	1.25E+03	2.70E+03	6.65E+03	14	14	100%	8.20E-01	11
I-129	3.10E+00	3.10E+00	3.10E+00	NA	NA	1	1	100%	NA	NA
Np-237	1.50E-01	1.50E-01	1.50E-01	NA	NA	1	1	100%	NA	NA
Pu-238	2.00E-02	2.59E+02	3.83E+01	8.86E+01	2.16E+02	14	14	100%	4.90E-03	14
Pu-239/240	0.00E+00	2.47E+01	3.30E+00	7.57E+00	1.84E+01	14	14	100%	1E-01	4
Sb-125	1.30E+01	1.30E+01	1.30E+01	NA	NA	1	1	100%	NA	NA
Sr-90	3.00E-01	1.08E+04	1.48E+03	3.02E+03	7.52E+03	14	14	100%	4.90E-01	13
U-234	5.10E+00	5.10E+00	5.10E+00	NA	NA	1	1	100%	1.44E+00	1
U-235	2.30E-01	2.30E-01	2.30E-01	NA	NA	1	1	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results used in this table are samples collected from boxed soil from the 1991-1992 emergency fire exit excavation at building 604/605 (CPP-89)
- Samples were analyzed for VOCs, inorganics, and radionuclides. Only those constituents identified in Appendix G of the OU 3-13 RI/FS Part A (DOE-ID 1997b) are shown in this table
- Samples rejected because of an unacceptable quality control parameter are not included in this table

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

B - The analyte reported value is <RDL, but>IDL

J The analyte was identified in the sample but the numerical result may not be accurate

NA Not Applicable

RME Reasonable Maximum Exposure

Because of the generally small area and contaminant mass of most of these sites, the quantities of COCs present at most sites do not pose a threat to groundwater. However, several sites have significant sources at or near the soil basalt interface. For those sites there is a minor threat to groundwater. The COCs at these sites include both radionuclide and nonradionuclide contaminants.

5.3.3.1 CPP-35 (Building 633 Decontamination Spill). Site CPP-35 resulted from a spill of decontamination fluid that entered the WCF air transport system and was released to soil. This release was estimated to have a contaminated area of 111 m^2 (1200 ft^2) . The release was approximately 38 L (10 gal) of solution containing nitric acid, mercuric nitrate, heavy metals, fluoride, nitrates, and as much as 10 Ci of total activity. Contaminated soil and gravel were removed and shipped to the RWMC for disposal. Sampling results data from the Track 2 investigation are summarized for CPP-35 in Table 5-4. No contaminants were detected below 2 m (7 ft).

5.3.3.2 CPP-36 (Contaminated Soil Southeast of the INTEC Stack). The contamination at Site CPP-36 is the result of the three separate releases, which are described below:

1. In 1970, the calciner offgas lines between the WCF and the stack were excavated. Highly contaminated soil (up to 20 R/hr) was encountered at a depth of 1.8 m (6 ft) beneath Olive Avenue. The exact location of the release source is unknown. According to records, the contaminated soil was excavated and disposed at the RWMC. Clean fill was used as backfill.

2. In October 1974, contamination was encountered under Olive Avenue during excavation for installation of lines. This contamination apparently was the result of waste that flowed out of an orifice corroded by nitric acid. The waste was probably from liquids being transferred from Tank WC- 119 (sump tank at the WCF) and Tank WC- 102 (PEW evaporator).

3. In November 1974, 2,840 L (750 gal) of solution containing an estimated 4 Ci of total activity leaked into Valve Pit MAH-OGF-P-04.

Two quantitative sampling events were undertaken at this site before the Track 2 investigation. In 1974, three samples were collected from the excavation under Olive Avenue and analyzed for radionuclides. The depths from which the samples were collected cannot be established from available reports. In 1991, samples were collected from four boreholes (Golder Associates 1992). The boreholes were drilled to a maximum depth of 1.8 m (6 ft). The samples were analyzed for VOCs, metals, and radionuclides. The VOCs were not measured above detection levels.

The Track 2 investigation involved installing seven "observation wells" to measure subsurface radiation levels and the drilling and sampling of two boreholes. Samples from the boreholes were analyzed for selected metals, nitrate and nitrite, fluoride, pH, and radionuclides. Summary sampling results statistics for data from CPP-36 is provided in Table 5-5. Based on the result of investigations conducted at Site CPP-36, the zone of contamination is assumed to extend from the ground surface to the soil/basalt interface at about 12.8 m (42 ft). This depth is based on high activity levels measured in the deepest samples collected from borings CPP-36-1 and CPP-36-2. Results from the "observation wells" show elevated radiation levels to at least 7.6 m (25 ft) below ground surface (bgs).

The area of CPP-36 is shown in Figure 1-5. The initial area was expanded because "observation wells" located at the boundaries of the area indicate radiation levels above background. In addition, the CPP-36 area has been extended to the southeast to incorporate Site CPP-91. Investigative results indicate contamination at CPP-91 to be indistinguishable from CPP-36. The revised area of Site CPP-36 is about 748 m^2 (8.052 ft^2).

Table 5-4. Summary sampling results statistics for soil contaminants at Site CPP-35[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detection	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Mercury	5E-02 B	7.20E+00	1.66E+00	2.49E+00	6.64E+00	14	12	86%	5E-02	11
Cadmium	1.40E+00	1.40E+00	1.40E+00	NA	NA	14	1	7%	2.20E+00	0
Am-241	1.38E-02	1.21E+00	5.17E-01	6.01E-01	1.72E+00	3	3	100%	1.10E-02	3
Cs-137	2.14E-01	8.64E+03	6.63E+02	2.14E+03	4.94E+03	14	14	100%	8.20E-01	9
Eu-154	3.18E-01	11.80E+00	3.37E+00	4.81E+00	1.30E+01	5	14	36%	NA	NA
Pu-238	7.93E-01	1.32E+01	5.44E+00	6.77E+00	1.90E+01	3	3	100%	4.90E-03	3
Pu-239/240	5.24E-02	7.25E-01	3.21E-01	NA	NA	3	3	100%	IE-01	2
Sr-90	7.52E+00	3.24E+03	5.77E+02	1.10E+03	2.78E+03	8	8	100%	4.90E-01	8
U-234	9.59E-01 J	1.02E+00J	9.82E-01	3.32E-02	1.10E+00	3	3	100%	1.44E+00	0
U-235	5.20E-02	7.20E-02	6.03E-02	1.03E-02	8.09E-02	3	3	100%	NA	NA
U-238	1.01E+00	1.14E+00	1.07E+00	6.51E-02	1.20E+00	3	3	100%	1.40E+00	0
Gross Alpha	3.65E+00	2.02E+02	2.76E+01	5.21E+01	1.32E+02	14	14	100%	NA	NA
Gross Beta	2.04E+01	1.21E+04	1.14E+03	3.19E+03	7.52E+03	14	14	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results used in this table are from samples collected from two borings installed during the OU 3-08 Track II investigation (WINCO 1993c)
- Samples were also analyzed for fluoride, pH, nitrate, nitrite, and K-40. These constituents are not shown in this table because they are not present at hazardous concentrations
- Samples rejected because of unacceptable quality control parameter are not included in this table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentration is the 95% Confidence limit (Rood et al. 1995).

B = The analyte reported value is <RDL, but > IDL

J = The analyte was identified in the sample but the numerical result may not be accurate.

NA = Not Applicable

RME = Reasonable Maximum Exposure

Table 5-5. Summary sampling results statistics for soil contaminants at Site CPP-36[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detection	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	3.20E+00	4.10E+00	3.69E+00	2.59E-01	4.21E+00	8	8	100%	5.80E+00	0
Ba	6.76E+01	8.92E+01	7.69E+01	7.43E+00	9.18E+01	8	8	100%	3E+02	0
Cd	8.10E-01B	8.40E-01 B	8.25E-01	2.12E-02	8.67E-01	19	2	11%	2.20E+00	0
Cr	9.60E+00	1.49E+01	1.21E+01	1.76E+00	1.56E+01	8	8	100%	3.30E+01	0
Hg	1.20E-01	1.66E+01	1.43E+00	3.78E+00	8.99E+00	19	19	100%	5E-02	19
Pb	7.20E+00	3.22E+02 J	4.74E+01	1.11E+02	2.69E+02	8	8	100%	1.70E+01	1
Am-241	1.03+00	7.63E+02	2.29E+02	3.63E+02	9.55E+02	13	4	31%	1.10E-02	4
Cs-137	2.04E+01	4.08E+05	2.93E+04	9.71E+04	2.24E+05	20	20	100%	8.20E-01	20
Eu-154	8.75E-02	4.74E+03	5.91E+02	1.50E+03	3.59E+03	11	10	91%	NA	NA
I-129	1.23E+00	2.43E+02	6.33E+01	1.20E+02	3.03E+02	9	4	44%	NA	NA
Np-237	4.00E-02	1.90E+00	8.90E-01	6.99E-01	2.29E+00	9	5	56%	NA	NA
Pu-238	1.70E-01	8.18E+03	1.82E+03	3.58E+03	8.98E+03	13	5	38%	4.90E-03	5
Pu-239/240	7.00E-02	3.24E+02	7.41E+01	1.41E+02	3.56E+02	13	5	38%	1E-01	4
Sr-90	2.90E-01	5.13E+04	2.81E+03	1.14E+04	2.56E+04	20	20	100%	4.90E-01	19
U-234	1.00E-01	2.81E+00	6.54E-01	7.95E-01	2.24E+00	13	13	100%	1.44E+00	2
U-235	4.44E-02	9.95E-02	7.19E-02	2.26E-02	1.17E-01	13	5	38%	NA	NA
U-238	1.20E-01	1.84E+00	6.48E-01	5.94E-01	1.84E+00	13	13	100%	1.40E+00	1
Gross Alpha	5.46E+00 J	2.75E+04 J	3.73E+03	8.83E+03	2.14E+04	11	11	100%	NA	NA
Gross Beta	7.48E+01	2.51E+05	4.50E+04	9.85E+04	2.42E+05	11	11	100%	NA	NA

Table 5-5. (Continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results are from samples collected from four borings installed during the 1991 assessment (Golder Associates 1991) and from two additional borings installed during the OU 3-08 Track II investigation (WINCO 1993c)
- Sampling results from an investigation in 1974 are not included in this table because the location of one of the samples and depths of all of the samples could not be established
- The samples from the 1991 investigation were analyzed for VOC's, Metals and Radiological Constituents. No VOC's were measured above detection limits and only those metals and radiological constituents that were identified with concentrations greater than detection limits are shown in the table.
- The OU3-08 Track II Investigation samples were also analyzed for fluoride, pH, nitrite and K-40. These constituents are not shown in the table because they are not present at hazardous concentrations
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

B = The analyte reported value is < RDL, but >IDL

J = The analyte was identified in the sample but the numerical result may not be accurate.

Na = Not Applicable

RME = Reasonable Maximum Exposure

5.3.3.3 CPP-91 (Building CPP-633 Blower Pit Drain). Site CPP-91 consists of soil potentially contaminated by discharges from the drain at the base of a blower pit located on the north side of the WCF (CPP-633). The blower pit contains a drain that is believed to discharge directly to the sediments below the blower pit floor, which is approximately 3.1 m (10 ft) bgs. In 1992, a cleanup of the blower pit revealed elevated radiation levels on the blower pit walls and floor. During the cleanup, water from rain and snowmelt had entered the blower pit and was observed to be flowing into the blower pit drain. A sample of the dirt on the blower pit floor showed elevated levels of Cs- 137, Cs- 134, Co-60, Eu- 154, and mercury. This suggests that releases of radionuclide contamination may have occurred through the blower pit drain to the underlying soils over the 25+ years since the WCF became operational. Upon discovery of the water and drain in 1992, the drain and blower pit were both scaled. Table 5-6 summarizes sampling results data from the CPP-91 soil borings.

5.3.3.4 CPP-01 (Concrete Settling Basins and Dry Wells East of CPP-603). This site is associated with the fuel storage basin cleanup support system, and consists of the concrete horizontal settling basin (CPP-740), concrete vertical settling pit (CPP-301), and two dry wells (CPP-303 and MAH-SFE-SW-048) east of CPP-603. The fuel storage basin cleanup support system received a backwash slurry of filter aid material (diatomaceous earth) from the Fuel Receiving and Storage Facility filter system. The shielding water in the fuel storage basin was recirculated through the filters to prevent accumulation of dirt and algae. The filtered solids and filter aid material were periodically backwashed from the filters and pumped to CPP-301, a 1.5 x 1.5 x 5.8 m (5 x 5 x 19 ft) vertical settling vault. When the slurry in the vault settled, the supernatant was drained from the vault to a deep dry well, CPP-303, where the effluent percolated into the surrounding soils.

The filter backwash settling system operated from 1951 to 1962. The horizontal settling system was constructed in 1962. The system consisted of a horizontal settling basin CPP-740 and dry well SW-048. The CPP-301 was removed from service and valved off. The CPP-740 basin included a 1.2 x 1.6 x 9.1 m (4 x 5.3 x 30 ft) horizontal settling system of weir compartments and an access manhole. This system served to settle slurry solids and to drain the supernatant to dry well SW-048 and subsequently the surrounding soils. The total volume (18,295 L [5,000 gal]) of sludge and liquid in the horizontal settling basin CPP-740 and the vertical settling pit CPP-301 was removed in the fall of 1993 under a CERCLA removal action. The liquid removed was sent to the PEW facility and the sludge was dried and sent to the RWMC.

Use of dry wells was discontinued in 1966 due to internal administrative controls. This decision prompted reactivation of CPP-301 as a settling pit. Upon reactivation, steam jetting was used to transfer the supernatant to waste storage tank SFE-20 (Site CPP-69 in OU 3-09). In March 1969, several Experimental Breeder Reactor (EBR) No. 2 fuel canisters ruptured, releasing contamination to the basin water. The CPP-740 settling facilities were removed from service in 1977 when the filters were replaced by a pressurized sand filtration system.

Depth of contamination at CPP-01 is assumed to extend from ground surface to the sediment/basalt interface at 9.8 m (32 ft) bgs. Table 5-7 provides summary sampling results statistics for CPP-01.

5.3.3.5 CPP-04/05 (Contaminated Soft Area Around CPP-603 Settling Tank). These sites located east of CPP-603 were combined because they were determined to have resulted from the same release. Site CPP-04 includes a 10.0 x 20.4 m (33 x 67 ft) area of contaminated soil above the horizontal settling basin CPP-740. Site CPP-05 includes a 10.0 x 20.4 m (33 x 67 ft) area of contaminated soil above the vertical settling pit CPP-301. Soil contamination associated with the two sites resulted from unintentional releases during sludge removal from the two structures in 1978.

Table 5-6. Summary sampling results statistics for soil contaminants in CPP-91 soil borings[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	3.60E+00 P	1.03E+01 P	6.17E+00	2.20E+00	1.06E+01	10	10	100%	5.80E+00	6
Ba	7.81E+01 P	1.86E+02 P	1.11E+02	3.12E+01	1.73E+02	10	10	100%	3E+02	0
Be	3.70E-01 P	1.20E+00 P	5.90E-01	0.28E-01	6.46E-01	10	10	100%	1.80E+00	0
Cd	4.3 E-01 BP	3.30E+00P	1.27E+00	8.90E-01	3.05E+00	10	10	100%	2.20E+00	1
Co	4.80E+00 BP	1.22E+01 P	7.05E+00	2.72E+00	1.25E+01	10	10	100%	1.10E+01	2
Cr	1.52E+01 JP	3.73E+01 JP	2.397E+01	7.49E+00	3.90E+01	10	10	100%	3.30E+01	2
Cu	1.25E+01 P	3.28E+01 P	1.768E+01	6.78E+00	3.12E+01	10	10	100%	2.20E+01	2
Hg	7.00E-02 B	5.40E-01	2.70E-01	1.50E-01	5.70E-01	10	8	80%	5.00E-02	8
Mn	1.67E+02 P	5.34E+02 P	2.616E+02	1.28E+02	5.18E+02	10	10	100%	4.90E+02	1
Ni	1.81E+01 P	3.80E+01 P	2.472E+01	6.85E+00	3.84E+01	10	10	100%	3.50E+01	2
Pb	5.60E+00 P	1.72E+01 P	9.74E+00	3.79E+00	1.73E+01	10	10	100%	1.70E+01	1
Sb	5.80E-01 BP	1.20E+00 BP	8.50E-01	2.30E-01	1.31E+00	10	9	90%	4.80E+00	0
Se	2.00E+00 P	2.00E+00 P	2.00E+00	NA	NA	10	1	10%	2.20E-01	1
Th	1.80E+00 BP	1.80E+00 BP	1.80E+00	NA	NA	10	1	10%	4.30E-01	1
V	2.34E+01 P	4.34E+01 P	3.083E+01	7.70E+00	4.62E+01	10	10	100%	4.50E+01	0
Zn	4.73E+01 P	1.07E+02 P	6.716E+01	2.03E+01	1.08E+02	10	10	100%	1.50E+02	0
Cs-137	1.00E-01	1.40E+02	3.081E+01	4.59E+01	1.23E+02	10	8	80%	8.20E-01	6
Pu-238	3.20E-01	3.20E-01	3.20E-01	NA	NA	1	1	100%	4.90E-03	1
Pu-239	6.00E-02	6.00E-02	6E-02	NA	NA	1	1	100%	1E-01	0
Sr-90	2.00E+01	7.58E+03	2.287E+03	3.60E+03	9.49E+03	4	4	100%	4.90E-01	4
Ic-99	2.32E+00	2.32E+00	2.32E+00	NA	NA	1	1	100%	NA	NA

Table 5-6. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
U-234	6.37E+00 J	6.37E+00 J	6.37E+00	NA	NA	1	1	100%	1.44E+00	1
U-235	2.00E-02	2.00E-02	2E-02	NA	NA	1	1	100%	NA	NA
U-236	1.00E-02 J	1E1.00E-02 J	1E-02	NA	NA	1	1	100%	NA	NA
U-238	6.40E-01	6.40E-01	6.40E-01	NA	NA	1	1	100%	1.40E+00	0
Gross Alpha	5.30E+00	1.90E+01	1.19E+01	4.69E+00	2.13E+01	9	8	89%	NA	NA
Gross Beta	2.70E+01	2.09E+04	284E+03	6.88E+03	2.98E+05	9	9	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples completed from two borings installed during the OU 3-13 RI. Results are provided in Appendix G of the OU 3-13 RI/FS Part A (DOE-ID 1997b) and the ERIS Database.
- Samples were analyzed for SVOCs, VOCs, Metals and Radiological Constituents. Only those constituents that were identified above detection limits in the samples are shown in the table except
  the following constituents which were detected but are not considered to be present at hazardous concentrations. Al, Ca, Fe, Mg, K, Na and Total Sr.
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represents the 95% upper confidence limit (Rood et al. 1995)

J = (Non-Rad) The analyte was identified in the sample but the numerical result may not be accurate.

J = (Rad) The result is statistically positive at the 95% confidence level and is considered to be an estimated quantity

P = Sample analysis by inductively coupled plasma atomic emission spectroscopy

NA = Not applicable

RME = Reasonable Maximum Exposure

Table 5-7. Summary sampling results statistics for soil contaminants at Site CPP-01[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Am-241	1.78E+00 J	1.78E+00 J	1.78E+00	NA	NA	3	1	33%	1.10E-02	1
Co-57	1.02E+00	1.02E+00	1.02E+00	NA	NA	19	1	5%	NA	NA
Cs-60	1.38E+00	3.32E+02	7.12E+01	1.46E+02	3.63E+02	19	5	26%	NA	NA
Cs-137	1.29E+00	4.60E+04	4.64E+03	1.20E+04	2.86E+04	19	15	79%	8.20E-01	15
Eu-152	2.23E+00	1.04E+02	5.37E+01	5.75E+01	1.69E+02	19	4	21%	NA	NA
Eu-154	4E+00	7.97E+01	5.03E+01	4.06E+01	1.32E+02	19	3	16%	NA	NA
Eu-155	8.81E+00	8.81E+00	8.81E+00	NA	NA	19	1	5%	NA	NA
Pu-239	5.30E+00 J	1.20E+01 J	8.83E+00	3.36E+00	1.56E+01	11	3	27%	1.00E-01	3
Sr-90	1.11E+01	4.85E+03	9.43E+02	1.46E+03	3.86E+03	16	16	100%	4.90E-01	16
U-235	9.34E-03	3.94E-02	2.40E-02	8.55E-03	4.11E-02	11	11	100%	NA	NA
U-238	1.12E-01	2.50E-01	2.01E-01	4.26E-02	2.86E-01	11	11	100%	1.4	0
Gross Alpha	4.30E+00	3.32E+03	4.47E+02	8.61E+02	2.17E+03	19	14	74%	NA	NA
Gross Beta	7.46E+00	4.32E+04	4.99E+03	1.01E+04	2.52E+04	19	19	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results are from samples collected from three borings and from the bottom of dry well SW-048 during the OU 3-09 Track 2 Investigation results are provided in the Final
  Preliminary Scoping Track 2 Summary Report For Operable Unit OU 3-09 (LITCO 1995b) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were also analyzed for Cd, K-40, Np-237, Pu-238 and U-234. This data is not shown because concentrations were below detection limits
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within tow standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995)

J Questionable I CS recovery or analytical yield

NA Not applicable

RME Reasonable Maximum Exposure

The contaminated area was later covered with 0.6 m (2 ft) of soil. Table 5-8 shows summary sampling results statistics for CPP-04/O5.

The COPCs for CPP-04/05 include Ce-144, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Eu-I 55, and U-235. The areal extent of contamination is estimated at 408 m^2 (4,422 ft^2) . Assuming an average depth of contamination of 0.6 m (2.0 ft), the total volume of contaminated soil is estimated at 245 m^3 (8,844 ft^3).

5.3.3.6 CPP-08109 (Contaminated Soil Area Around CPP-603 Basin Filter System).

These sites were combined because they were determined to have resulted from failure of an underground carbon steel filter system line due to corrosion. Approximately 251 m^3 (2,700 ft^3) of soil were contaminated with approximately 79,494 L (21,000 gal) of radionuclide-contaminated water from the CPP-603 basin over a 7-day period.

The exact location of the leak was never determined. The leaking line section was replaced and removed from service. Contaminated soil resulting from the leak was apparently encountered by construction crews on the east side of CPP-603, where a section of the line was located. The area of contamination was delineated by radiological survey instruments, however no soil samples were collected. Site CPP-09 was identified in the FFA/CO as "soil contamination northeast corner of CPP-603 South Basin." Site CPP-08 was identified as "CPP-603 Basin Filter System Line Failure." Sites CPP-08 and -09 were combined as one site based on information gathered during preparation of Track 2 investigation for each site. Table 5-9 provides summary sampling results statistics for CPP-08/09.

The COPCs include Cs-137, Sr-90, Eu-152, Eu-154 and U-235. The assumed areal extent is 251 M^2 (2700 ft^2). The assumed depth of contamination is 9.4 m (31 ft), with an estimated contaminated soil volume of 2,3 70 m^3 (83,700 ft^3).

5.3.3.7 CPP-10 (Contaminated Soil Area around CPP-603 Plastic Pipeline Break). This site resulted from a release of approximately 3000 L (800 gal) of radionuclide-contaminated CPP-603 basin water that drained onto a shielded floor area as a result of failure of a PVC line in December 1976. Approximately 34 m^2 (366 ft^2) of asphalt and soil outside the building were contaminated. Apparently no remedial actions were performed at the site, other than placing several inches of clean soil over the contaminated area. Table 5-10 provides summary sampling results statistics for CPP-10.

Radionuclide contaminants include Co-60, Cs-137, Eu-152, -154, and -155, Sr-90, and U-235. The estimated area of CPP-10 is 31.2 m^2 (336 ft^2). Contamination is assumed to extend from ground surface to the soil-basalt interface at 10.4 m (34 ft) bgs.

5.3.3.8 CPP-1 1 (CPP-603 Sludge and Water Release). This site resulted from a release of contaminated sludge and water from CPP-603 in February 1978. Approximately 1,136 to 1,893 L (300 to 500 gal) of sludge and water were released, and covered an area of 8.5 x 17 m (28 x 56 ft). The initial spill was cleaned up and soils with radiation levels greater than 1 R/hr were removed.

The remainder of the area was roped off. Tank SFE-06 is located 1.8 m (6 ft) bgs at the site, and is still used for storage of radionuclide-contaminated waste. The tank is not known to be leaking. Summary sampling results statistics are provided in Table 5-11.

Contaminants of potential concern include arsenic, thorium, Co-60, Sr-90, Cs- 137,- Eu- 154, and Np-237. Contamination is estimated to extend from ground surface to 5.5 m (18 ft) bgs. This estimate was based on radionuclide activities above background in samples collected at 3.8 m (12.5 ft) bgs.

Table 5-8. Summary sampling results statistics for radionuclides at Sites CPP-04/05[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Ce-144	2.00E-01	2.39E+03	1.20E+02	3.28E+02	7.76E+02	204	133	65%	NA	NA
Co-60	1.05E-02	1.45E+03	4.62E+01	1.57E+02	3.60E+02	204	172	84%	NA	NA
Cs-134	7.50E-02	2.26E+02	1.81E+01	3.77E+01	9.35E+01	204	89	44%	NA	NA
Cs-137	2.19E-01	2.65E+04	9.60E+02	3.27E+03	7.50E+03	204	204	100%	8.20E-01	196
Eu-152	2.00E-01	3.50E+04	9.32E+02	3.49E+03	7.91E+03	204	199	98%	NA	NA
Eu-154	4.73E-01	3.22E+04	9.31E+02	3.34E+03	7.61E+03	204	187	92%	NA	NA
Eu-155	5.38E-03	7.60E+03	2.27E+02	7.96E+02	1.82E+03	204	178	87%	NA	NA
U-235	4.75E-02	3.02E-01	7.01E-02	3.62E-02	1.43E-01	120	120	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from 51 borings installed to characterize the CPP-740 horizontal settling basin in 1981. Results are provided in the Radioactive Waste Characterization of CPP-603 Cleanup Basin-CPP-740 (EG&G 1982) and in Appendix E of the Preliminary Scoping Track 2 Summary Report For Operable Unit 3-09 (LITCO 1995b)

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

NA = Not applicable

RME = Reasonable Maximum Exposure

Table 5-9. Summary sampling results statistics for soil contaminants at Site CPP-08/09[a].

Contaminants	Soil Concentration (pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Cs-137	1.49E+01	1.08E+03	5.32E+02	5.83E+02	1.70E+03	4	4	100%	8.20E-01	4
Eu-152	4.38E+00	4.38E+00	4.38E+00	NA	NA	4	1	25%	NA	NA
Eu-154	7.78E-01	2.95E+00	1.86E+00	1.54E+00	4.94E+00	4	2	50%	NA	NA
Sr-90	2.52E+01 J	1.40E+02	8.53E+01	5.76E+01	2.01E+02	3	3	100%	4.90E-01	3
U-235	1.93E-02	2.61E-02	2.27E-02	4.81E-03	3.23E-02	2	2	100%	NA	NA
U-238	1.56E-01	1.61E-01	1.59E-01	3.54E-03	1.66E-01	2	2	100%	1.40E+00	0
Gross Alpha	5.10E+00	7.99E+01	2.91E+01	3.48E+01	9.87E+01	4	4	100%	NA	NA
Gross Beta	9.88E+01	9.36E+02	5.19E+02	4.34E+02	1.39E+03	4	4	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from one boring installed during the OU 3-09 Track 2 Investigation. Results are provided in the Final Preliminary Scoping Track 2 Summary Report For Operable Unit OU 3-09 (LITCO 1995b) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were also analyzed for Co-57, Co-60, Eu-155, K-40, U-234, Np-237, Pu-238, Pu-239 and Am-241. This data is not shown because concentrations were below detection limits.
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J Questionable LCS recovery or analytical yield.

NA Not applicable

RME - Reasonable Maximum Exposure

Table 5-10. Summary sampling results statistics for soil contaminants at Site CPP-10[a].

Contaminants	Soil Concentration (pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Co-60	3.18E+00	3.18E+00	3.18E+00	NA	NA	6	1	17%	NA	NA
Cs-137	2.15E+00	1.19E+03	4.91E+02	5.36E+02	1.56E+03	6	6	100%	8.20E-01	6
Eu-152	9.16E+00	9.16E+00	9.16E+00	NA	NA	6	1	17%	NA	NA
Eu-154	5.70E+00	5.70E+00	5.70E+00	NA	NA	6	1	17%	NA	NA
Eu-155	1.48E+00	1.48E+00	1.48E+00	NA	NA	6	1	17%	NA	NA
Sr-90	4.17E+01	5.83E+01 J	5.00E+01	1.17E+01	7.34E+01	2	2	100%	4.90E-01	2
U-235	1.13E-02	1.42E-02	1.28E-02	1.46E-03	1.57E-02	3	3	100%	NA	NA
U-238	1.76E-01	2.10E-01	1.88E-01	1.88E-02	2.26E-01	3	3	100%	1.4	0
Gross Alpha	2.78E+00	1.38E+02	4.97E+01	5.65E+01	1.63E+02	6	5	83%	NA	NA
Gross Beta	1.42E+02	5.45E+03	1.48E+03	2.05E+03	5.58E+03	6	6	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from one boring installed during the OU 3-09 Track 2 Investigation. Results are provided in the Final Preliminary Scoping Track 2 Summary Report For Operable Unit OU 3-09 (LITCO 1995b) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were also analyzed for Co-57, K-40, U-234, Np-237, Pu-238, Pu-239 and Am-241. This data is not shown because concentrations were below detection limits.
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J - Questionable LCS recovery or analytical yield.

NA Not applicable

RME Reasonable Maximum Exposure

Table 5-11. Summary sampling results statistics for soil contaminants at Site CPP-11[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	2.80E+00	6.40E+00	4.77E+00	1.27E+00	7.31E+00	10	10	100%	5.80E+00	2
Ba	6.34E+01 P	1.22E+02 P	9.76E+01	1.96E+01	1.37E+02	10	10	100%	3.00E+02	0
Be	2.50E-01 P	5E-01 P	4.23E-01	7.32E-02	5.69E-01	10	10	100%	1.80E+00	0
Cd	4.30E-01 P	1.70E+00 P	1.12E+00	5.00E-01	2.12E+00	10	10	100%	2.20E+00	0
Co	3.50E+00 B P	6.30E+00 B P	5.13E+00	7.83E-01	6.70E+00	10	10	100%	1.10E+01	0
Cr	1.32E+01 J P	2.37E+01 P	1.85E+01	3.07E+00	2.46E+01	10	10	100%	3.30E+01	0
Cu	7.80E+00 P	1.54E+01 P	1.31E+01	2.26E+00	1.76E+01	10	10	100%	2.20E+01	0
Hg	5.00E-02 B	5.00E-02 B	5.00E-02	NA	NA	10	1	10%	5.00E-02	0
Mn	1.32E+02 P	2.58E+02 NJ P	1.97E+02	4.44E+01	2.86E+02	10	10	100%	4.90E+02	0
Ni	1.16E+01 P	2.06E+01 P	1.73E+01	2.78E+00	2.29E+01	10	10	100%	3.50E+01	0
Pb	5.30E+00 P	8.80E+00 P	6.96E+00	1.11E+00	9.18E+00	10	10	100%	1.70E+01	0
Sb	4.40E-01 B P	8.30E-01 B P	6.06E-01	1.56E-01	9.18E-01	10	9	90%	4.80E+00	0
Se	8.50E-01 B P	8.50E-01 B P	8.50E-01	NA	NA	10	1	10%	2.20E-01	1
Th	1.30E+00 B P	1.30E+00 B	1.30E+00	NA	NA	10	1	10%	4.30E-01	1
V	1.83E+01	2.81E+01	2.50E+01	3.14E+00	3.13E+01	10	10	100%	4.50E+01	0
Zn	3.29E+01	6.42E+01	5.04E+01	8.44E+00	6.73E+01	10	10	100%	1.50E+02	0
Co-60	1.10E+01	6.10E-01	2.93E-01	2.75E-01	8.43E-01	10	3	30%	NA	NA
Cs-137	2.90E-01	7.27E+01	2.56E+01	2.64E+01	7.84E+01	10	10	100%	8.20E-01	9
Eu-154	3.60E-01	1.80E+00	7.53E-01	5.64E-01	1.88E+00	10	6	60%	NA	NA
Np-237	1.50E-01	1.50E-01	1.50E-01	NA	NA	1	1	100%	NA	NA
St-90	1.31E+01 J	1.31E+01 J	1.31E+01	NA	NA	1	1	100%	4.90E-01	1

Table 5-11. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
U-234	1.20E+00	1.20E+00	1.20E+00	NA	NA	1	1	100%	1.44E+00	0
U-238	1.00E+00	1.00E+00	1.00E+00	NA	NA	1	1	100%	1.40E+00	0
Gross Alpha	4.60E+00	2.30E+01	1.11E+01	5.16E+00	2.14E+01	10	10	100%	NA	NA
Gross Beta	2.40E+01	2.98E+03 J	3.74E+02	9.17E+02	2.21E+03	10	10	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from three borings installed during the OU 3-13 RI. Results are provided in Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b) and the LRIS Database.
- Samples were analyzed for CLP Metals and Radiological Constituents. Only those constituents that were identified above detection limits in the samples are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Al, Ca, Fe, Mg, K and Na.
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J (Non-Rad) The analyte was identified in the sample but the numerical result may not be accurate.

J (Rad) The result is statistically positive at the 95% confidence level and is considered to be an estimated quantity.

B The analyte reported value is < RDL, but > IDL.

N Spiked sample recovery not within control limit.

P Sample analysis by inductively coupled plasma atomic emission spectroscopy.

NA Not applicable.

RME Reasonable Maximum Exposure

Radionuclide activities were still above background levels at that depth; however, COPC activities decrease with depth. The areal extent of the site is 208 m^2 (2,240 ft^2). The total estimated contaminated soil volume is 1,140 m^3 (40,390 ft^3).

5.3.3.9 CPP-03 (Temporary Storage Area Southeast of CPP-603). Site CPP-03 is a temporary storage area southeast of CPP-603 that was used to store old and abandoned equipment. most of which was radioactively contaminated. The area was decommissioned in the late 1970s and all stored material was boxed and sent to the RWMC for disposal. Contaminated soil was removed, boxed and sent to the RWMC, and the area was covered with 28 cm (11 in.) of "cold" soil. Subsequently, 9.175 m^3 (12,000 yd) of contaminated soil excavated from the Tank Farm was stockpiled at the site before burial in three trenches located in the northeast corner of the INTEC.

Radiological field surveys in the area have indicated surface activity levels above background at various locations at the site. Three boreholes in the area were drilled to 3.0 in (10 ft) bgs in locations where high surface activities were observed. Samples were collected and submitted for radionuclide analysis. Summary sampling results statistics are provided in Table 5-12. The COPCs include Cs-137 and Sr-90. Cesium-137 is the primary COC, with contamination detected from the surface to about 1.2 m (4 ft) bgs. The areal extent of contamination is estimated at 6,970 m^2 (75,000 ft^2), and the estimated volume of contaminated soil is 8,364m^3 (300,000 ft^3).

5.3.3.10 10 CPP-67 (CPP Percolation Ponds #1 and #2). Site CPP-67 consists of two unlined service waste percolation ponds. The ponds receive service wastewater consisting primarily of cooling water and condensed steam generated by various INTEC operations. INTEC wastewater that contains only traces of radioactivity (or none at all) passes through the service waste system. The waste consists primarily of cooling water and steam condensates. This waste activity is monitored before being discharged to SWP-1 or SWP-2. There are three main service waste systems at INTEC: (1) the eaststde system, (2) the westside system, and (3) the CPP-604 PEW process condensate monitor/shutdown system. Figure 1-5 shows the relative location of the ponds, which are fenced to exclude entry of large wildlife and unauthorized personnel. Table 5-13 shows summary sampling results statistics for CPP-67.

SWP- 1 is located outside the south INTEC security fence, southeast of CPP-603 and was established in 1984. The pond is approximately 125.0-m (410-ft) long in the east-west direction and 146.3 m (480 ft) in the north-south direction and approximately 5.5-m (18-ft) deep. The pond was excavated in gravelly alluvium that is approximately 7.6- to 9.1-m (25- to 30-ft) thick and is underlain by basalt, which locally outcrops in the pond.

The SWP-2 is located outside the south INTEC security fence, southeast of CPP-603. The SWP-2 was established in 1985 when it became apparent that the infiltration capacity of SWP-1 had decreased and water levels began to rise. The pit bottom is approximately 152.4-m (500-ft) square and 3 to 4 m (12 to 14 ft) deep. The pit was excavated in gravelly alluvium approximately 6 to 11 m (20 to 35 ft) thick, underlain with basalt. Basalt outcrops in the comer of SWP-2. The pond is designed to accommodate continuous disposal of approximately 11.4 M L (3 M gal) of water per day.

RCRA clean-closure equivalency was achieved for metals contamination in Pond SWP- 1 in April 1994 and Pond SWP-2 in May 1995; therefore, only radionuclide contamination was assessed as part of the WAG 3 RI/BRA. Site CPP-67 is considered to be a significant source of the perched water beneath the southern portion of the INTEC.

Table 5-12. Summary sampling results statistics for soil contaminants at Site CPP-03.

Contaminants	Soil Concentration (pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Cs-137	2.53E-01	6.16E+01	1.89E+01	2.46E+01	6.81E+01	9	7	78%	8.20E-01	7
Sr-90	1.60E+01	4.39E+01 J	3.00E+01	1.97E+01	6.94E+01	2	2	100%	4.90E-01	3
Gross Alpha	0.00E+00	7.24E+00	3.57E+00	3.25E+00	1.01E+01	9	4	44%	NA	NA
Gross Beta	3.02E+00	1.67E+02	4.68E+01	6.76E+01	1.82E+02	9	6	67%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from three borings installed during the OU 3-09 Track 2 Investigation. Results are provided in the Final Preliminary Scoping Track 2 Summary Report For Operable Unit OU 3-09 (LITCO 1995b) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were also analyzed for Co-57, Co-60, Eu-152, Eu-154, Eu-155 and K-40. This data is not shown because concentrations were below detection limits
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J - Questionable LCS recovery or analytical yield

NA - Not applicable

RME - Reasonable Maximum Exposure

Table 5-13. Summary sampling results statistics for soil contaminants at Site CPP-67[a].

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Ag	2.10E-01 BJ	1.80E+01 J	2.91E+00	3.84E+00	1.06E+01	87	34	39%	0.00E+00	34
As	1.20E+00 B	1.38E+01	4.52E+00	2.17E+00	8.86E+00	99	98	99%	5.80E+00	24
Ba	3.21E+01	4.00E+02	1.44E+02	8.40E+01	3.12E+02	92	92	100%	3.00E+02	4
Be	3.00E-01 J	8.30E-01	5.61E-01	1.62E-01	8.85E-01	67	8	12%	1.80E+00	0
Cd	4.20E-01 B	1.12E+01	1.82E+00	2.14E+00	6.10E+00	100	65	65%	2.20E+00	9
Co	1.70E+00 B	1.00E+01	4.82E+00	1.83E+00	8.48E+00	66	46	70%	1.10E+01	0
Cr	3.60E+00 NJ	1.08E+02	2.35E+01	1.90E+01	6.15E+01	99	95	96%	3.30E+01	15
Cu	8.60E+00 J	1.49E+02 J	2.43E+01	2.06E+01	6.55E+01	66	66	100%	2.20E+01	22
Hg	9.00E-02	1.26E+02 J	1.26E+01	2.76E+01	6.78E+01	81	66	81%	5.00E-02	66
Pb	3.90E+00 J	1.95E+01J	8.49E+00	3.33E+00	1.52E+01	98	88	90%	1.70E+01	1
Mn	3.86E+01 EJ	3.59E+02 EJ	1.23E+02	7.12E+01	2.65E+02	59	59	100%	4.90E+02	0
Ni	6.90E+00	2.83E+01	1.51E+01	5.37E+00	2.58E+01	67	67	100%	3.50E+01	0
Sb	3.60E-01 B	6.90E+00 B	1.42E+00	2.42E+00	6.26E+00	56	7	13%	4.80E+00	1
Se	1.00E-01 BJ	8.00E-01 J	3.88E-01	2.71E-01	9.30E-01	100	8	8%	2.20E-01	4
Th	2.10E-01 B	2.10E-01 B	2.10E-01	0.00E+00	2.10E-01	57	1	2%	4.30E-01	0
V	5.60E+00	3.63E+01 N	1.53E+01	5.66E+00	2.66E+01	67	67	100%	4.50E+02	0
Zn	2.44E+01 NJ	1.02E+02 J	4.77E+01	1.74E+01	8.25E+01	67	67	100%	1.50E+02	0
Cyanide	1.20E-01 B	5.20E-01 J	2.90E-01	2.07E-01	7.04E-01	65	3	5%	NA	NA
Sulfide	5.40E-01	1.57E+01	8.10E+00	5.20E+00	1.85E+01	10	10	100%	NA	NA
2-Butanone	7.00E-03 J	9.00E-03 J	8.00E-03	1.41E-03	1.08E-02	33	2	6%	NA	NA
Acetone	5.00E-03 J	9.10E-02 B	2.39E-02	2.99E-02	8.37E-02	7	33	21%	NA	NA
Benzene	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	33	1	3%	NA	NA
bis (2-Ethylhexyl)	3.60E-02 J	3.70E+00	1.31E+00	1.76E+00	4.83E+00	29	5	17%	NA	NA

Table 5-13. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
phthalate										
Butylbenzyl-phthalate	4.00E-02 J	1.40E+00	6.12E-01	6.75E-01	1.96E+00	29	4	14%	NA	NA
Carbon Disulfide	1.40E-02	1.40E-02	1.40E-02	NA	NA	33	1	3%	NA	NA
Chlorobenzene	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	33	1	3%	NA	NA
Di-n-buytlphthalate	3.80E-02 J	1.30E-01 J	8.92E-02	4.74E-02	1.84E-01	29	5	17%	NA	NA
Diethyl-phthalate	4.10E-02 J	4.10E-02 J	4.10E-02	NA	NA	29	1	3%	NA	NA
Methylene Chloride	2.00E-02 J	2.40E-02 J	9.63E-03	7.44E-03	2.45E-02	33	8	24%	NA	NA
Pentachloro-phenol	3.70E-01 J	3.70E-01 J	3.70E-01	NA	NA	29	1	3%	NA	NA
Toluene	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	33	1	3%	NA	NA
Trichloroethane	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	33	1	3%	NA	NA
Am-241	8.00E-02 J	7.80E+00	6.31E-01	1.46E+00	3.55E+00	53	27	51%	1.1E-02	27
Ce-144	4.00E-01	1.50E+00	9.23E-01	5.52E-01	2.03E+00	58	3	5%	NA	NA
Co-60	1.60E-01	2.35E+00	5.99E-01	6.43E-01	1.89E+00	58	12	21%	NA	NA
Cs-134	1.50E-01	3.50E+00	1.50E+00	9.23E-01	3.35E+00	58	23	40%	NA	NA
Cs-137	1.00E-01	1.80E+02	4.06E+01	4.67E+01	1.34E+02	58	43	745	8.2E-01	35
Eu-154	2.80E-01	4.00E+00	1.63E+00	1.26E+00	4.15E+00	38	7	18%	NA	NA
H-3	6.10E-01 J	6.10E-01 J	6.10E-01	NA	NA	10	1	10%	NA	NA
I-129	1.46E+00	3.70E+00	2.50E+00	9.67E-01	4.43E+00	20	4	20%	NA	NA
Np-237	6.30E-01	1.63E+00	1.12E+00	2.90E-01	1.70E+00	10	10	100%	NA	NA
Pu-238	9.00E-02	3.04E+01	6.10E+00	7.50E+00	2.11E+01	53	36	68%	4.90E-03	36
Pu-239/240	5.00E-02	2.07E+00	5.49E-01	5.43E-01	1.64E+00	53	22	42%	1.00E-01	21
Ru-106	1.40E+00	5.97E+00	3.45E+00	1.91E+00	7.27E+00	58	7	12%	NA	NA

Table 5-13. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Sb-125	3.10E-01	5.10E+00	1.76E+00	1.73E+00	5.22E+00	58	8	14%	NA	NA
Sr-90	1.20E-01	1.63E+01	2.07E+00	3.73E+00	9.53E+00	54	24	44%	4.90E-01	20
U-234	0.00E+00	2.75E+00	9.98E-01	5.12E-01	2.02E+00	53	53	100%	1.44E+00	6
U-235	7.00E-02	7.00E-02	7.00E-02	NA	NA	43	1	2%	NA	NA
U-235/236	1.00E-01	1.00E-01	1.00E-01	NA	NA	10	1	10%	NA	NA
U-238	9.00E-02	2.60E+00	8.92E-01	4.37E-01	1.77E+00	54	50	93%	1.4E+00	4
Y-90	1.10E-01	1.20E+00	4.04E-01	4.05E-01	1.21E+00	11	7	65%	NA	NA
Gross Alpha	7.70E+00	7.30E+01	2.85E+01	1.78E+01	6.41E+01	34	34	100%	NA	NA
Gross Beta	1.19E+01	1.63E+02	4.80E+01	3.27E+02	1.13E+02	44	44	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples from during 1991-92 by Golder Associates. Analytical results used to develop this table were taken from the WINCO Track 1 Decision Document Package OU 3-03, Site CPP-67, CPP Percolation Ponds #1 and #2 (WINCO, 1994), Appendix G of the OU3-13 RI/FS Part A (DOE-ID, 1997b) and from the ERIS database.
- Only those constituents that were identified above detection limits are shown in the table except for the following constiuents which were detected by are not considered to be present at hazardous concentrations Al, CA, FE, Mg, K and Na.
- Samples rejected because of an unacceptable quality control parameter are not included in the table

b The RME concentrations is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

B - The analyte reported value is <RDI, but > IDL

E = The reported value is estimated because of the presence of interference.

J = The analyte was identified in the sample but the numerical result may not be accurate.

N - Spiked sample recovery was not within the control limits.

S - The reported value was determined by the method of standard additions.

NA Not applicable

RME - Reasonable Maximum Exposure

Based on the investigative results, the zone of contamination for SWP-1 is estimated to be about 1.8 m (6.0 ft) thick, and extends from the surface to 1.8-m (6.0-ft) bgs. Based on the dimensions of SWP-1, the volume of contaminated soil beneath SWP-1 was estimated to be 32,922 m^3(1, 180,800 ft^3).

Based on the investigative results, the zone of contamination for SWP-2 is assumed to be 1.8-m (6.0-ft) thick, and extends from the surface to 1.8-m (6.0-ft) bgs. This depth is based on the decrease in radionuclide COPCs with depth, and the low activities measured in deeper samples. Based on the dimensions of the pit, the volume of contaminated soil beneath the pit was estimated to be 14,814 m^3 (1,500,000 ft^3).

5.3.3.11 CPP-34 A/B (Soil Storage Area). Site CPP-34 is a soil storage trench in the northeast comer of the INTEC. The area is 4,366 m^2 (47,000 ft^2). In 1984, radionuclide-contaminated soil at levels up to 30 mR/hr was removed from a pile cast of CPP-603 and disposed of in the trench. The soil was originally excavated from Site CPP-33. Contaminants included nitric acid and radionuclides, including Cs-137, U-234, U-238, Np-237, Sr-90, and Pu-238. Table 5-14 shows summary sampling results statistics for CPP-34. Based on the investigative results, the primary COCs at this site are Cs-137 and Sr-90. The zone of contamination assumed for this site is from 0 to 6.1 m (0 to 20 ft). The volume of contaminated soil was estimated to be 20,912 m^3 (738,500 ft^3). An average width of the trench (10.7 m [35 ft]) was used to calculate soil volumes, as the width of the trench varied from 13.7 to 7.6 m (45 to 25 ft).

5.3.3.12 CPP-13 (Release from Solid Storage Cyclone NE of CPP-633). Site CPP-13 resulted from an air release of calcined, radioactively-contaminated waste. Site CPP-13 is located on an earthen berm covering underground storage Bin Set 3 which contains calcined high-level radioactive waste (WINCO 1993c). While attempting to clear a restriction in the solid storage cyclone (WC-912) on October 26, 1976, the cyclone became overpressurized and blew contaminated granular solids into the air.

The release contaminated the roof of building CPP-747, located on the top of the concrete-vaulted storage bin and the berm area northeast of building CPP-747. Subsequent cleanup efforts were successful in decontaminating the top of building CPP-747. Surface soil from the bin set area contains radioactivity levels ranging between 800 and 3,000 counts per minute (cpm). The contamination over the berm area was left in place and covered with approximately 0.15 m (6 in.) of clean soil. Summary sampling results statistics for soil contaminants are given in Table 5-15.

The zone of contamination at CPP-13 is assumed to extend throughout the estimated 7.6-m (25.ft) high berm to approximately 0.8 m (2.5 ft) below the base of the berm (original ground surface). The area of CPP-13 is estimated at 366 m^2 (3,949 ft^2).

5.3.3.13 CPP-19 (CPP-603 to -604 Line Leak). This site resulted from a 1978 release of 7,570 L (2,000 gal) of radionuclide-contaminated liquid that leaked from an underground waste transfer line between CPP-603 and WL-102 in CPP-604. The waste transfer line was constructed of 304 stainless steel that reduced from a 3.81- to 3.18-cm (1-1/2- to 1-1/4-in.) diameter line and ran for 530 m (0.33 mi) at a depth of approximately 1.5 m (5 ft) bgs. The major area of contamination was estimated at the time to be approximately 10 m^2 (108 ft^2) on the surface. The waste transfer line was abandoned in place after the leak was discovered. Table 5-16 shows summary sampling results statistics for soil contaminants for CPP-19.

Numerous radionuclides were identified as COPCs for Site CPP-19. Cesium-137, Sr-90. and isotopes of europium are the most widespread and are found at the highest activity levels. These COPCs range in activity as high as 408,000 pCi/g for Cs-137 at boring CPP-19-2 drilled at the site of the release.

Table 5-14. Summary sampling results statistics for soil contaminants at Site CPP-34.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Ag	1.90E+00	2.50E+00	2.20E+00	4.24E-01	3.05E+00	20	2	10%	0.00E+00	2
As	1.50E+00	7.10E+00	3.96E+00	1.86E+00	7.68E+00	20	20	100%	5.80E+00	4
Ba	5.28E+01	2.39E+02	1.07E+02	4.87E+01	2.04E+02	20	20	100%	3.00E+02	0
Be	5.00E-01	5.00E-01	5.00E-01	NA	NA	2	1	50%	1.80E+00	0
Cd	6.00E-01	1.00E+00	7.80E-01	2.05E-01	1.19E+00	20	5	25%	2.20E+00	0
Cr	9.10E+00	2.80E+01	1.53E+01	4.12E+00	2.35E+01	20	20	100%	3.30E+01	0
Co	3.60E+00	7.60E+00	5.60E+00	2.83E+00	1.13E+01	2	2	100%	1.10E+01	0
Cu	1.27E+01	1.71E+01	1.49E+01	3.11E+00	2.11E+01	2	2	100%	2.20E+01	0
Fluoride	1.30E+00	2.60E+00	1.93E+00	3.72E-01	2.67E+00	15	15	100%	NA	NA
Hg	1.00E-01	6.00E-01	3.50E-01	3.54E-01	1.06E+00	20	2	10%	5.00E-02	2
Mn	1.19E+02	2.69E+02	1.94E+02	1.06E+02	4.06E+02	2	2	100%	4.90E+02	0
Ni	1.31E+01	2.60E+01	1.96E+01	9.12E+00	3.78E+01	2	2	100%	3.50E+01	0
Pb	3.00E+00	1.32E+02	1.41E+01	2.81E+01	7.03E+01	20	20	100%	1.70E+01	2
Se	7.00E-01	7.00E-01	7.00E-01	0.00E+00	7.00E-01	20	1	5%	2.20E-01	1
Sulfide	2.18E+01	8.14E+01	3.95E+01	2.46E+01	8.87E+01	5	5	100%	NA	NA
V	1.72E+01	2.21E+01	1.97E+01	3.46E+00	2.66E+01	2	2	100%	4.50E+01	0
Zn	3.71E+01	8.95E+01	6.33E+01	3.71E+01	1.38E+02	2	2	100%	1.50E+02	0
bis (2-ethylhexl) phalate	4.60E-01	6.20E-01	5.40E-01	1.13E-01	7.66E-01	20	2	10%	NA	NA
Cs 137	1.10E+00	2.00E+03	3.96E+02	6.13E+02	1.62E+03	20	16	80%	8.20E-01	16
Np 237	7.00E-01	7.00E-01	7.00E-01	NA	NA	20	1	5%	NA	NA

Table 5-14. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Pu-238	5.10E+00	5.10E+00	5.10E+00	NA	NA	20	1	5%	4.90E-03	1
Sr-90	1.60E+00	6.00E+03	8.13E+02	1.49E+03	3.79E+03	20	19	95%	4.90E-01	17
U-234	1.10E+00	2.50E+00	1.47E+00	4.40E-01	2.35E+00	20	8	40%	1.44	2
U-238	1.00E+00	2.80E+00	1.71E+00	6.45E-01	3.00E+00	20	9	45%	1.4	5

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results are from samples collected from four borings installed during the 1990 Golder Associates Investigation (Golder Associates 1990). Results are provided in the Golder and Associates report and in Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b)
- Selected samples were analyzed for inorganics, radionuclides, a full suite of VOCs, SVOCs, organochlorine pesticides, PCBs, herbicides and dioxins. Only those constituents that were identified above detection limits are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Al, Ca, Mg, K and Na
- Samples rejected because of an unacceptable quality control parameter were not included in the table

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995)

NA Not applicable

RME Reasonable Maximum Exposure

Table 5-15. Summary sampling results statistics for soil contaminants at Site CPP-13.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	5.30E+00 BP	8.30E+00 P	6.30E+00	1.02E+00	8.34E+00	7	7	100%	5.80E+00	4
Ba	7.58E+01 P	1.13E+02 P	8.93E+01	1.39E+01	1.17E+02	7	7	100%	3.00E+02	0
Be	3.80E-01 BP	5.30E-01 BP	4.36E-01	5.13E-02	5.39E-01	7	7	100%	1.80E+00	0
Co	4.10E+00 BP	5.60E+00 BP	4.61E+00	5.70E-01	5.75E+00	7	7	100%	1.10E+01	0
Cr	1.16E+01 P	1.71E+01 P	1.37E+01	2.25E+00	1.82E+01	7	7	100%	3.30E+01	0
Cu	1.20E+01 JP	1.74E+01 JP	1.42E+01	2.01E+00	1.82E+01	7	7	100%	2.20E+01	0
Hg	1.30E-01	9.10E-01	4.40E-01	4.14E-01	1.27E+00	7	3	43%	5.00E-02	3
Mn	1.39E+02 JP	2.57E+02 JP	1.82E+02	4.07E+01	2.63E+02	7	7	100%	4.90E+02	0
Ni	1.41E+01 P	1.97E+01 P	1.57E+01	2.23E+00	2.02E+01	7	7	100%	3.50E+01	0
Pb	6.30E+00 P	1.39E+01 P	8.46E+00	2.51E+00	1.35E+01	7	7	100%	1.70E+01	0
Se	6.80E-01 BP	9.60E-01 BP	8.40E-01	1.24E-01	1.09E+00	7	4	57%	2.20E-01	4
V	1.69E+01 P	2.65E+01 P	2.11E+01	3.34E+00	2.78E+01	7	7	100%	4.50E+01	0
Zn	3.84E+01 P	8.59E+01 P	4.99E+01	1.64E+01	8.27E+01	7	7	100%	1.50E+02	0
Zr	7.50E+00 P	1.23E+01 P	1.06E+01	1.57E+00	1.37E+01	7	7	100%	NA	NA
Co-60	4.90E-01	9.00E-01	6.95E-01	2.90E-01	1.28E+00	7	2	29%	NA	NA
Cs-134	6.00E-01	6.00E-01	6.00E-01	NA	NA	7	1	14%	NA	NA
Cs-137	8.00E-02	4.63E+03	1.21E+03	2.04E+03	5.29E+03	7	7	100%	8.20E-01	6
Eu-154	2.20E+01	3.10E+01	2.65E+01	6.36E+00	3.92E+01	7	2	29%	NA	NA
Sr-90	4.70E+00	4.18E+03	1.37E+03	1.93E+03	5.23E+03	5	5	100%	4.90E-01	5
Tc-99	9.00E-01	2.70E+00	1.67E+00	9.29E-01	3.53E+00	4	3	75%	NA	NA

Table 5-15. (continued).

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Gross Alpha	4	15	8.03E+00	3.72E+00	1.55E+01	7	7	100%	NA	NA
Gross Beta	27	7950	1.99E+03	3.35E+03	8.69E+03	7	7	100%	NA	NA

a NOTE:

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from three borings installed during the OU 3-13 RI. Results are provided in Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b) and the ERIS Database
- Samples were analyzed for CLP Metals, zirconium and radiological constituents Only those constituents that were identified above detection limits are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Al, Ca, Fe, Mg, K and Na
- Samples rejected because of an unacceptable quality control parameter were not included in the table

b The RME concentration is the 95% upper value based on the empirical rule (95%of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J - (Non-Rad) The analyte was identified in the sample but the numerical result may not be accurate.

B - The analyte reported value is < RDL, but > IDL.

P - Sample analysis by inductively coupled plasma atomic emission spectroscopy

NA - Not applicable

RME - Reasonable Maximum Exposure.

Table 5-16. Summary sampling results statistics for soil contaminants at Site CPP-19.[a]

Contaminants	Soil Concentration mg/kg [nonradionuclide] or pCi/g [radionuclide] Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	3.10E+00 JP	7.00E+00 JP	4.65E+00	1.23E+00	7.11E+00	10	10	100%	5.80E+00	1
Ba	4.45E+01 P	1.84E+02 P	1.03E+02	4.64E+01	1.96E+02	10	10	100%	3.00E+02	0
Be	1.60E-01 P	6.60E-01 P	4.08E-01	1.56E-01	7.20E-01	10	10	100%	1.80E+00	0
Ca	2.18E+03 P	2.32E+05 P	3.53E+04	6.97E+04	1.75E+05	10	10	100%	2.40E+04	2
Cd	1.30E-01 BP	9.60E-01 BP	4.33E-01	2.92E-01	1.02E+00	21	10	100%	2.20E+00	0
Co	1.90E+00 BP	8.20E+00 BP	4.77E+00	2.00E+00	8.77E+00	10	10	100%	1.10E+01	0
Cr	5.10E+00 JP	2.63E+01 P	1.54E+01	7.45E+00	3.03E+01	10	10	100%	3.30E+01	0
Cu	6.00E+00 P	1.67E+01 P	1.25E+01	3.85E+00	2.02E+01	10	10	100%	2.20E+01	0
Hg	1.50E-01	1.50E-01	1.50E-01	0.00E+00	1.50E-01	10	1	10%	5.00E-02	1
Mn	9.11E+01 P	2.94E+02 NJP	1.80E+02	6.77E+01	3.15E+02	10	10	100%	4.90E+02	0
Ni	8.40E+00 P	2.64E+01 P	1.65E+01	5.76E+00	2.80E+01	10	10	100%	3.50E+01	0
Pb	3.80E+00 JP	1.01E+01 P	6.86E+00	1.80E+00	1.05E+01	10	10	100%	1.70E+01	0
Sb	5.30E-01 B P	8.30E-01 B P	7.12E-01	1.13E-01	9.38E-01	10	6	60%	4.80E+00	0
V	6.50E+00 BP	3.64E+01 P	1.94E+01	1.04E+01	4.02E+01	10	10	100%	4.50E+01	0
Zn	2.21E+01 NJP	8.60E+01 P	4.75E+01	2.00E+01	8.75E+01	10	10	100%	1.50E+02	0
Am-241	1.97E+00	1.97E+00	1.97E+00	NA	NA	3	1	100%	1.10E-02	1
Co-60	1.90E-01	2.16E+04	1.08E+04	1.53E+04	4.14E+04	21	2	10%	NA	NA
Cs-134	5.00E-02	6.00E-02	5.50E-02	7.07E-03	6.91E-02	10	2	20%	NA	NA
Cs-137	6.00E-02	4.08E+05	3.40E+04	1.18E+05	2.70E+05	21	12	57%	8.20E-01	10
Eu-152	1.52E+00	8.76E+04	2.92E+04	5.06E+04	1.30E+05	11	3	27%	NA	NA
Eu-154	1.70E-01	5.35E+04	1.34E+04	2.67E+04	6.68E+04	21	4	19%	NA	NA

Table 5-16. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Eu-155	1.60E-01	9.62E+03	3.21E+03	5.55E+03	1.43E+04	21	3	14%	NA	NA
Nb-95	6.00E-02	9.00E-02	7.33E-02	1.53E-02	1.04E-01	10	3	30%	NA	NA
Pu-239/240	1.41E+02	1.41E+02	1.41E+02	NA	NA	1	1	100%	1.00E-01	1
Sr-90	2.85E+01	1.25E+05	2.68E+04	5.02E+04	1.27E+05	10	8	80%	4.90E-01	8
U-235	1.73E-02	2.36E+00	8.17E-01	1.34E+00	3.50E+00	5	3	60%	NA	NA
U-238	1.56E-01	4.53E-01	2.58E-01	1.69E-01	5.96E-01	5	3	60%	1.40E+00	0
Gross Alpha	1.57E+00	1.61E+04	4.50E+03	4.50E+03	1.05E+04	21	19	100%	NA	NA
Gross Beta	2.51E+00	5.48E+05	3.53E+04	1.25E+05	2.85E+05	21	21	90%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results are from samples collected from two borings installed during the OU 3-09 Track 2 Investigation and two borings installed during the OU 3-13 RI. Results are provided in the Final Preliminary Scoping Track 2 Summary Report for Operable Unit OU 3-09 (LITCO 1995b), Appendix G of the OU 3-13 RI/FS Part A (DOE-ID 1997b) and the ERIS Database
- Samples were analyzed for CLP Metals and Radiological Constituents. Only those constituents that were identified above detection limits in the samples are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Al, Fe, Mg, K, Na and K-40
- Samples rejected because of an unacceptable quality control parameter are not included in the table

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995)

J The analyte was identified in the sample but the numerical result may not be accurate

B The analyte reported value is > RDL, but < MDL

N Spiked sample recovery not within control limits

P Sample analysis by inductively coupled plasma atomic emission spectroscopy

NA Not applicable

RME Reasonable Maximum Exposure

The COPCs were detected at activity levels above background in samples collected just above the soil/basalt interface at approximately 9.2 m (31 ft) bgs. The zone of contamination is assumed to extend from the ground surface to the soil/basalt interface. The area of site CPP- 19 has been expanded to the north, west, and south based on the soil boring results. The area of Site CPP-19 is estimated to be 306 m^2 (3.300 ft^2).

5.3.3.14 CPP-92 (*Soil Boxes West of CPP-1617)*. This site is a group of 648 boxes of soil located west of CPP-1617 that contain soils and debris with low levels of radioactive contamination. The 0.6 x 1.2 x 2.4 m (2 x 4 x 8 ft) and 1.2 x 1.2 x 2.4 m (4 x 4 x 8 ft) boxes are constructed of 1.9-cm (0.75-in.) plywood and are lined with a polyethylene membrane. The soils were generated during various INTEC activities, including the Tank Farm upgrade, CERCLA remedial projects, the CPP-603 cleanup, excavation for the fire exit from building 604/605 and miscellaneous excavations at INTEC where soil contamination was encountered. Most of the boxes contain soil with such low levels of contamination that the RWMC vill not accept the waste for disposal.

Boxed soil from the excavation for the fire exit from building 604/605 was sampled and analyzed for inorganics, VOCs, and radionuclides. Sampling results data for the soil generated during the 604/605 excavation are provided in Table 5-3.

The COPCs identified from contaminant screening for the various excavation activities are arsenic, Am-241, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, I-129, Np-237, Pu-238, Pu-239/240, Sr-90, Sb-125, U-234, and U-235. VOCs were not detected in the samples. The only inorganics detected above background were arsenic at 5.9 mg/kg and mercury at 10.4 mg/kg. Mercury was below the EPA Region III nsk-based soil concentration of 23 mg/kg residential, noncarcinogenic soil screening level. These contaminants are consistent with the types of contaminants contained in the service wastes and condensates from the PEW evaporator that have historically included nitric acid, mercury, plutonium, cesium, and strontium.

The soil and debris are contained in polyethylene-lined boxes that have not deteriorated. Therefore, it is assumed that significant amounts of contaminated soil have not leaked from the boxes and that lateral and vertical contaminant migration from the box staging area have not occurred. Assuming that the boxes are 80% full, there is a total of approximately 1,000 m^3 (37,000 ft^3) of soil in the boxes.

5.3.3.15 CPP-93 (Simulated Calcine Disposal Trench). This trench was excavated in the early to mid- 1960s and was used to dispose of simulated calcine test batches before hot startup of the WCF. Ten test batches of solution containing aluminum nitrate, nitric acid, sodium nitrate and boric acid were calcined and disposed in the trench. None of the test batches contained radionuclides; however, one test batch contained mercuric nitrate. Sampling and analysis identified mercury, aluminum, nitrate/nitrite and sodium as contaminants. Table 5-17 shows soil contaminant summary sampling results statistics for CPP-93.

The nonradioactive simulated calcine associated with Site CPP-93 was generated in 1961 and 1962 during testing of building CPP-633 waste calcining equipment and systems before operation with high-level radioactive waste. Historical operator log entries and photographs indicate that several tons of simulated calcine material were disposed in the trench. The trench was approximately 61 m (200 ft) in length and 2.4 m (8 ft) in width at the bottom, sloping to 4.9 m (16 ft) in width at the top. The trench contained 1. 1 to 1.2 m (3.5 to 4 ft) of nonradioactive calcine before being backfilled to grade with approximately 1.2 in (4 ft) of topsoil. Based on photographs and operator logs, the trench was used for simulated calcine disposal from 1964 through 1966.

Table 5-17. Summary sampling results statistics soil contaminants for Site CPP-93.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Al	6.11E+03	1.20E+05	3.97E+04	4.48E+04	1.29E+05	8	8	100%	1.60E+04	3
Hg	2.80E+00	1.40E+02	4.43E+01	5.19E+01	1.48E+02	8	8	100%	5.00E-02	8
Nitrate/Nitrite	1.00E+00	7.49E+01	1.66E+01	2.77E+01	7.20E+01	8	8	100%	NA	NA
Na	4.29E+02 B	4.29E+02 B	4.29E+02	NA	NA	8	1	13%	5.20E+02	0

a NOTE:

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from four borings installed during the OU 3-13 RI. Results are provided in Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b) and the ERIS Database.

b The RME concentration is the 95% upper value based on the empirical rule (95%of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

B The analyte reported value is < RDL, but > IDL

NA - Not applicable

RME = Reasonable Maximum Exposure

During the investigation more than 60 borings were drilled to define the simulated calcine. Because the calcine was easily identified visually only a few samples were collected for laboratory analysis. The analytical results from borings CPP-93-1 through CPP-93-4 confirm the presence of thin layers of simulated calcine material in the vicinity of a trench located southeast of building CPP-603. The presence of simulated calcine material is supported by visual observations in the borings and elevated concentrations of mercury, aluminum, nitrate/nitrite, and sodium. The observed calcine was only 3- to 5-cm (1- to 2-in.) thick.

Samples of the simulated calcine contain elevated concentrations of mercury, aluminum, nitrate/nitrite, and sodium. Concentrations of sodium, nitrate/nitrite, and aluminum appear to decrease with depth in the borings to background levels but mercury concentrations are still above background at the deepest samples in the borings. The full extent of mercury above background has not been defined but the analytical data suggest that mercury concentrations would continue to decrease with depth below 3.0 m (10 ft). The results of additional borings, drilled outside of the area of the trench indicate that significant lateral migration of mercury and aluminum from the buried calcine has not occurred.

The contaminated zone for this site is assumed to be from 0.8 to 7.6 m (2.5 to 25 ft). A volume of contaminated soil of 2,039 m^3 (72,000 ft^3) was estimated based on the reported dimensions of the trench. A trench width of 4.9 m (16 ft) down to a depth of 7.6 m (25 ft) was used to account for some lateral migration of COPCs. This site is being addressed as an ecological risk site.

5.3.3.16 CPP-14 (Decommissioned Sewage Treatment Plant). Site CPP-14 is the site of a decommissioned sewage treatment plant that operated from 1951 through 1982. The treatment plant processed sanitary wastes from nine facilities at the INTEC. Site CPP-14 is located in the north-central portion of the INTEC, south of Cypress Avenue, east of Beech Street, and north of the INTEC Tank Farm as shown on Figure 1-5. Site CPP- 14 was determined in the RI/BRA (DOE-ID 1997b) to be solely an ecological concern due to the presence of mercury at a depth greater than 9 feet.

The treatment plant consisted of two Imhoff digestion tanks, a trickling filter, a chlorine contact basin, sludge drying beds, and a drain field. Raw sewage was initially digested in the Imhoff tank followed by secondary treatment of the effluent in the trickling filter. The digested sludge was transferred to the sludge drying beds, while liquid effluent from the trickling filter was chlorinated and discharged to the drain field.

The sewage treatment facility was demolished as part of the Utility Replacement and Expansion Project (UREP) to upgrade INTEC facilities. Demolition was completed in September 1983 and reportedly consisted of:

- Removing the wastewater treatment facilities and associated equipment to a depth of 1.5-m (5-ft) belowgrade
- Removing and disposing of all remaining sludge in the drying beds
- Removing all buried piping, except the 0.3-m (12-in.) influent line and the 0. 15-m (6-in.) effluent lines from the chlorine contact basin to the drain field.

The excavated area was backfilled and graded to match the surrounding ground surface.

The influent manhole, ejector pit. Imhoff tanks, final tank, and chlorination tank extended to as deep as 6.1 m (20 ft) belowgrade. The lower portions of these facilities were left abandoned in place.

Demolition planning documents stated that drainage holes approximately 0.09 m^2 (1 ft) would be cut in the bottoms of all abandoned structures to prevent accumulation of infiltrating surface water. Also left in place were the 0.3 m (12 in.) diameter influent line, the 0.15 in (6 in.) effluent line to the drain field, and the drain field distribution piping.

The extent of contamination at the former sewage treatment plant was evaluated based on the results of sampling. The zone of contamination in the area of the Imhoff Tanks is assumed to be 0.9 m (3.0 ft) thick, and extends from 2.4 to 3.4 m (8 to 11-ft) bgs. This thickness is based on the initial depth at which sludge was encountered in sampling, and the depth of the base of the tanks. The area of the tanks is 18.6 m^2 (200 ft). Radionuclide COPCs at this site include Cs- 137, Np-237, U-235, and Sr-90. Of these, Cs- 137, Np-237, and Sr-90 were detected at activities above 1.0 pCi/g. Cs- 137 activity ranged as high as 6.21 pCi/g,

The zone of contamination at CPP-14 Plant site was assumed to be 8.2 m (27 ft) thick. This zone extends from 1.5 to 9.7 m (5.0 to 32.0 ft) bgs. The area of CPP-14 Plant site measures 900 m^2 (9,860 ft). Numerous radiological COPCs were detected in multiple plant site area samples. These include Cs-137, U-234, U-238, and Np-237. Of these, U-234 and U-238 were detected at the highest activities, 6.89 and 52.1, respectively. Cs- 137 and Sr-90 detections were also common, but at lower activities. Table 5-18 provides summary sampling results statistics for soil samples collected at CPP-14.

The zone of contamination at the drain field is assumed to extend from 4.3 to 7.6 m (25 ft) bgs. The top of this interval is based on the depth of the drain field piping. The area of CPP-14 drain field is estimated to be 306 m^2 (3,300 ft^2). Radiological COPCs at the drain field are Np-237 and Sr-90. Of these COPCs, only Np-237 was detected above 1 pCi/g. Np-237 was detected at a maximum activity of 1.4 pCi/g.

5.3.3.17 CPP-37A (Gravel Pit #1). Site CPP-37A (Pit #1) is located outside of the INTEC security fence and measures approximately 43 m (140 ft) in width 64 m (2 10 ft) in length and is 4.3 m (14 ft) in depth. No information is available on the date pit usage began; however, Pit #1 was used for decontamination of radiolonuclide-contaminated construction equipment during July and October 1983. In addition, during 1982 and 1983, the pit was used as a percolation pond for INTEC service wastewater while the injection well was being refitted. This pit currently receives stormwater runoff from the INTEC.

Soil samples were collected from Pit #1 in 1991. Analytical results are summarized in Table 5-19. Based on the contaminant screening, COPCs identified for Pit #1 were arsenic, Co-60, Am-241, Cs-137, Np-237, Pu-238. Sr-90, U-235, and U-238, The Track 2 investigation for Site CPP-37 (WINCO 1994a) Pit #1 indicated that arsenic was detected above background in eight out of 14 samples collected. However. the maximum arsenic concentration was only 8.7 mgikg relative to the background value for arsenic of 5.8 mg/kg.

Radionuclides detected above background in soil samples collected in Pit #1 were Arn-241, Cs-137, Pu-238, Sr-90, and U-238. Other radionuclides that do not have a background value were detected at low concentrations including (maximum concentrations in parentheses): Co-60 (0.55 pCi/g), Np-237 (1.07 pCi/g) and U-235 (0.05 pCi/g). No radionuclides were detected in the 0- to 0.3-m (0- to 0.5-ft) samples except for Sr-90 at 0.69±0.12 pCi/g in the southwestern portion of the pit. Radionuclides were not detected above background in the deep borehole below 4.6 m (15 ft).

The contaminated zone at Pit #1 is assumed to extend from 0 to 3.0 m (10 ft). The area of Pit #1 is 2,731 m^2 (29,400 ft^2) and 9,179 m^2 (98.800 ft^2) based on the dimensions reported in the Track 2 (WINCO 1994a).

Table 5-18. Summary sampling results statistics for soil contaminants at Site CPP-14. [a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Imhoff Tanks										
Ag	1.22E+01	4.89E+01	3.06E+01	2.60E+01	8.26E+01	2	2	100%	0.00E+00	2
As	4.60E+00	4.90E+00	4.75E+00	2.12E+01	5.17E+00	2	2	100%	5.80E+00	0
Ba	1.75E+02	2.07E+02	1.91E+02	2.26E+01	2.36E+02	2	2	100%	3.00E+02	0
Be	5.30E-01 B	5.60E-01 B	5.45E-01	2.12E-02	5.87E-01	2	2	100%	1.80E+00	0
Cr	5.12E+01	6.07E+01	5.60E+01	6.72E+00	6.94E+01	2	2	100%	3.30E+01	2
Cu	9.63E+-01	9.63E+01	9.63E+01	NA	NA	2	1	50%	2.20E+01	1
Hg	1.20E+00	4.00E+00	2.60E+00	1.98E+00	6.56E+00	2	2	100%	5.00E-02	2
Mn	2.07E+02	2.48E+02	2.28E+02	2.90E+01	2.86E+02	2	2	100%	4.90E+02	0
Ni	2.40E+01	2.62E+01	2.51E+01	1.56E+00	2.82E+01	2	2	100%	3.50E+01	0
Pb	3.56E+01	2.11E+02	1.23E+02	1.24E+02	3.71E+02	2	2	100%	1.70E+01	2
Th	2.40E-01 B	2.40E-01 B	2.40E-01	NA	NA	2	1	50%	4.30E-01	0
V	3.10E+01	3.49E+01	3.30E+01	2.76E+00	3.85E+01	2	2	100%	4.50E+01	0
Zn	1.35E+02	4.75E+02	3.05E+02	2.40E+02	7.85E+02	2	2	100%	1.50E+02	1
Acetone	1.30E-02	2.10E-02	1.70E-02	5.66E-03	2.83E-02	2	2	100%	NA	NA
Di-n-octyl phthalate	2.90E-01 J	2.90E-01 J	2.90E-01	NA	NA	2	1	50%	NA	NA
Bis(2-Ethylhexyl) Phthalate	9.80E-01	1.70E+00	1.34E+00	5.09E-01	2.36E+00	2	2	100%	NA	NA
Toluene	6.00E-03 J	2.90E-02	1.75E-02	1.63E-02	5.01E-02	2	2	100%	NA	NA
Total Xylenes	5.00E-03 J	2.70E-02	1.60E-02	1.56E-02	4.72E-02	2	2	100%	NA	NA
Phenol	2.20E-01 J	2.30E+00	1.26E+00	1.47E+00	4.20E+00	2	2	100%	NA	NA

Table 5-18. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Numbe r of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
4-Methylphenol	7.60E-01 J	7.60E-01 J	7.60E-01	NA	NA	2	1	50%	NA	NA
1,2-Dichloroethane	3E-03 J	3E-03 J	3E-03	NA	NA	2	1	50%	NA	NA
1,4-Dichlorobenzene	3.10E-01 J	3.10E-01 J	3.10E-01	NA	NA	2	1	50%	NA	NA
Benzoic Acid	2.30E-01 J	3.20E-01 J	2.75E-01	6.36E-02	4.02E-01	2	2	100%	NA	NA
Methylene Chloride	1.20E-01 B	1.20E-01 B	1.20E-01	NA	NA	2	1	50%	NA	NA
Naphthalene	1.70E-01 J	1.30E+00	7.35E-01	7.99E-01	2.33E+00	2	2	100%	NA	NA
4-Chloroaniline	6.40E-01 J	1.10E+00 J	8.70E-01	3.25E-01	1.52E+00	2	2	100%	NA	NA
Phenanthrene	1.50E-01 J	3.70E-01 J	2.60E-01	1.56E-01	5.72E-01	2	2	100%	NA	NA
Fluoranthene	2.40E-01 J	7.20E-01 J	4.80E-01	3.39E-01	1.16E+00	2	2	100%	NA	NA
Pyrene	3.00E-01 J	6.60E-01 J	4.80E-01	2.55E-01	9.90E-01	2	2	100%	NA	NA
Benzo(a)anthracene	1.50E-01 J	3.80E-01 J	2.65E-01	1.63E-01	5.91E-01	2	2	100%	NA	NA
Chrysene	3.80E-01 J	3.80E-01 J	3.80E-01	NA	NA	2	1	50%	NA	NA
Benzo(b)fluoranthene	3.20E-01 J	3.20E-01 J	3.20E-01	NA	NA	2	1	50%	NA	NA
Benzo(k)fluoranthene	2.70E-01 J	2.70E-01 J	2.70E-01	NA	NA	2	1	50%	NA	NA
Benzo(a)pyrene	3.40E-01 J	3.40E-01 J	3.40E-01	NA	NA	2	1	50%	NA	NA
Aroclor-1260	6E+00 X	2.30E+01 X	1.45E+01	1.20E+01	3.85E+01	2	2	100%	NA	NA
Cs-137	4.94E+00	6.21E+00	5.58E+00	8.98E-01	7.38E+00	2	2	100%	8.20E-01	2
Np-237	1.70E+00	1.98E+00	1.84E+00	1.98E-01	2.24E+00	2	2	100%	NA	NA
Sr-90	7.10E-01	1.07E+00	8.90E-01	2.55E-01	1.40E+00	2	2	100%	4.90E-01	2
U-234	7.90E-01	1.15E+00	9.70E-01	2.55E-01	1.48E+00	2	2	100%	1.44E+00	0
U-235	5.00E-02	5.00E-02	5.00E-02	NA	NA	2	1	50%	NA	NA
U-238	5.10E-01	5.30E-01	5.20E-01	1.14E-02	5.48E-01	2	2	100%	1.40E+00	0

Table 5-18. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Y-90	7.00E-01	1.10E+00	9.00E-01	2.83E-01	1.47E+00	2	2	100%	NA	NA
Plant										
Ag	8.00E-01 B	8.30E+00 J	4.12E+00	2.77E+00	9.66E+00	11	5	45%	0E+00	5
As	2.40E+00	4.10E+00 J	3.50E+00	7.30E-01	4.96E+00	11	7	64%	5.80E+00	0
Ba	4.96E+01	1.49E+02	8.54E+01	3.16E+01	1.49E+02	11	11	100%	3.00E+02	0
Be	2.40E-01 B	6.30E-01 B	4.09E-01	1.44E-01	6.97E-01	11	10	91%	1.80E+00	0
Cd	4.00E-01 B	6.60E-01 B	5.25E-01	1.11E-01	7.47E-01	11	4	36%	2.20E+00	0
Co	3.70E+00 B	6.60E+00 B	4.72E+00	1.16E+00	7.04E+0	11	6	55%	1.10E+01	0
Cr	7.30E+00 J	3.04E+01	1.60E+01	6.44E+00	2.89E+01	11	11	100%	3.30E+01	0
Cu	9.40E+00	3.11E+01	1.50E+01	8.34E+00	3.17E+01	11	6	55%	2.20E+01	1
Hg	4E-02	1.10E-01	7.50E-02	4.95E-02	1.74E-01	11	2	18%	5.00-02	1
Mn	1.02E+02 J	2.92E+02 J	1.69E+02	5.93E+01	2.88E+02	11	11	100%	4.90E+02	0
Ni	1.05E+01	2.65E+01	1.61E+01	5.57E+0	2.72E+01	11	11	100%	3.50E+01	0
Pb	4.60E+00 J	6.22E+01	1.68E+01	1.95E+01	5.58E+01	11	8	73%	1.70E+01	2
Sb	1.23E+01 B	1.23E+01 B	1.23E+01	NA	NA	11	1	9%	4.80E+00	1
V	1.04E+01	3.04E+01	1.82E+01	6.42E+00	3.10E+01	11	11	100%	4.50E+01	0
Zn	2.31E+01	7.71E+01	4.20E+01	1.91E+01	8.2E+01	11	8	73%	1.50E+02	0
2-Butanone	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	11	1	9%	NA	NA
4-Nitrophenol	2.60E-01 J	2.60E-01 J	2.60E-01	NA	NA	10	1	10%	NA	NA
Di-n-octyl Phthalate	2.40E-01 J	2.40E-01 J	2.40E-01	NA	NA	10	1	10%	NA	NA
Methylene Chloride	2.50E-02 B	1.20E-01 B	7.33E-02	4.42E-02	1.62E-01	11	4	36%	NA	NA

Table 5-18. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Numbe r of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Bis(2-Ethylhexyl)										
Phthalate	4.30E-02 J	4.30E-02 J	4.30E-02	NA	NA	10	1	10%	NA	NA
Toluene	4E-03 J	4E-03 J	4.00E-03	NA	NA	11	1	9%	NA	NA
Total Xylenes	4.40E-02	4.40E-02	4.40E-02	NA	NA	11	1	9%	NA	NA
Benzoic Acid	2.00E-01 J	2.00E-01 J	2.00E-01	NA	NA	10	1	10%	NA	NA
Tetrachloroethylene	1E-03 J	1E-03 J	1E-03	NA	NA	11	1	9%	NA	NA
Pentachlorophenol	3.80E-01 J	3.80E-01 J	3.80E-01	NA	NA	10	1	10%	NA	NA
Aroctor-1254	2.10E-02 JX	1.20E-01 JX	7.05E-02	7.0E-02	2.11E-01	10	2	20%	NA	NA
Aroclor-1260	1.00E-01 JX	5.70E-01 DJX	2.93E-01	2.46E-01	7.85E-01	10	3	30%	NA	NA
Am-241	1.15E+00	1.15E+00	1.15E+00	NA	NA	11	1	9%	1.10E-02	1
Cs-137	3.10E-01	3.89E+0	1.80E+00	1.40E+00	4.60E+00	11	5	45%	8.20E-01	3
Np-237	4.05E-01	5.50E+00	2.32E+00	1.50E+00	5.32E+00	11	9	82%	NA	NA
Sb-125	1.00E-01 J	1.0E-01 J	1.00E-01	NA	NA	11	1	9%	NA	NA
Sr-90	7.00E-02	5.70E-01	2.39E-01	1.71E-01	5.81E-01	11	7	64%	4.90E-01	1
U-234	9.00E-02 J	689E+00	8.89E-01	2.00E+00	4.89E+00	11	11	100%	1.44E+00	1
U-235	5.00E-02	6.80E-01	3.65E-01	4.45E-01	1.26E+00	11	2	18%	N	NA
U-238	1.00E-01 J	5.21E+01	5.16E+00	1.56E+01	3.64E+01	11	11	100%	1.40E+00	2
Y-90	1.00E+01 J	4.00E-01	2.30E-01	1.54E-01	5.38E-01	1	3	43%	NA	NA
Drain Field										
Ag	3.30E+00 J	3.30E+00 J	3.30E+00	NA	NA	3	1	33%	0E+00	1
As	1.10E+00 J	8.60E+00	4.80E+00	3.75E+00	1.23E+01	3	3	100%	5.80E+00	1
Ba	7.12E+01	1.99E+02	1.17E+02	7.15E+01	2.60E+02	3	3	100%	3.00E+02	0

Table 5-18. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[a] (mg/kg or pCi/g)	Number of Samples Greater than Background
Be	4.30E-01 B	4.30E-01 B	4.30E-01	NA	NA	3	1	33%	1.80E+00	0
Cd	8.10E-01 B	8.10E-01 B	8.10E-01	NA	NA	3	1	33%	2.20E+00	0
Co	4.40E+00 B	9.00E+00 B	6.00E+00	2.60E+00	1.12E+01	3	3	100%	1.10E+01	0
Cr	1.57E+01	2.52E+01	1.90E+01	5.37E+00	2.97E+01	3	3	100%	3.30E+01	0
Cu	1.89E+01	1.94E+01	1.92E+01	3.54E-01	1.99E+01	3	2	67%	2.20E+01	0
Hg	3.80E-01 J	3.80E-01 J	3.80E-01	NA	NA	3	1	33%	5.00E-02	1
Mn	8.13E+01	4.13E+02 J	2.38E+02	1.67E+02	5.72E+02	3	3	100%	4.90E+02	0
Ni	1.33E+01	2.26E+01	1.75E+01	4.71E+00	2.69E+01	3	3	100%	3.50E+01	0
Pb	9.40E+00 J	1.55E+01 J	1.27E+01	3.08E+00	1.89E+01	3	3	100%	1.70E+01	0
Se	4.30E-01 B	6.90E-01 J	5.60E-01	1.84E-01	9.28E-01	3	2	67%	2.20E-01	2
Tl	2.10E-01 B	2.40E-01 B	2.25E-01	2.12E-02	2.67E-01	3	2	67%	4.30E-01	0
V	1.47E+01	2.97E+01	2.24E+01	7.51E+00	3.74E+01	3	3	100%	4.50E+01	0
Zn	4.50E+01	8.86E+01	6.78E+01	2.19E+01	1.12E+02	3	3	100%	1.50E+02	0
Di-n-butyl Phthalate	9.00E-02 J	9.00E-02 J	9.00E-02	NA	NA	3	1	33%	NA	NA
Naphthalene	1.20E-01 J	1.80E-01 J	1.50E-01	4.24E+00	8.63E+00	3	2	67%	NA	NA
Phenanthrene	8.70E-02 J	8.70E-02 J	8.70E-02	NA	NA	3	1	33%	NA	NA
Aroclor 1260	7.20E-01 DJX	7.20E-01 DJX	7.20E-01	NA	NA	3	1	33%	NA	NA
Cs-137	3.15E+00	3.15E+00	3.15E+00	NA	NA	3	1	33%	8.20E-01	1
Np-237	5.90E-01	1.40E+00	1.04E+00	4.12E-01	1.86E+00	3	3	100%	NA	NA
Sr-90	9.00E-02	8.80E-01	5.00E-01	3.96E-01	1.29E+00	3	3	100%	4.90E-01	2
U-234	3.10E-01	4.20E-01	3.73E-01	5.69E-02	4.87E-01	3	3	100%	1.44E+00	0
U-238	2.30E-01	3.90E-01	2.90E-01	8.72E-02	4.64E-01	3	3	100%	1.40E+00	0

Table 5-18. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Y-90	9.00E-02	9.00E-01	4.95E-01	5.73E-01	1.64E+00	2	2	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from 17 soil samples collected from five pipe excavation locations and 10 boreholes installed under the OU 3-05 Track 2 investigation. Results are provided in The Track 2 Summary Report, Waste Area Group 3, Operable unit 3-05, Old Sewage Treatment Plant West of CPP-664 (WINCO 1993$_J$) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were analyzed for metals, radionuclides, VOCs, SVOCs, PCBs, pesticides/herbicides and dioxin/furans Only those constituents that were identified above detection limits are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentration: Al, Ca, Fe, Mg, K and Na.
- Samples rejected because of an unacceptable quality control parameter are not included in the table

b The RME: concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J The analyte was identified in the sample but the numerical result may not be accurate.

B The analyte reported value is<CRDL, but> IDL

JX - The reported value is an estimate quantity manually entered onto the results form.

DJX = The compound was analyzed at a secondary dilution factor and was an estimated quantity that was manually entered onto the results form.

NA - Not Applicable

RME: - Reasonable Maximum Exposure.

Table 5-19. Summary sampling results statistics for soil contaminants at Site CPP-37A, Gravel Pit #1.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	4.10E+00	8.70E+00	5.83E+00	1.20E+00	8.23E+00	14	14	100%	5.80E+00	8
Ba	7.87E+01	2.29E+02	1.30E+02	4.85E+01	2.27E+02	14	14	100%	3.00E+02	0
Cd	3.50E-01 B	1.50E+00	8.27E-01	3.45E-01	1.52E+00	14	14	100%	2.20E+00	0
Cr	1.02E+01	3.01E+01	1.88E+01	5.61E+00	3.00E+01	14	14	100%	3.30E+01	0
Hg	1.20E-01 J	9.60E-01	5.70E-01	4.18E-01	1.41E+00	14	4	29%	5.00E-02	4
Pb	7.10E+00	1.77E+01	1.10E+01	3.75E+00	1.85E+01	14	14	100%	1.70E+01	1
Se	2.00E-01 BJ	4.10E-01 B	2.34E-01	7.28E-02	3.80E-01	14	14	100%	2.20E-01	1
Methylene Chloride	4.70E-02	1.40E-01	8.93E-02	3.91E-02	1.68E-01	NA	4	NA	NA	NA
Toluene	1.00E-03 J	1.00E-03 J	1.00E-03	NA	NA	NA	1	NA	NA	NA
1,1,1-Trichloroethane	5.00E-03 J	5.00E-03 J	5.00E-03	NA	NA	NA	1	NA	NA	NA
Am-241	2.30E-01	9.90E-01	4.76E-01	2.56E-01	9.88E-01	13	7	54%	1.10E-02	7
Co-60	5.50E-01	5.50E-01	5.50E-01	NA	NA	13	1	8%	NA	NA
Cs-137	1.40E-01	3.82E+00	1.13E+00	1.22E+00	3.57E+00	13	9	69%	8.20E-01	4
Np-237	3.20E-01	1.07E+00	6.62E-01	2.49E-01	1.16E+00	13	11	85%	NA	NA
Pu-238	1.00E-01	1.20E-01	1.10E-01	1.41E-02	1.38E-01	13	2	15%	4.90E-03	2
Sr-90	1.70E-01	6.90E-01	3.70E-01	1.69E-01	7.08E-01	13	9	69%	4.90E-01	2
U-234	2.20E-01	7.10E-01	3.63E-01	1.37E-01	6.37E-01	13	12	92%	1.44E+00	0
U-235	5.00E-02	5.00E-02	5.00E-02	NA	NA	13	1	8%	NA	NA
U-238	7.00E-02	3.99E+00	7.27E-01	1.00E+00	2.73E+00	13	13	100%	1.40E+00	1

a NOTE:

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from samples collected from ten borings installed under the OU 3-02 Track 2 Preliminary Scoping Package for CPP-37 by Golder Associates, Inc. Results are provided in the Draft Report for the Idaho Chemical Processing Plant Drilling & Sampling Program at Land Disposal Unit CPP-37 (Golder Associates 1992) and Appendix G of the OU 3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were analyzed for metals, radionuclides, VOC's, SVOC's, PCBs and pesticides/herbicides. Only those constituents that were identified above detection limits are shown in the table.
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean).

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J The analyte was identified in the sample but the numerical result may not be accurate.

B The analyte reported value is < RDL but > IDL.

NA Not applicable or not available.

RME Reasonable Maximum Exposure.

5.3.3.18 CPP-37b, Gravel Pit and Debris Disposal Pit #2. Site CPP-37b is located inside the INTEC security fence. Before being backfilled, the site was approximately 79 m (260ft) in width, 116 m (380 ft) in length and was 7.9-m (26-ft) deep and area of approximately 9,179 m^2 (98,800 ft^2). Prior to 1982, this pit was often used for the disposal of waters released from the sludge dewatering pit of the old STP (CPP-715). After 1982, the pit was used to dispose of construction debris, some of which may have been radionuclide contaminated. Anecdotal information suggests that the Pit may also have been used for the disposal of chemical wastes. Additionally, the CPP-37b was open in 1964 when the release of radioactive steam associated with Site CPP-26 occurred. Radioactive steam containing Cs-137 was released from a decontamination header in the HLLW Tank Farm. The year this pit was backfilled is unknown, but it is believed to have been backfilled to grade shortly after its use as a construction debris landfill was discontinued. Modeling and sampling of the site indicated the site is not a significant contributor to groundwater risk or surface exposure risk. However, since the pit was previously used as a landfill, characterization is considered insufficient to recommend no further action at the site. Table 5-20 provides summary sampling results statistics for soil samples from Site CPP-37B.

5.3.3.19 CPP-48 (French Drain South of CPP633). Site CPP-48 was an excess chemical dump tank located south of the old WCF (CPP-633) that was used as a french drain from 1975 to 1981 (herein referred to as "dump tank"). The dump tank was made of steel and measured approximately 1.5 m (5 ft) in diameter and 3.7 m (12) long, with a lid and no bottom. The top is the dump tank stood approximately 0.6 m (2 ft) above the ground surface, with the tank bottom at 3 m (10 ft) bgs. As a part of the calcining process, nitric acit and other chemicals consisting primarily of aluminum nitrate and calcium nitrate used in the calcining process were disposed into CPP-48. The chemicals and radionuclides released to the dump tank were not treated or neutralized before percolating into the soil matrix through the bottom of the tank. A portable above ground disposal line was used to discharge effluent to the dump tank. Table 5-21 provides summary sampling results statistics for soils collected at CPP-48.

Prior to the installation of an excess chemical dump tank (CPP-48), in 1975, waste chemicals wee disposed directly to the soil in a trench-like depression located at the dump tank site. The trench is approximately 3 x 1.5 x 0.3 m (10 x 5 x 1 ft) in size. From 1975 to 1981, chemicals from the calcining process wee disposed directly to the CPP-48 was a flexible hose that, when not in use, was "rolled up" and stored in CPP-633. In August 1993, the dump tank was dismantled, packaged, and removed to the Waste Experimental Reduction Facility (WERF).

Records indicate that the Chemical disposal to CPP-48 was in low quantities (several gallons at a time). Through the years of operation, however, site personnel indicate thousands of gallons of waste effluent may have been disposed. No records were kept regarding the volume of effluent disposed or the constituents in the waste stream, but it is suspected the mercury, Cs-137, Sb-125, and Eu-155 may have been introduced to this site via waste chemicals from the calcining process.

In March 1991, a RCRA sampling program was conducted to characterize possible soil contaminants in the vicinity of the dump tank. Samples were collected from a boring drilled to 14 m (46.5 ft) bgs and analyzed fro RCRA metals, pH, nitrite, and nitrate. Analysis indicated soil samples contained no detectable levels of the VOCs, semiVOCs, pesticides, dioxin/furan, or herbicides.

Table 5-20. Summary sampling results statistics for soil contaminants at Site CPP-37B, Gravel Pit #2.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Ag	5.60E-01	8.50E+00	4.19E+00	4.01E+00	1.22E+01	28	3	11%	0E+00	3
As	1.20E+00 B	1.14E+01 J	4.42E+00	1.84E+00	8.10E+00	28	28	100%	5.80E+00	3
Ba	5.18E+01 J	4.68E+02	1.26E+02	7.73E+01	2.81E+02	28	28	100%	3.00E+02	1
Cd	4.10E-01 B	3.20E+00	1.22E+00	6.55E-01	2.53E+00	28	22	79	2.20E+00	1
Cr	1.08E+01	4.26E+01	1.85E+01	7.06E+00	3.26E+01	28	28	100%	3.30E+01	1
Hg	1.20E-01 J	1.20E-01 J	1.20E-01	NA	NA	28	1	3%	5.00E-02	1
Pb	1.90E+00 J	2.26E+01 J	9.60E+00	4.56E+00	1.87E+01	28	28	100%	1.70E+01	2
Se	2.00E-01 B	6.50E-01 B	2.81E-01	1.32E-01	5.45E-01	28	15	54%	2.20E-01	4
Methylene Chloride	3.50E-02	2.90E-01	1.20E-01	1.04E-01	3.28E-01	NA	7	NA	NA	NA
Kepone	7.00E-02 J	7.00E-02 J	7.00E-02	NA	NA	NA	1	NA	NA	NA
Acenaphthene	3.70E-02 J	3.70E-02 J	3.70E-02	NA	NA	NA	1	NA	NA	NA
Fluorene	6.10E-02 J	6.10E-02 J	6.10E-02	NA	NA	NA	1	NA	NA	NA
Phenanthrene	4.00E-01	4.00E-01	4.00E-01	NA	NA	NA	1	NA	NA	NA
Anthracene	3.50E-01	3.50E-01	3.50E-01	NA	NA	NA	1	NA	NA	NA
Fluoranthene	2.20E-01 J	2.20E-01 J	2.20E-01	NA	NA	NA	1	NA	NA	NA
Pyrene	2.10E-01 J	2.10E-01 J	2.10E-01	NA	NA	NA	1	NA	NA	NA
Benzo(a)anthracene	7.20E-02 J	7.20E-02 J	7.20E-02	NA	NA	NA	1	NA	NA	NA
Chrysene	1.10E-01 J	1.10E-01 J	1.10E-01	NA	NA	NA	1	NA	NA	NA
bis(2-Ethylhexyl)Phthalate	2.40E-01 J	2.40E-01 J	2.40E-01	NA	NA	NA	1	NA	NA	NA
Aroclor 1254	2.30E-01	2.30E-01	2.30E-01	NA	NA	NA	1	NA	NA	NA

Table 5-20. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Aroctor-1260	4.20E-01	4.20E-01	4.20E-01	NA	NA	NA	1	NA	NA	NA
Am-241	2.1E-01	3.89E+00	1.18E+00	1.40E+00	3.98E+00	26	6	26%	1.10E-02	6
Cs-137	1.40E-01	6.31E+00	2.04E+00	1.67E+00	5.38E+00	26	17	65%	8.20E-01	11
I-129	1.57E+0	1.57E+00	1.57E+00	NA	NA	26	1	4%	NA	NA
Np-237	3.20E-01	8.60E-01	5.13E-01	1.26E-01	7.65E-01	26	26	100%	NA	NA
Pu-238	6.00E-02	5.00E-01	1.99E-01	1.57E-01	5.13E-01	26	8	31%	4.90E-03	8
Sr-90	8.00E-02	4.31E+00	9.30E-01	1.06E+00	3.05E+00	26	21	81%	4.90E-01	12
U-234	1.50E-1	1.21E+00	3.12E-01	2.14E-01	7.40E-01	26	26	100%	1.44E+00	0
U-235	5.00E+02	7.00E-02	5.75E-02	9.57E-03	7.66E-02	26	4	15%	NA	NA
U-238	1.60E-013	7.44E+00	7.87E-01	1.46E+00	3.71E+00	26	26	100%	1.40+00	3

a NOTE

- Duplicate sample results were not included in the statistical analysis
- Analytical results are from samples collected from four borings installed under the OU 3-02 Track 2 Preliminary Scoping Package for CPP-37 by Golder Associates, Inc Results are provided in the Draft Report for the Idaho Chemical Processing Plant Drilling & Sampling Program at Land Disposal Unit CPP-37 (Golder Associates 1992) and Appendix G of the OU3-13 RI/FS Part A (DOE-ID 1997b).
- Selected samples were analyzed for metals, radionuclides, VOCs, SVOCs, PCBs and pesticides/herbicides. Only those constituents that were identified above detection limits are shown in the table
- Samples rejected because of unacceptable quality control parameter are not included in the table

b The RME concentration is the 95% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J The analyte was identified in the sample but the numerical result may not be accurate.

B The analyte reported value is <RDI, but> IDL

NA Not applicable or not available

RME Reasonable Maximum Exposure

Table 5-21. Summary sampling results statistics for soil contaminants at Site CPP-48. [a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Numbe r of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	2.70E+00	1.32E+01	5.45E+00	2.92E+00	1.13E+01	11	11	100%	5.80E+00	3
Ba	3.70E+01 B	3.14E+02	9.92E+01	7.51E+01	2.49E+02	11	11	100%	3.00E+02	1
Cr	7.70E+00	3.96E+01	1.79E+01	8.10E+00	3.41E+01	11	11	100%	3.30E+01	1
Cu	1.05E+01J	1.05E+01 J	1.05E+01	NA	NA	1	1	100%	2.20E+01	0
Hg	5.10E-01	9.50E-01	7.87E-01	2.41E-01	1.27E+00	11	3	27%	5.00E-02	3
Ni	1.89E+01	1.89E+01	1.89E+01	NA	NA	1	1	100%	3.50E+01	0
Pb	4.60E+00	2.39E+01	9.51E+00	6.05E+00	2.16E+01	8	8	100%	1.70E+01	1
V	1.80E+01	1.80E+01	1.80E+01	NA	NA	1	1	100%	4.50E+01	0
Zn	4.52E+01	4.52E+01	4.52E+01	NA	NA	1	1	100%	1.50E+02	0
Nitrate	7.05E-01	5.71E+00	2.58E+00	2.42E+00	7.42E+00	7	5	71%	NA	NA
Nitrite	5.29E-01	5.90E-01	5.72E-01	2.91E-02	6.30E-01	7	4	57%	NA	NA
Nitrate/Nitrite	9.60E-01	5.40E+00	2.88E+00	2.12E+00	7.12E+00	4	4	100%	NA	NA
Chloride	1.20E+00 J	3.30E+00 J	2.42E+00	8.92E-01	4.20E+00	4	4	100%	NA	NA
Fluoride	5.20E+00	2.64E+02	1.91E+02	1.24E+02	4.39E+02	4	4	100%	NA	NA
Sulfate	2.21E+01	1.31E+02	5.18E+01	5.31E+01	1.58E+02	4	4	100%	NA	NA
Sulfide	1.56E+00	1.56E+00	1.56E+00	NA	NA	1	1	100%	NA	NA
Tin	3.00E-02	3.00E-02	3.00E-02	NA	NA	1	1	100%	NA	NA
Cs-137	3.30E+00	6.50E+01	4.13E+01	2.41E+01	8.95E+01	11	5	45%	8.20E-01	5
Eu-155	5.20E-01	6.70E-01	5.95E-01	1.06E-01	8.07E-01	4	2	50%	NA	NA
Pu-238	6.00E-02	9.00E-02	7.50E-02	1.29E-02	1.01E-01	4	4	100%	4.90E-03	4
Sb-125	2.40E+00	5.30E+00	3.28E+00	1.38E+00	6.04E+00	11	4	36%	NA	NA

Table 5-21. (continued)

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Numbe r of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Sr-90	1.20E-01	2.60E-01	1.87E-01	7.2E-02	3.27E-01	8	3	38%	4.90E-01	0
U-234	1.10E+00	2.50E+00	1.58E+00	6.29E-01	2.84E+00	4	4	100%	1.44E+00	1
U-238	1.10E+00	2.70E+00	1.68E+00	7.04E-01	3.09E+00	4	4	100%	1.40E+00	2
Gross Alpha	9.00E+00	1.40E+01	1.15E+01	3.54E+00	1.86E+01	4	2	50%	NA	NA
Gross Beta	1.12E+02	1.22E+02	1.18E+02	4.32E+00	1.27E+02	4	4	100%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analsis.
- Analytical results are from samples collected from 1 boring installed in 1991 and from three boreholes and excavated soil in 1993. Results are provided in the Closure Plan for Land Disposal Unit CPP-48 (INEL 1991) and the ERIS database.
- Selected samples were analyzed for inorganics, radionuclides, VOCs, SVOCs, pesticides/herbicides, and dioxins/furans Only those constituents that were identified above detection limits are shown in the table
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

h The RME concentrations is the 95% upper value based on the empirical rule (95%of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

J The analyte was identified in the sample but the numerical result may not be accurate.

B - The analyte reported value is <RDL, but > IDL

NA - Not applicable or not available.

In August 1993, the dump tank was removed, cut into sections, packaged, and delivered to WERF for disposal. Four soil samples were taken at the bottom of the dump tank excavation (3 m [10 ft] bgs) and at (3.7 m [12 ft] bgs), to determine possible soil contamination in the underlying soil. Samples were analyzed for kerosene, VOCs, semi VOCs, RCRA metals, and radionuclides. Kerosene, VOC, and semi VOC constituents were not detected. Analysis for radionuclide contamination showed a Cs-137 concentration highest at 3.7 m (12 ft) bgs with 65±1 pCig/g, an SB-125 concentration of 5.32±0.2 pCi/g at 3 m (10 ft), and the highest Eu-155 concentration of 0.67±0.10 pCi/g at 3.7 m (12 ft).

5.3.3.20 CPP-44. A grease pit south of CPP-608 has an ecological HI greater than 1.0 from exposure to cadmium, chromium III, chromium VI, lead, mercury, nickel, and decanal. Cadmium and nickel are native metals that are eliminated as COPCs when compared to 10X background (Rood et al. 1995). Table 5-22 provides summary sampling results statistics for soils collected at CPP-44.

5.3.3.21 CPP-55. An area contaminated with paint solvents, has an ecological HI greater than 1.0 from exposure to metals (arsenic, chromium III, chromium VI, lead, mercury, nickel, selenium, and silver). Arsenic, chromium III, lead, and nickel are native metals that are eliminated as COPCs when compared to 10X background (Rood et al. 1995). Chromium is not expected to persist in the environment in the chromium VI from (Bartlett and Kimble 1976. Rai et al. 1989) Mercury remains a concern after this initial screening with a maximum concentration of 5.2 mg/kg. The next highest was 0.62. It is highly probable that the one sample having the high hit was a small hotspot that would not contribute that greatly to average exposure. Table 5-23 provides summary sampling results statistics for soils collected at CPP-55.

5.3.4 Perched Water (Group 4)

Perched water consists of water in the vadose zone that is saturating sediments or basalts above the regional aquifer (Figure 5-2 and 5-3). The perched water is discussed in Sections 5.1 and 5.2. Contaminants already in the perched water are a potential source of SRPA contamination. Contaminants of concern (Sr-90) were selected based on transport of the contaminant to the SRPA, and future ingestion of SRPA groundwater post 2095. Other contaminants are summarized in the following paragraphs. The Perched Water (Group 4) is identified as containing low-level threat wastes. As noted in Section 5.2. Table 5-1, the perched water is a result of recharge from man-made sources at INTEC. When INTEC operations cease the recharge sources will stop and the perched water bodies will not yield sufficient water to be usable to future users.

As part of the WAG 3 RI, a complete round of groundwater samples were collected during May and June 1995 from all perched water wells having sufficient water for sample collection. These data are summarized in Table 5-24. The results of previous groundwater sampling efforts have been described in *the WAG 3 Comprehensive RI/FS Work Plan* (LITCO 1995c). Figure 5-6 shows well location where perched water has been observed at INTEC and Figure 5-7 shows measured Sr-90 activities in the perched water.

The only chemical constituent in the upper perched groundwater zone beneath the northern portion of INTEC detected above either a Federal primary or secondary MCL was nitrate. The MCL for nitrate is 10 mg/L. The highest nitrate/nitrite concentrations (35.4 mg/L in well CPP 55-06 and 26.8 mg/L in well MW-10) were measured in the southeastern portion of the northern perched groundwater.

Table 5-22. Summary statistics for soil contaminants at Site CPP-44.[a]

Contaminants	Soil Concentration (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
As	2.1E+00 J	7.1E+00 J	4.66E+00	2.32E+00	9.30E+00	5	5	100%	5.80E+00	2
Be	8.80E-01	1.60E+00	1.17E+00	3.50E-01	1.87E+00	6	4	67%	1.80E+00	0
Cd	1.6E+00 J	8.40E+00 J	4.95E+00	2.58E+00	1.01E+01	6	6	100%	2.20E+00	5
Cr	2.93E+01 J	1.54E+03 J	5.17E+02	5.99E+02	1.72E+03	6	6	100%	3.30E+01	5
Cu	1.69E+01 J	4.78E+01 J	2.71E+01	1.17E+01	5.05E+01	6	6	100%	2.20E+01	3
Hg	2.60E-01	5.00E+00	2.43E+00	1.74E+00	5.91E+00	6	6	100%	5.00E-02	6
Ni	3.5E+01 J	3.44E+02 J	1.54E+02	1.10E+02	3.74E+02	6	6	100%	3.50E+01	5
Pb	8.9E+00 J	2.81E+02 J	8.69E+01	1.12E+02	3.11E+02	6	6	100%	1.70E+01	3
Sb	6.6E-01 BJ	1.9E+00 BJ	1.09E+00	7.00E-01	2.49E+00	6	3	50%	4.80E+00	0
Se	1.5E-01 BJ	2.20E+00 J	1.18E+00	1.45E+00	4.08E+00	6	2	33%	2.20E-01	1
Th	1.1E-01 BJ	4.70E-01 BJ	3.40E-01	2.00E-01	7.40E-01	6	3	50%	4.30E-01	1
Zn	4.03E+01 J	1.22E+02 J	6.79E+01	2.90E+01	1.26E+02	6	6	100%	1.50E+02	0
1,1,1 Trichloro ethane	5.00E-03 J	5.00E-03 J	5.00E-03	NA	NA	6	1	17%	NA	NA
2-Pentanone, 4-hydroxy 4-methyl	7.80E+00 J	9.50E+00 J	8.65E+00	1.20E+00	1.11E+01	6	2	33%	NA	NA
Decanal	9.00E-03 J	9.00E-03J	9.00E-03	NA	NA	6	1	17%	NA	NA
Oil and Grease	2.58E+03 J	3.83E+03 J	3.21E+03	8.84E+02	4.98E+03	6	2	33%	NA	NA

a NOTE

- Duplicate sample results were not included in the statistical analysis.
- Analytical results are from soil samples collected from the surface soil overlying the pad, grease pit trench and the sump beneath the grease pit trench. Results are provided in the Track 2 Draft Final Scoping Summary Report OU 3-10, Reference 10, Analytical Data Report; CPP-44 Grease Pit South of Building 608, November, 1993, (LITCO 1994)
- Selected samples were analyzed for metals, VOCs, SVOCs, PCBs, and TPH. Only those constituents that were identified above detection limits are shown in the table.
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

b The RME concentration is the 95th% upper value based on the empirical rule (95% of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95th% upper confidence limit (Rood et al. 1995)

J The analyte was identified in the sample but the numerical result may not be accurate

B The analyte reported value is < RDL but > IDL

NA Not applicable

Table 5-23. Summary statistics for soil contaminants at Site CPP-55.[a]

Contaminants	Soil Concentration, (mg/kg [nonradionuclide] or pCi/g [radionuclide]) Minimum	Maximum	Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection	INEEL Background[c] (mg/kg or pCi/g)	Number of Samples Greater than Background
Ag	1.90E+00	6.10E+00	3.00E+00	1.31E+00	5.62E+00	49	16	33%	0.00E+00	16
As	3.80E+00	1.34E+01	6.34E+00	1.78E+00	9.90E+00	49	49	100%	5.80E+00	30
Ba	7.00E+01	6.09E+02	1.59E+02	1.01E+02	3.60E+02	49	49	100%	3.00E+02	4
Cd	9.40E-01	1.40E+00	1.16E+00	1.90E-01	1.54E+00	49	4	8%	2.20E+00	0
Cr	1.33E+01	6.47E+01	2.54E+01	9.09E+00	4.35E+01	49	48	98%	3.30E+01	6
Hg	5.00E-02	5.20E+00	4.30E-01	1.03E+00	2.49E+00	49	24	49%	5.00E-02	22
Ni	1.38E+01	1.21E+02	2.70E+01	2.04E+01	6.77E+01	49	49	100%	3.50E+01	7
Pb	4.10E+00	3.20E+01	9.59E+00	5.13E+00	1.99E+01	49	49	100%	1.70E+01	2
Sr-90	4.30E+03	4.80E+03	4.55E+03	3.54E+02	5.26E+03	5	2	40%	4.90E-01	2

a NOTE

- Duplicate sample results were not included in the statistical analsis.
- Analytical results are from samples collected from 11 boreholesdrilled during the 1989-90 investigation by Golder Associates Analytical results used to develop this table were taken from the Closure Report for CPP-55, Mercury Contaminated Area (DOE 1990) that was provided in the WINCO Track 1 Decision Document Package 0U 3-02, Site CPP-55, Mercury Contaminated Area South of CPP T-15 (WINCO 1993).
- Selected samples were analyzed for VOC's, metals and radionuclides as well as the full 40 CFR 264 Appendix 8 and Target Compound List constituents Those constituents identified in the Closure Report for CPP-55 are shown in the table except for the iron and K-40 which were detected but are not considered to be present at hazardous concentrations.
- Three organics constituents toluene, 4-methyl 2-pentanone, and bis(2-ethylhexyl) phthalate were detected in the VOC analyses However, all three were eliminated from further consideration during the validation procedure because all three are recognized laboratory contaminants.
- Samples rejected because of an unacceptable quality control parameter are not included in the table.

b The RME concentrations is the 95% upper value based on the empirical rule (95%of the measurements lie within two standard deviations of their mean)

c The INEEL background concentrations represent the 95% upper confidence limit (Rood et al. 1995).

B - The analyte reported value is <RDL, but > IDL

NA - Not applicable

Table 5-24. Summary sampling results statistics for contaminants in the perched water wells (May-June 1995).[a]

Contaminants	Water concentration, mg/L or pCi/L					Number of Samples	Number of Detects	Frequency of Detection
	Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]			
Ag	7.70E-04 BNJ	1.40E-03 B	1.09E-03	4.45E-04	1.98E-03	16	2	13%
As	3.40E-03 B	4.90E-03 B	4.17E+00	7.51E-01	5.67E+00	16	3	19%
Ba	7.14E-02 B	3.94E-01	1.95E-01	9.14E-02	3.78E-01	16	16	100%
Be	1.20E-04	1.20E-04	1.20E-04	NA	NA	16	1	6%
Chloride	2.15E+01	1.25E+02	5.49E+01	2.78E+01	1.11E+02	16	16	100%
Co	5.70E-04	1.30E-03	7.80E-04	2.52E-04	1.28E-03	16	8	50%
Cr	4.30E-03 B	1.11E-02	6.05E-03	2.52E-03	1.11E-02	16	6	38%
Cu	1.30E-03 B	1.49E-02 B	3.75E-03	4.53E-03	1.28E-02	16	8	50%
Fluoride	1.60E-01	3.60E-01	2.51E-01	4.68E-02	3.45E-01	16	16	100%
Mn	8.50E-04 B	1.86E-01	2.11E-02	5.15E-02	1.24E-01	16	13	81%
Ni	2.50E-03 B	7.50E-03 B	4.63E-03	2.58E-03	9.79E-03	16	3	19%
NO_2, NO_3 - N	3.30E+00	6.96E+01	1.99E+01	1.69E+01	5.37E+01	16	16	100%
Pb	2.00E-03 BJ	2.00E-03 BJ	2.00E-03	NA	NA	16	1	6%
Sb	2.00E-03 B	6.40E-03 B	3.60E-03	1.67E-03	6.94E-03	16	5	31%
Se	3.00E-03 B	4.00E-03 B	3.33E-03	5.77E-04	4.48E-03	16	3	19%
Sulfate	2.62E+01	6.18E+01	4.03E+01	1.27E+01	6.57E+01	16	16	100%
Th	3.30E-03 B	5.00E-03 B	4.15E-03	1.20E-03	6.55E-03	16	2	13%
V	1.50E-03 BJ	6.70E-03 B	3.56E-03	1.81E-03	7.18E-03	16	11	69%
Zn	2.60E-03 B	6.93E-02 EJ	2.15E-02	2.06E-02	6.27E-02	16	10	63%
Am-241	3.00E-02	1.60E-01	9.50E-02	9.19E-02	2.79E-01	16	2	13%
Pu-238	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	16	2	13%
Pu-239/240	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	16	2	13%
Sr-90	00E+01	3.20E+05	4.06E+04	8.60E+04	2.13E+05	16	14	88%

Table 5-24. (continued).

Contaminants	Water concentration, mg/L or pCi/L							
	Minimum	Maximum	Arithmetic Mean	Standard Deviation	RME[b]	Number of Samples	Number of Detects	Frequency of Detection
Tc-99	4.00E-01	7.36E+02 J	8.96E+01	1.91E+02	4.72E+02	16	14	88%
Tritium	6.21E+02	7.30E+04	2.00E+04	2.35E+04	6.70E+04	16	14	88%
U-234	1.90E+00 J	1.18E+01	4.70E+00	3.24E+00	1.12E+01	16	7	44%
U-238	8.00E-01 J	2.70E+00 J	1.94E+00	6.08E-01	3.16E+00	16	7	44%
Gross Alpha	2.30E+00	1.14E+03	1.88E+02	3.68E+02	9.24E+02	16	9	56%
Gross Beta	5.20E+00	5.89E+05	7.00E+04	1.51E+05	3.72E+05	16	16	100%

a NOTE

- Duplicate and QC sample results were not included in the statistical analysis.
- Analytical results are from perched groundwater samples collected during May and June 1995 as part of the OU 3-13 RI. Results are provided in Table 4-2 of the OU3-13 RI/FS Part A (DOE-ID 1997b) and the ERIS Database.
- Samples were analyzed for miscellaneous inorganics, TAL inorganics and radionuclides. Only those constituents that were identified above detection limits in the samples are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Ca, Fe, Mg, K, Na, Alkalinity, Bic Alkaline, Carbonate, TKN and Ammonia-N.
- Samples rejected because of an unacceptable quality control parameter were not included in the table.

b The RME concentration is the 95% upper value based on the empirical rule (95%of the measurements lie within two standard deviations of their mean).

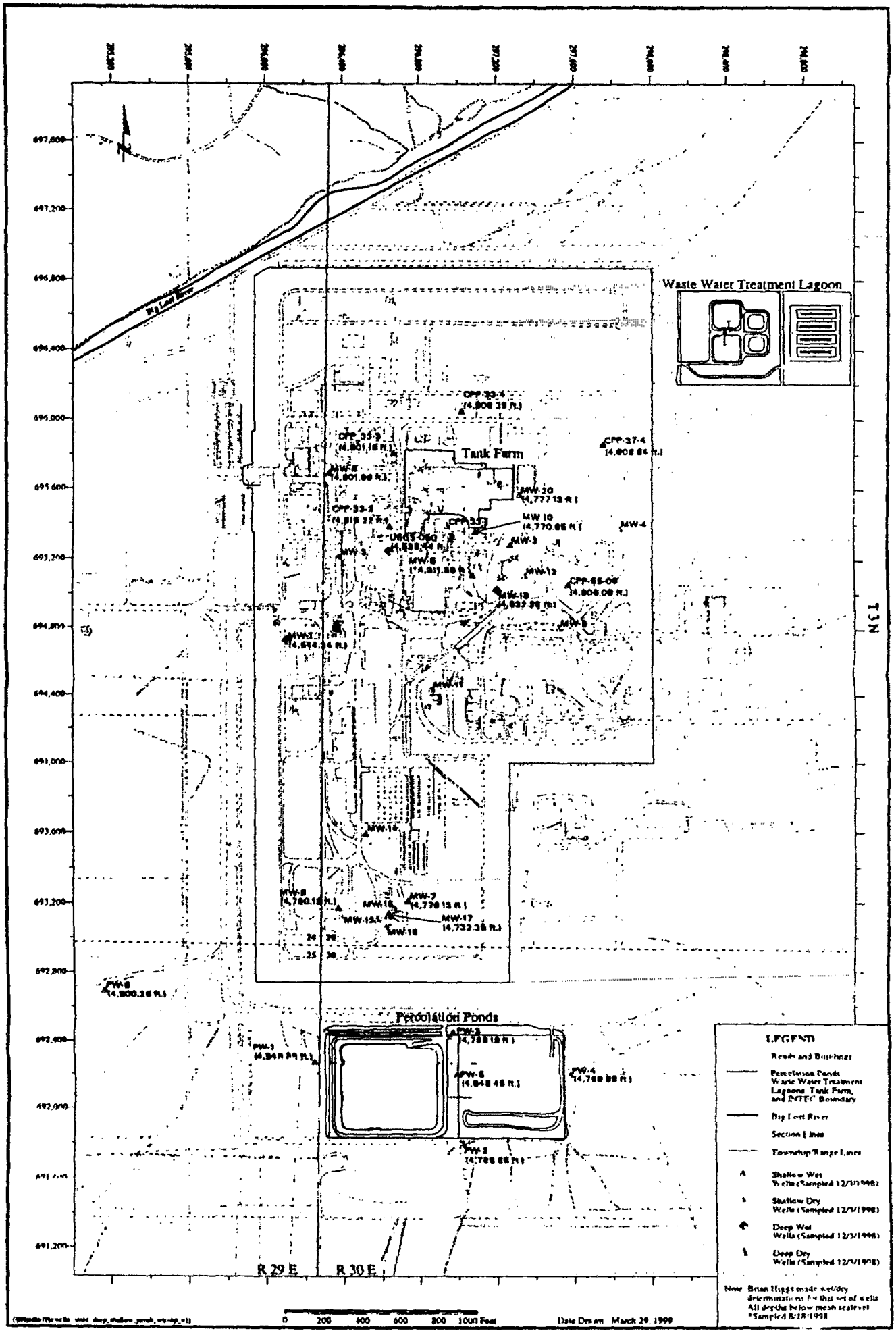
B Contaminant in associated blank

E The reported value is an estimate because of interference

J Estimated concentration

N Spiked sample recovery was not within control limits

NA Not applicable


Waste Water Treatment Lagoon
Tank Farm
Big Lost River
Percolation Ponds
T 3 N
R 29 E
R 30 E
LEGEND
Roads and Buildings
Percolation Ponds Waste Water Treatment Lagoons Tank Farm, and INTEC Boundary
Big Lost River
Section Lines
Township/Range Lines
Shallow Wet Wells (Sampled 12/3/1998)
Shallow Dry Wells (Sampled 12/3/1998)
Deep Wet Wells (Sampled 12/3/1998)
Deep Dry Wells (Sampled 12/3/1998)
Note: Brian Higgs made wet/dry determinations for this set of wells. All depths below mean sea level.
*Sampled 8/18/1998
0 200 400 600 800 1000 Feet
Date Drawn March 29, 1999

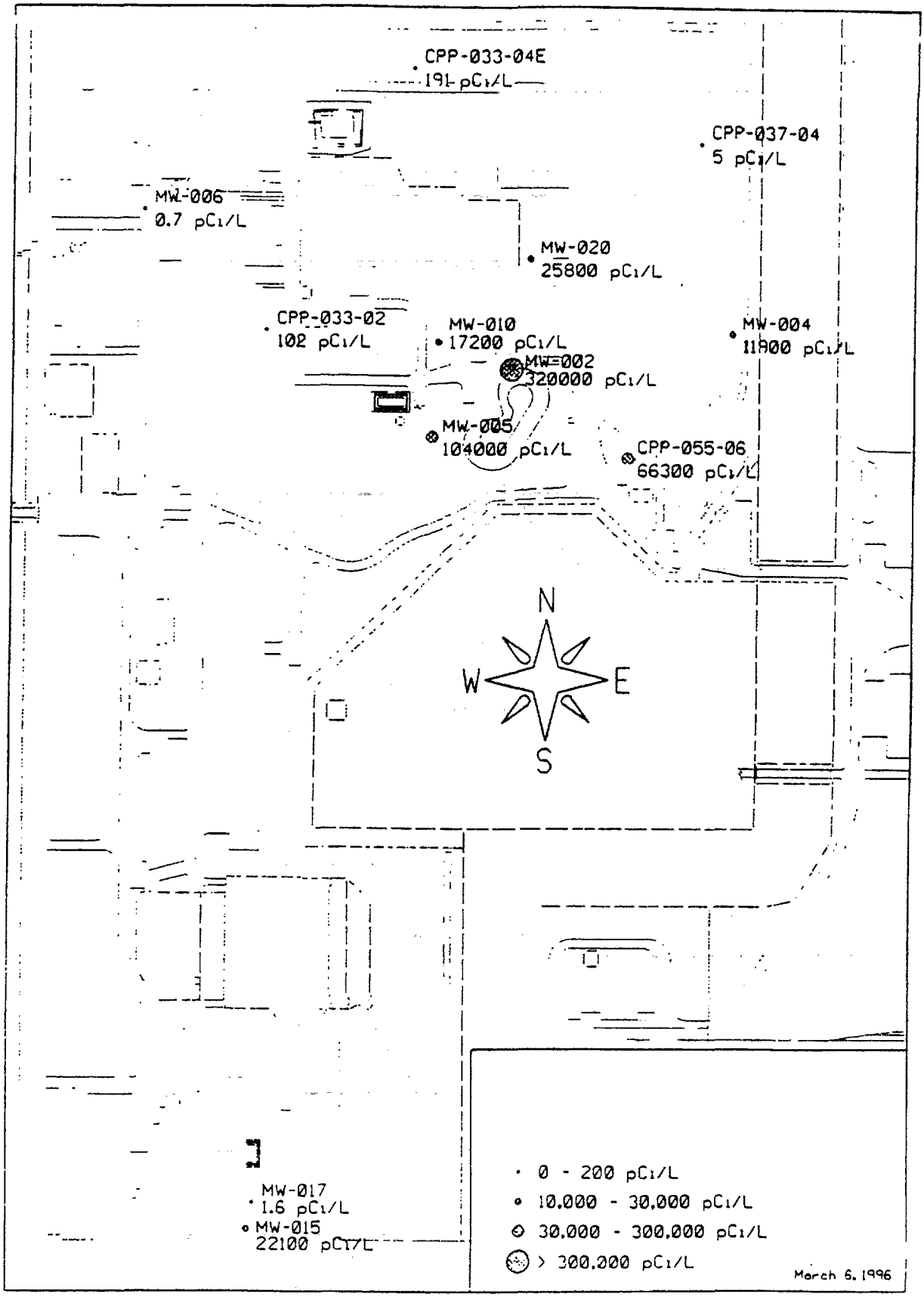


Figure 5-7. Sr-90 concentration in the upper perched groundwater (May-June 1995)

5.3.4.1. Northern Perched Groundwater. The highest perched water radioactive contamination occurs beneath the northern portion of INTEC, particularly associated with wells MW-2, MW-5, and CPP 55-06 (Figure 5-6). The maximum gross alpha and gross beta activity measured in the upper perched groundwater were 1.140±220 pCi/L and 589,000±2,600 pCi/L, respectively, in well MW-2. At a depth of approximately 42 m (140 ft), the maximum gross alpha and gross beta concentrations measured in the perched groundwater 137±9 pCi/L and 65,300±600 pCi/L in wells MW-10 and MW-20.

The most significant radionuclides in the upper perched water body are Sr-90 and Tc-99. Low levels of H-3 were also detected in the upper perched water zone. The low H-3 concentrations in the upper perched water zone is a significant contrast to the waste stream that was directed to the INTEC disposal well where the vast majority of the associated radioactivity consisted of H-3. Strontium-90 was detected in all wells completed in the northern area of the upper perched water zone. The maximum S-90 concentration detected was 320,000±3,000 pCi/L (well MW-2) followed by 104,000±1,000 pCi/L (well MW-5) and 66,300±600 pCi/L (well CPP 55-06). The only other fission product detected in the upper perched groundwater is Tc-99. Tc-99 has been detected in all wells except CPP 33-4 and MW-6. The maximum Tc-99 concentration detected in the upper perched groundwater zone was 105±2 pCi/L in well MW-5.

Two wells (MW-10 and MW-20) are completed in water-bearing zone at depths of approximately 42 m (140 ft). The maximum concentrations for H-3, Sr-90, and Tc-99 from these wells are from the wells completed in the upper perched groundwater body [i.e., at approximately 33 m (110 ft)] to this deeper zone indicates an increase in both H-3 and Tc-99 concentrations and a decrease in the Sr-90 concentrations.

5.3.4.2 Southern Perched Groundwater. Perched water has been identified beneath two areas of the southern INTEC. A small perched water body has been identified in the vicinity of building CPP-603 and larger perched water body has developed from the discharge of waste water to the percolation ponds.

Wells that monitor the groundwater quality in the upper perched groundwater zone around CPP-603 include MW-7, MW-9, MW-13, MW-14, MW-15, MW-16, and MW-17. From the inorganic analysis, only nitrate/nitrite was detected at a concentration exceeding the MCL at well MW-15 (14.7 mg/L). The radionuclides detected the groundwater include H-3 (3,360±176 to 25,700±400 pCi/L) and Tc-99 (6.4±0.6 to 23.7±0.6 pCi/L). In addition, Sr-90 and U-234 were detected in MW-15 at concentrations of 17,200±200 pCi/L and 11.8±1 pCi/L, respectively.

Perched groundwater in the percolation pond area is monitored by six wells, designated as PW-1 through PW-6, which monitor the upper-most perched groundwater body associated with waste water discharge to the percolation ponds. These wells have been monitored by the USGS since 1987. Wells PW-1, PW-2, PW-4, and PW-5 have been sampled on a quarterly basis as part of the INTEC groundwater monitoring program since 1991 (LITCO 1995c).

The waste stream to the percolation ponds is virtually the same as the waste stream formerly sent to the disposal well. Most of the historical radioactivity present in the PW-series wells is from H-3, with Sr-90 providing a secondary activity contribution. According to the USGS monitoring, activities from both H-3 and Sr-90 have remained relatively stable with the exception of an increased H-3 activity period in mid-1988. These data are presented in Figure 4-9 of the OU 3-13 RI (DOE-ID 1997b).

Constituents detected in the upper perched water zone in the vicinity of the percolation ponds that exceeded either a Federal primary or secondary MCL include chloride, nitrate, manganese, iron, and Sr-90. Chloride concentrations generally exceeded the Federal secondary MCL of 250 mg/L in all wells. Nitrate concentrations exceeded the federal primary MCL of 10 mg/L in a single sample collected from well PW-4 (14.1J mg/L from the October 1993 sample). Manganese concentrations exceeded the Federal secondary MCL of 50 Fg/L in two samples collected from well PW-2 (165FLg/L from the October 1991 sample and 60.2 Fg/L from the August 1993 sample). Iron concentrations exceeded the federal secondary MCL of 300 Fg/L in one sample collected from PW-1 (324JFg/L from the April 1993 sample) and the first three samples collected from PW-2 (i.e., prior to September 1992). Strontium-90 concentrations exceeded the Federal primary MCL of 8 pCi/L in samples collected from PW-1, PW-4. and PW-5 with the maximum concentration measured during October 1991 sampling event at PW-1 (15.7 pCi/L).

5.3.4.3 Deep Perched Groundwater. Contamination in the lower portion of the vadose zone is different in composition from the upper perched zone. The lower vadose zone perched water contamination results from two events during which the INTEC injection well (CPP-23) collapsed and service wastewater was released into the vadose zone above the lower sediment units. The lower vadose zone contamination includes Cs-137, Sr-90, plutonium, I-129 and mercury. Deep perched groundwater is monitored at the INTEC by wells MW-1, MW-17, MW-18, and USGS-50 that are completed in water-bearing zones occurring at depths between 99.4 to 102.4 m (326 to 336 ft), 109.7 to 116.1 m (360 to 381 ft), 120.1 to 126.2 m (394 to 414 ft), and 109.7 to 123.4 m (360 to 405 ft), respectively. Historically, two rounds of groundwater samples have been collected from MW-1, one round of groundwater samples have been collected from MW-17 and MW-18, and a substantial database concerning radioactive contaminants is available for the water quality from USGS-50. Results from these water sampling events are described in the WAG 3 RI/FS Work Plan (LITCO 1995c).

Well MW-1 is located in the northern INTEC. The only chemical contaminant to exceed either a Federal primary or secondary MCL was nitrate/nitrite at a concentration of 69.6 mg/L. The radionuclides detected in water samples from well MW-1 include Sr-90 (4.5±0.4 pCi/L) and H-3 (24,700±400 pCi/L). Of these contaminants, only H-3 was measured above the Federal primary MCL of 20,000 pCi/L. Since H-3 concentrations in the deep perched water zone are higher than the H-3 concentrations in the overlying perched water bodies, the source of this contamination is either from a historical release where the contaminants have moved through the system or waste water disposal to the ICPP injection well.

Well MW-18 is completed in the deeper perched water zone near the eastern boundary of the INTEC. From the June 1995 sampling event, only nitrate/nitrite concentration at 34.4 mg/L exceeded either a Federal primary or secondary MCL. The radionuclides detected in the deep perched groundwater at this location include H-3 (73,000±700 pCi/L), Sr-90 (207±2 pCi/L), and Tc-99 (736±6J pCi/L). The H-3 and Tc-99 concentrations from this well are some of the highest concentrations measured in the perched groundwater beneath the ICPP.

USGS-50 was originally intended to be completed in the aquifer, but was ultimately drilled to a total depth of 123 m (405 ft) to monitor a deep perched water zone. This well is located in the north central portion of the facility. The highest concentrations of H-3 and Sr-90 occurred in 1969 and 1970. These elevated concentrations were attributed to the failure of the ICPP disposal well where the waste water was injected into the vadose zone rather than directly to the aquifer. Based on the response observed in well USGS-50 and the ICPP disposal well records, it appears the injection well failed in mid-1967 and allowed approximately 3.41×10^9 L (9.0×10^8 gal) of waste water to be injected into the basalt above the 69-m (226-ft) plug (Robertson et al. 1974). The ICPP disposal well was repaired by early 1971. It again failed in the 1970s and was repaired in 1982.

From the May 1995 water sampling of USGS-50, the concentrations of all chemical contaminants except nitrate/nitrite were below Federal primary or secondary MCLs. Nitrate/nitrite concentration was measured at 31.3 mg/L. compared to the Federal primary MCL of 10 mg/L. Radionuclides in the groundwater that were detected include H-3 (61,900±700 pCi/L), Sr-90 (151±2 pCi/L), and Tc-99 (63±1J pCi/L). The concentrations for H-3 and Sr-90 are within the expected values based on the historical sampling conducted by the USGS.

Well MW-17 is the only deep perched water monitoring well located in the southern portion of the INTEC. This well has been constructed to monitor three perched water bodies: an upper zone from 55.4 to 58.4 m (181.7 to 191.7 ft) b1s, a middle zone from 80.4 to 83.5 m (263.8 to 273.8 ft) b1s, and a lower zone from 110 to 116 m (360 to 381 ft) b1s. During the May 1995 sampling event, water was only present in the upper and lower zones. None of the chemical constituents detected in the groundwater exceeded either a Federal primary or secondary MCL. Only two radionuclides (H-3 and Tc-99) were detected in groundwater samples collected from MW-17. The concentrations of these two radionuclides were similar between the upper and lower perched water zones. H-3 concentrations varied from 25,100±400 to 25,700±400 pCi/L and Tc-99 concentrations varied from 5.9±0.6 to 6.4±0.6 pCi/L.

5.3.5 Snake River Plain Aquifer (Group 5)

The water quality in the SRPA at and downgradient from the ICPP has been adversely impacted due to past facility operations. The SRPA (Group 5) is identified as containing low-level threat wastes. The majority of INTEC-related SRPA contamination is due to the disposal of wastes through the ICPP injection well. Contamination in the aquifer is also due to downward migration of contaminants from surface soils and perched groundwater zones. The injection well was the primary source for waste disposal from 1952 through February 1984 and used intermittently for emergency situations until 1986. The average discharge to the well during this period was approximately 1.4 B L/yr (363 M gal/yr) or about 3.8 M L/day (1 M gal/day) (DOE-ID 1997b). It has been estimated a total of 22,000 Ci of radioactive contaminants have been released in 4.2 x 10^{10} L (1.1 x 10^{10} gal) of water (WINCO 1994c). Table 5-25 is a summary of the total curies discharged to the injection well for each radionuclide and includes the curies remaining after radioactive decay (DOE-ID 1997b). The vast majority of this radioactivity is attributed to H-3 (approximately 96%) with minor components of Am-24 1, Tc-99. Sr -90. Cs- 137, Co-60. 1-129. and Pu. The remedy selection for the SRPA was based on groundwater transport modeling used to predict the activities/concentrations of contaminants in groundwater at the time of exposure (post 2095). This section presents data on the current water quality in the SRPA.

Since the 1950's, the USGS has installed 33 monitoring wells around the ICPP to characterize the occurrence, movement, and quality of the water in the SRPA. The location of the wells completed in the SRPA and the frequency of groundwater sample collection by the USGS are provided in Figure 4-12 of the OU 3-13 RI (DOE-ID 1997b). The ICPP has a groundwater sampling program of selected SRPA wells to satisfy the groundwater monitoring requirements for the RCRA and DOE Order 5400.1. This sampling program, implemented in October 1991, uses selected USGS wells and collects samples on a quarterly basis to be analyzed for the RCRA groundwater contamination parameters, RCRA drinking water parameters. RCRA groundwater quality parameters, and selected radionuclides. The results from this sampling program are provided in the WAG 3 RI/FS Work Plan (LITCO 1995c).

In May and June 1995, a complete round of groundwater samples were collected from the aquifer wells located near and downgradient from the ICPP (Figure 5-8). The results from this sampling effort are provided in Table 5-26. The aquifer data summarized in the RI are discussed in the following paragraphs. An isopleth map of 1995 I-129 concentrations is shown in Figure 1-7 to identify the extent of Group 5. A map of the 1995 Tritium plume is shown in Figure 5-4 and the Sr-90 plume is shown in Figure 5-5.

Table 5-25. Activity of radionuclides discharged to the ICPP injection well (RWMIS Database).

Radionuclide	Half Life (years)	Total Activity Injected (Ci)	Total Activity Remaining* (Ci)	Percent of the Injected Activity Remaining (after decay)	Percent of the Current Activity
Ag-110m	6.80E-01	8.36E-05	1.34E-12	0.0	0.00
Am-241	4.32E+02	3.17E-04	3.08E-04	97.2	0.00
Ba-140	3.49E-02	5.05E-04	8.86E-156	0.0	0.00
C-14	5.73E+03	1.27E-01	1.27E-01	99.8	0.00
Ce-141	8.90E-02	1.68E-04	3.19E-61	0.0	0.00
Ce-141/144	7.80E-01	1.16E-01	2.42E-14	0.0	0.00
Ce-144	7.80E-01	1.75E+01	2.07E-06	0.0	0.00
Co-57	7.40E-01	6.54E-03	8.91E-09	0.0	0.00
Co-60	5.27E+00	1.49E-01	8.77E-03	5.9	0.00
Cr-51	7.59E-02	5.37E-03	2.91E-67	0.0	0.00
Cs-134	2.06E+00	1.50E+00	2.03E-03	0.1	0.00
Cs-137	3.02E+01	2.05E+01	1.19E+01	57.8	0.30
Cs-138	6.10E-05	2.50E-01	0.00E+00	0.0	0.00
Eu-152	1.36E+01	8.12E-02	4.36E-02	53.7	0.00
Eu-154	8.80E+00	8.38E-02	2.95E-02	35.2	0.00
Eu-155	4.96E+00	2.22E-02	3.43E-03	15.5	0.00
H-3	1.23E+01	2.13E+04	3.89E+03	18.2	99.44
Hg-203	1.28E-01	7.33E-05	3.10E-42	0.0	0.00
I-129	1.57E+07	2.78E-01	2.78E-01	100.0	0.01
I-130	2.21E-02	2.98E+01	4.38E-152	0.0	0.00
K-40	1.28E+09	2.81E-12	2.81E-12	100.0	0.00
La-140	4.60E-03	6.22E-04	0.00E+00	0.0	0.00
Mn-54	8.30E-01	6.55E-03	7.02E-08	0.0	0.00
Nb-95	9.58E-02	4.63E-01	4.17E-35	0.0	0.00
Np-237	2.14E+06	5.48E-03	5.48E-03	100.0	0.00
Pr-144	3.29E-05	4.47E-01	0.00E+00	0.0	0.00
Pu-238	8.78E+01	1.32E-01	1.15E-01	87.1	0.00
Pu-239	2.44E+04	1.05E-02	1.04E-02	99.9	0.00
Pu-239/240	2.44E+04	3.74E-02	3.74E-02	99.9	0.00
Pu-240	6.57E+03	1.14E-03	1.14E-03	99.8	0.00
Rb-106	9.48E-07	4.81E+00	0.00E+00	0.0	0.00
Ru-103	1.10E-01	1.45E-01	4.59E-37	0.0	0.00
Ru-106	1.00E+00	1.70E+01	6.85E-04	0.0	0.00
Sb-124	1.65E-01	2.41E-04	5.02E-36	0.0	0.00
Sb-125	2.77E+00	1.86E+00	1.22E-02	0.7	0.00
Sr-85	1.78E-01	9.14E-05	1.78E-23	0.0	0.00
Sr-89	1.40E-01	5.59E+00	4.51E-27	0.0	0.00
Sr-89/90	2.86E-01	1.31E+00	6.40E-01	48.8	0.02
Sr-90	2.86E+01	1.60E+01	8.75E+00	54.5	0.22
U-234	2.45E+05	2.28E-02	2.28E-02	100.0	0.00
U-235	7.04E+08	1.94E-03	1.94E-03	100.0	0.00
U-236	2.34E+07	4.09E-04	4.09E-04	100.0	0.00
U-238	4.47E+09	6.81E-03	6.81E-03	100.0	0.00
Y-90	7.32E-03	1.32E+00	0.00E+00	0.0	0.00
Zn-65	6.68E-01	4.65E-04	1.39E-11	0.0	0.00
Zr-95	1.78E-01	2.34E-01	2.53E-23	0.0	0.00
Zr/Nb-95	1.78E-01	2.06E+01	1.38E-43	0.0	0.00
Unidentified Alpha	–	6.36E-01	–	–	–
Unidentified Beta-Gamma	–	5.82E+01	–	–	–
Others**		6.33E+02	–	–	–
	Total	2.22E+04	3.92E+03	–	100.0

* Decayed to January 1, 1995

** Estimate of radionuclides other than H-3 from 1957 to 1962 [assuming 95.5% of the total curies is H-3, Barraclough (1966)]

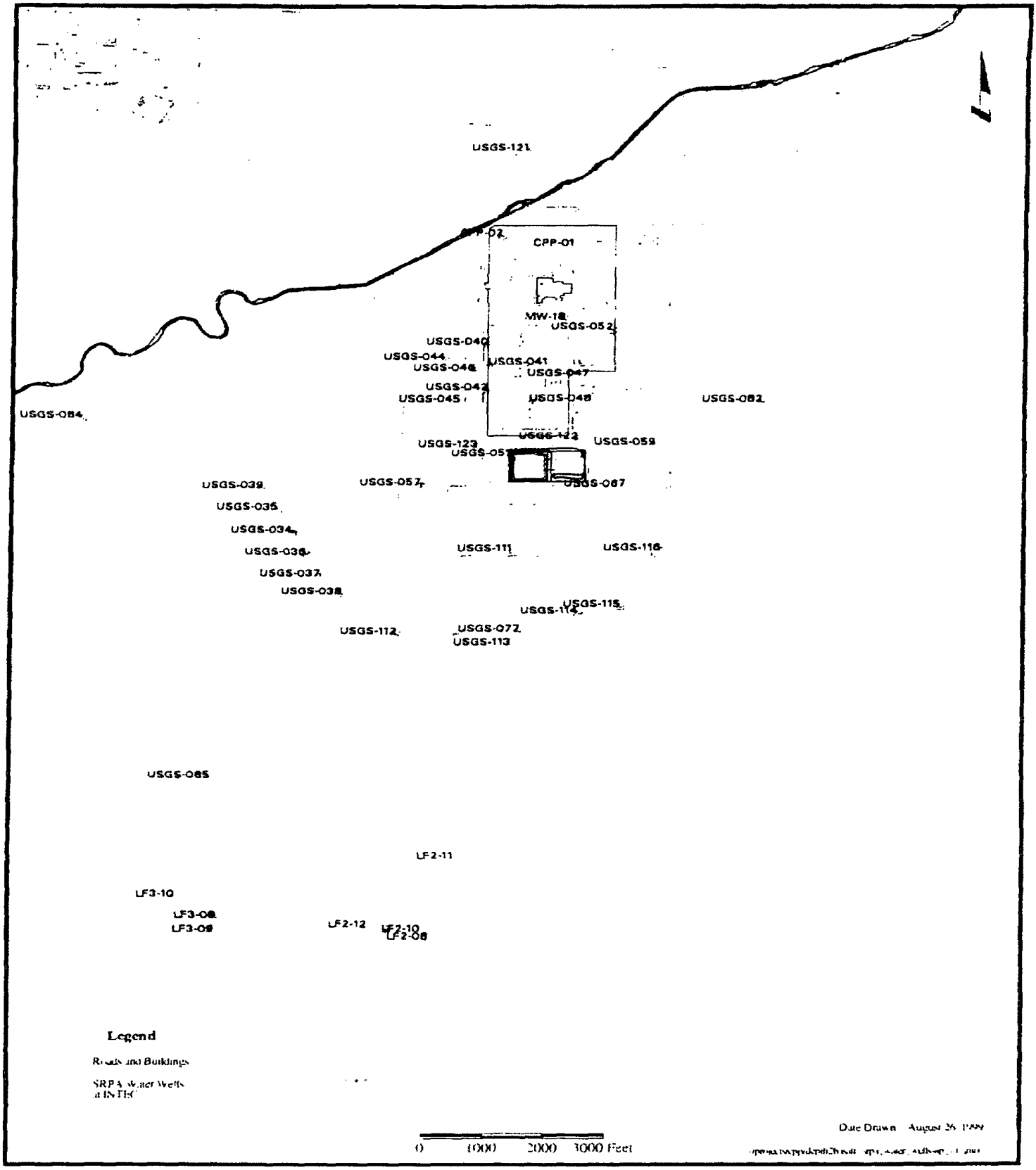


Figure 5-8. SRPA sampling wells location map

Table 5-26. Summary sampling results statistics for contaminants in the SRPA Wells (May-June 1995).[a]

Contaminants	Water concentration, mg/L or pCi/L Minimum	Maximum	PRG[b]	Number of Samples	Number of Detects	Frequency of Detection
Ag	6.30E-04 BNJ	8.80E-04 BNJ	1E-01[c]	38	3	8%
As	3.10E-03 B	1.08E-02 B	5E-02	42	3	7%
Ba	5.00E-02 B	2.05E-01	2E+00	42	42	100%
Cd	4.80E-04 B	3.00E-03 B	5E-03	42	4	10%
Co	5.20E-04 B	1.40E-03 B	NA	42	8	19%
Cr	1.80E-03 B	3.88E-02	1E-01	42	31	74%
Cu	1.60E-03 BJ	3.20E-03 B	1.3E+00	42	7	17%
Hg	1.00E-04 B	4.40E-04	2E-03	42	7	17%
Mn	8.40E-04 B	6.28E-02	5E-02[c]	42	10	24%
Ni	4.30E-03 B	2.06E-01	NA	42	6	14%
Pb	2.30E-03 BWJ	3.77E-02	1.5E-02	42	10	24%
Sb	1.90E-03 B	4.60E-03 B	6E-03	42	3	7%
Se	1.40E-03 B	3.70E-03 B	5E-02	42	7	17%
V	2.30E-03 B	9.90E-03 B	NA	42	24	57%
Zn	2.60E-03 B	4.54E-01 EJ	5E+00[c]	42	27	64%
Am-241	5.40E-01	5.40E-01	≤1.5E+01[d]	49	1	2%
I-129[e]	9E-07	3.82E+00	1E+00[d]	33	32	94%
Sr-90	7.00E-01	8.40E+01	8E+00	70	49	70%
Tc-99	1.10E+00	4.48E+02	9E+02[d]	70	57	81%
Tritium	5.81E+02	3.07E+04	2E+04	49	45	92%
U-234	7.00E-01	2.60E+00	1.5E+01[f]	49	7	14%
U-238	8.00E-01	1.10E+00	1.5E+01[f]	49	4	8%

Table 5-26. (continued)

Contaminants	Water concentration, mg/L or pCi/L Minimum	Maximum	PRG[h]	Number of Samples	Number of Detects	Frequency of Detection
Gross Alpha	2.30E+00	1.00E+01	1.5E+01[g]	49	20	41%
Gross Beta	2.40E+00	4.69E+02	4mR/yr[h]	49	49	100%

a NOTE

- Duplicate and QC sample results were not included in the statistical analysis
- Analytical results are from groundwater samples collected from the SRPA during May and June 1995 as part of the OU 3 13 RI. Results are provided in Table 1-4 of the OU 3 13 RI ES Part A (DOE ID 1997b) and the ERIS Database
- Samples were analyzed for TAL inorganics and radionuclides. Only those constituents that were identified above detection limits in the samples are shown in the table except for the following constituents which were detected but are not considered to be present at hazardous concentrations: Ca, Fe, Mg, K, and Na
- Samples rejected because of an unacceptable quality control parameter were not included in the table

b The PRG concentrations are from the Primary Constituent Standards table in IDAPA 16.01.11.200(a) unless otherwise footnoted

c The PRG concentrations for manganese, silver, and zinc are from the Secondary Constituent Standards in IDAPA 16.01.11.200 (b)

d The PRG concentrations for Am-241, I-129, and Tc-99 are calculated values based on the National Interim Primary Drinking Water Regulations, EPA 570/9-76-003

e Summary sampling data for I-129 was taken from data collected during the 1990-91 USGS sampling event (USGS 1994). The data shown in the table is only from those wells sampled both during the 1990-91 USGS sampling event and the WAG 3 RI ES, May-June 1995, sampling event

f The PRG concentrations for U-234 and U-238 are from Section 8, Table 8-2 of this ROD

g The PRG concentration for gross alpha includes radium-226 but excludes radon and uranium

h The PRG concentration for gross beta (combined beta photon emitters) is 4 mR/yr effective dose equivalent

B Contaminant in associated blank

I The reported value is estimated because of the presence of interference

J Estimated concentration

N Spiked sample recovery was not within control limits

W Post-digestion spike for GFAAS analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance

NA Not applicable

PRG Preliminary Remediation Goal

5.3.5.1 Cesium-137. According to Bartholomay (1997), Cs-137 has been detected above reporting levels through 1985 in wells USGS-40 and USGS-47 at the ICPP due to liquid-waste discharge to the ICPP injection well. During 1982 to 1985, maximum concentrations in wells USGS-40 and USGS-47 were 237±45 and 200±50 pCi/L, respectively. During 1986 to 1988, Cs-137 was not detected in these wells (Orr and Cecil 1991). Since 1988, cesium-137 was detected in one sample from well USGS-40 (70±30 pCi/L on January 15, 1990) and one sample from well USGS-47 (70±30 pCi/L on April 29, 1992). Cs-137 was not detected in any of the aquifer wells sampled during the WAG 3 RI. The half-life for Cs-137 is 30.17 yrs.

5.3.5.2 Plutonium. Monitoring the quantities of Pu-238 and Pu-239/-240 (undivided) discharged to the ICPP disposal well began in 1974. Prior to that time, alpha activity from plutonium disintegration was not separable from the monitored, undifferentiated alpha activity. During 1974 through 1985, about 0.15 Ci of Pu-238 and 0.05 Ci of Pu-239/-240 (undivided) were discharged to the ICPP injection well. During the period from 1986 to 1988, approximately 0.06 Ci of plutonium isotopes were discharged to the infiltration ponds at the ICPP. The half-lives of Pu-238, -239, and -240 are 87.7, 24, 100, and 6,560 years, respectively.

According to Orr and Cecil (1991), plutonium has been detected in the SRPA near the ICPP in wells USGS-40 and USGS-47. Both of these wells are located near the ICPP injection well. In well USGS-40, Pu-238 and Pu-239/-240 (undivided) were last detected in January 1987 at concentrations of 0.47±0.16 pCi/L and 5.5±0.4 pCi/L, respectively. In well USGS-47, Pu-238 was last detected in October 1983 at a concentration of 0.5±0.06 pCi/L. Since the 1986 to t988 period reported by Orr and Cecil (1991).

Pu-238 was only detected in a single water sample collected from well USGS-48. The sample was collected in October 1990 and had a concentration near the MDL at 0.05±0.02 pCi/L. Between 1992 and 1995, all plutonium measurements at the INEEL were below the reporting level (Bartholomay 1997). Plutonium was not detected in any of the aquifer wells sampled during the WAG 3 RI field investigation of 1995.

5.3.5.3 Americium-241. Americium-241 is a decay product of Pu-241 and has a half-life of 432.7 years. According to Orr and Cecil (1991), Am-241 has only been detected in the SRPA near the RWMC and TAN. Since 1988, however, Am-241 was detected in well USGS-44 during July 1992 at concentrations of 0.07±0.03 and 0.08±0.03 pCi/L, in welt USGS-37 during October 1992 at a concentration of 0.09±0.03 pCi/L, and in well USGS-85 during June 1991 at concentrations of 0.08±0.03 pCi/L. During 1992-1995, all other plutonium measurements were below the reporting level (Bartholomay 1997). During the WAG 3 RI field investigation in 1995, Am-241 was detected in well USGS-42 at a concentration of 0.54±0.14 pCi/L.

5.3.5.4 Iodine-129. From 1953 to 1983, an estimated 0.01 to 0.136 Ci/yr (0.56 to 1.18 Ci) of 1-129 were contained in the wastewater discharged to the disposal well (Mann et al. 1988). For 1984 to 1986, the annual amount of 1-129 in the wastewater discharged to the ICPP percolation ponds ranged from 0.0064 to 0.039 Ci,

Four rounds of goundwater samples (1977, 1981, 1986, 1990, and 1991) have been collected by the USGS from the SRPA at the ICPP (Mann and Beasley 1994). According to Mann and Beasley (1994). "In 1990 and 1991 concentrations of 1-129 in water samples from wells that obtain water from the Snake River Plain aquifer ranged from 6.00E-7±2.00E-7 to 3.82±0.19 pCi/L. The mean concentration in water from 18 wells was 0.81±0.19 as compared to 1.3±0.26 in 1986." Mann et al. (1988) reported a

similar decrease in I-129 groundwater concentrations between the 1981 and 1986 sampling events. The distribution of I-129 in the SRPA for 1990-91 is provided in Figure 1-7.

During the WAG 3 RI, I-129 was detected in wells USGS-67, LF2-12. and LF3-08 at concentrations of 1±03 pCi/L, 1.2±0.3 pCi/L, and 0.9±0.3 pCi/L, respectively. Two of these wells are located several miles downgradient from the ICPP. The limited amount of I-129 contamination in the aquifer is consistent with the observations made by Mann et al. (1988) where decreasing I-129 concentrations were attributed to decreasing I-129 disposal and the change in disposal techniques. The half-life of I-129 is 1.57E+07 years.

5.3.5.5 Tritium. A H-3 plume has developed in the SRPA from disposal of liquid wastes at the INEL. The principle sources of H-3 in the aquifer have been through injection of liquid wastes through the disposal well at the ICPP and discharge of waste water to the infiltration ponds at the ICPP and the TRA. It is estimated approximately 30,900 Ci of H-3 have been discharged to the SRPA at the ICPP since 1952 (Orr and Cecil 1991). Of this amount, approximately 22,200 Ci were discharged via the disposal well at the ICPP. The remainder of the H-3 was discharged to the aquifer via the ICPP percolation ponds.

According to Orr and Cecil (Page 30, 1991), "Tritium concentrations in water from the Snake River Plain aquifer decreased by as much as 39,000 pCi/L during 1986-1988. By October 1988, tritium concentrations ranged from 700±200 pCi/L to 61,600±1,100 pCi/L and the tritium plume extended southwestward in the general direction of ground-water flow. The size of the plume in which tritium concentrations exceeded 500 pCi/L decreased from about 51 mi^2 in October 1985 to about 45 mi^2 in October 1988. The area of the plume containing tritium concentrations in excess of the MCL of 20,000 pCi/L (EPA 1989, p. 551) decreased from 4.4 to 2.8 mi^2. The reduced concentrations of H-3 were attributed to radioactive decay processes, overall reduction in H-3 disposal rates, dilution from recharge, and changes in the disposal methods

The distribution of H-3 in the SRPA for May 1995 is shown in Figure 5-4. The size of the plume that exceeds the federal drinking water standard of 20,000 pCi/L is approximately 3.3 km^2 (1.3 mi^2). significantly smaller than the 7.3 km^2 (2.8 mi^2) reported in October 1988.

5.3.5.6 Strontium-90. A plume of Sr-90 has formed downgradient from the ICPP primarily in response to the ICPP disposal well. According to Orr and Cecil (page 32, 1991), "in October 1985, the size of the strontium-90 plume where concentration exceeded 6 pCi/L was about 2 mi^2 (Pittman et al. 1988, p. 53): the concentrations of strontium-90 in wells 57 and 47 were 74±5 and 63±5 pCi/L, respectively. Strontium concentrations decreased as much as 33 pCi/L during 1996-1988. By October 1988, strontium-90 concentrations ranged from 8±2 to 48±3 pCi/L, and the area of the strontium-90 plume had decreased to approximately 0.8 mi^2. The strontium-90 concentrations in wells 57 and 47, both within the plume, decreased to 41±3 and 48±3 pCi/L, respectively." They attributed the reduced areal extent and concentration of Sr-90 to the diversion of liquid radioactive wastes from the disposal well to the infiltration ponds, in addition to radioactive decay, diffusion, dispersion, and dilution from natural recharge. Since 1989 concentrations of Sr-90 in water samples from most wells have remained relatively constant.

The distribution of Sr-90 in the SRPA for May 1995 is provided in Figure 5-5. The areal extent of the Sr-90 plume has decreased between October 1988 and May 1995, consistent with the previous trend. The maximum Sr-90 concentration detected in the aquifer was 84 pCi/L in well MW-18. Historical Sr-90 concentrations for the USGS and CPP aquifer wells were provided in the WAG 3 RI/FS Work Plan (LITCO 1995c).

5.3.5.7 Technetium-99. Tc-99 was identified in 32 of the 44 wells sampled during the WAG 3 RI. The highest concentrations of Tc-99 were identified in the north central portion of the ICPP in wells MW-18, USGS-47, and USGS-52 having concentrations of 448±4 pCi/L, 235±3 pCi/L, and 174±2 pCi/L, respectively. The Tc-99 plume extends to the southwest of the ICPP and includes wells USGS- 123, USGS-57, and USGS-39. The maximum Tc-99 concentration outside the ICPP security perimeter fence is 49 pCi/L in well USGS-123.

Chemical constituents detected in SRPA at the INEEL have in the past included total chromium, sodium, chloride, and nitrate. During the WAG 3 RI, water samples were collected from all aquifer wells and analyzed for CLP metals plus zirconium. From the 44 wells tested, only the water sample from well LF2-11 exceeded a federal primary or secondary MCL. The magnesium concentration in LF2-11 was measured at 62.8 µg/L, compared to a federal secondary MCL of 50 µg/L. This well is located approximately three miles downgradient from ICPP and since magnesium was not measured in other wells above the federal secondary MCL, this contamination is not likely associated with the ICPP.

5.3.6 Buried Gas Cylinders (Group 6)

Site CPP-94 includes an area about 2.4 km (1.5 mi) northeast of the INTEC along the south side of a dirt security road. Four exposed gas cylinders have been observed at the site and are believed to contain hydrofluoric acid. Site CPP-84 is located outside the INTEC fence line, east of Lincoln Boulevard and south of the Big Lost River. An estimated 40 to 100 cylinders were disposed in a trench at Site CPP-84. The safety hazards associated with CPP-94 and CPP-84 are similar. The potential for cylinder over-pressurization and bursting is considered to be the most serious hazard at both sites. Hydrofluoric acid is very corrosive, reacts violently with moisture, and can generate explosive concentrations of hydrogen gas. Fluoride, a chemical residual of hydrofluoric acid reactions, is a potential health and ecological hazard. No known release of the cylinder contents has occurred. As no sampling activities have been conducted at these sites, no sample results or sampling statistics are available. The buried gas cylinders (Group 6) are considered to contain low-level threat wastes.

5.3.7 SFE-20 Hot Waste Tank System (Group 7)

A preliminary investigation conducted in 1984 indicated that the tank liquid and sludge contain elevated levels of Cs-l37, Cs-134, Co-60, Sr-90, and isotopes of europium, plutonium, and uranium. Previous spills within the tank vault and pump pit contained similar contaminants. Site CPP-69, soil contamination is associated with CPP-VES-SFE-20. Soils beneath the tank vault have not been sampled due to inaccessibility. There is no evidence that the vault has leaked. The soils were not included as a source in the vadose zone and groundwater models used for risk assessment. The SFE-20 Hot Waste Tank System (Group 7) is identified as containing principal threat wastes.

In February 1984, liquid and sediment samples were taken from the tank interior, vault floor, and pump pit (Table 5-27). The analysis consisted of only Co-60, Cs-137, Cs-134, Eu-152, Eu-154, Eu-155, Sb-125, total strontium, and plutonium and uranium isotopes. The reported concentrations of Cs-137. total strontium. and plutonium isotopes in the single tank liquid sample were 2,050,000; 9,700,000; and 17,600,000 pCi/L. respectively (WINCO 1984). For the same radionuclides, the concentrations in the tank sediment sample were reported at 55,400,000,000; 4,700,000,000; and 93,500,000 pCi/L, respectively. Three samples were collected from the floor (two liquids and one sediment). The reported concentrations in the two liquid floor samples for Cs-137 (analysis for total strontium and plutonium isotopes was not requested) taken from the south and center vault floor locations were 905,000 and 248,000,000 pCi/L, respectively. The reported concentrations of Cs- 137, total strontium. and plutonium isotopes in the sediment sample collected on the north end of the vault were 8,920,000; 1,720,000; and

79,200 pCi/g, respectively. For the same radionuclides, the concentrations in the pump pit sediment sample were 2,290,000; 5,890,000, and 3,010 pCi/g, respectively. Only Cs-137 at a concentration of 76,000 pCi/L, was reported for the pump pit liquid sampling (WINCO 1984).

There are no data available for nonradioactive constituents; however, the tank contents may contain inorganic and organic constituents that were associated with the operation of the CPP-603 spent fuel storage pool filtration system. It should be noted that generally, longer lived radionuclides (i.e., those having half-lives greater than 10 years) are of most concern and thus, those with shorter half lives were not summarized in this section.

Table 5-27. Summary analytical results for the SFE-20 hot waste tank system.

Identification Number and	Location	Type	Co-60	Cs-137	CS-134	Eu-152	Eu-154	Eu-155	Sb-125	Sr	Pu	U*
Radioisotopic content of smears and samples of SFF-20 area (Sample concentration (pCi/smear [sear samples], pCi/g [solids] or pCi/mL [liquids])												
1	Pipes (exteriors) and walls (interior) in pump pit midway between CPP-642 and pit floor	Smear	[a]	7.68E+02	[a]	S [a]	[a]	[a]	[a]	[b]	[b]	[b]
2	Pipes and walls in pump pit 1 to 2 ft from bottom	Smear	S [a]	8.97E+03	S [a]	S [a]	S [a]	S [a]	S [a]	[b]	S [b]	[b]
3	Walls, floor, and ceiling of access tunnel	Smear	5.54E+01	1.39E+04	5.92E+01	5.84E+02	5.70E+02	12.1E+02	S [a]	S [b]	[b]	S [b]
4	Representative areas of vault walls	Smear		2.19E+03								
5	SFE-20 tank (exterior)	Smear	1.51E+00	5.84E+04	9.84E+01	1.20E+0	7.70E+02	2.04E+02	S [a]	S [b]	S [b]	[b]
7	Areas of apparent seepage on walls	Smear	9.51E+01	4.16E+04	S [a]	S [a]	S [a]	S [a]	S [a]	S [b]	S [b]	S [b]
8	Floor-south end of vault	Liquid	5.83E+00	9.05E+02	1.35E+00	S [a]	S [a]	S [a]	S [a]	S [b]	S [b]	S [b]
9	Floor-center section	Liquid	1.05E+02	2.48E+05	1.55E+00	S [a]	S [a]	S [a]	S [a]	1.71E+05	1.02E+02	<1.60E-04
10	SFE-20 tank interior	Liquid	7.43E+01	2.05E+03	7.76E+00	S [a]	S [a]	S [a]	7.32E+01	9.70E+01	1.76E+04	<1.60E-04
11	Floor-north end of vault	Dry Solids	2.15E+04	8.92E+06	1.06E+04	1.50E+05	1.31E+05	4.73E+04	S [a]	1.72E+06	7.92E+04	S [b]
12	Bottom 6 in-tank interior	Wet Solids	3.27E+05	5.54E+07	1.62E+04	1.38E+05	1.21E+05	S [a]	S [a]	4.70E+06	9.35E+04	1.91E-03
13	Bottom of pump pit	Wet Solids	2.38E+04	2.29E+06	1.33E+04	5.65E+04	4.62E+04	2.05E+04	4.73E+04	5.89E+06	3.01E+03	[b]
14	Pump pit-sump	Liquid	[a]	76	S [a]	S [a]	S [a]	S [a]	[a]	S [b]	[b]	b

Table 5-27. (continued).

Sample Number	Cs-137	K-40	Ra-226	Th-232	Alpha
Analysis for SFF-20 surface soil samples (Sample concentration [pCi/gl])					
1	2.29E+01	1.78E+01	3.22E+00	2.03E+00	5.0E-02
2	4.40E+00	[a]	3.18E+00	2.80E+00	2.35E+00
3	2.28E+01	[a]	6.33E+00	2.10E+00	[a]
4	2.39E+01	3.17E+01	[a]	[a]	[a]
5	3.43E+01	2.91E+01	[a]	[a]	[a]

C The unit of measures for Uranium (U) was reported in g/l
a Isotopic below detection limit
b Analysis was not requested Decision was based on earlier Alpha Scan results
c Analysis not performed Analyzed only samples expected to show highest concentrations

6. CURRENT AND POTENTIAL SITE AND RESOURCE USES

The original mission of INTEC was to reprocess spent reactor fuel elements to recover highly enriched uranium, In 1992. the mission was changed and the facility no longer reprocesses spent nuclear fuels. The current mission of INTEC is to provide safe interim storage of spent nuclear fuels. provide research and development support for the disposition of these fuels in a federal geologic repository, manage other HLW, manage wastes from past reprocessing and D&D activities, and develop improved waste management techniques.

6.1 Current Land Uses

The INEEL consists of approximately 2,305 km^2 (890 mi^2) (230,266 ha [569,000 acres]). The majority of this land, approximately 98%, has not been impacted by DOE site operations. Only 2% of the INEEL has been impacted by Site operations. Past use of the INEEL as a Department of Defense target range has resulted in an area of greater than 518 km^2 (200 mi^2) contaminated by unexploded ordnance. Land uses for the entire INEEL are currently restricted and controlled. There are no areas of current residential land use within the INEEL boundaries. The typical INEEL land use consists of wildlife management areas, government industrial operations areas, and waste management areas. Some recreational use, such as hunting, is allowed in designated areas during selected periods of time which are controlled by the DOE and the Idaho Department of Fish and Game or Native American Treaties. Additionally, the DOE through the BLM leases land parcels for commercial use, such as sheep grazing.

Current land-use is government-control led industrial use. It is termed "controlled" because there is no unrestricted public access to the INTEC and INEEL. Although there are public highways that traverse the INEEL, activities beyond the highway right-of-way are controlled and restricted by fences and security guards. For example, access to INEEL facilities require proper clearance, training, or escort and self-imposed (DOE) controls to limit the potential for unacceptable exposures.

6.2 Reasonably Anticipated Future Land Use

Planning assumptions in the INEEL Comprehensive Facility Land Use Plan (DOE-ID 1998d) are that the INEEL will remain under government management and control for at least the next 100 years. Future government rnanagement and control becomes increasingly uncertain with time. Regardless of the future use of' the land now occupied by the INEEL the federal government has an obligation to provide adequate institutional controls (i.e.. limit access) to areas that pose an unacceptable health or safety risk to the public and workers until that risk diminishes to an acceptable level for any intended uses. Achievement of this, obligation hinges on Congress appropriating sufficient funds to the responsible government entity charged to maintain the institutional controls for as long as necessary and as long as the federal government of the United States remains viable. No residential development (i.e.. housing) will be allowed to occur within INEEL boundaries during the next 100 years. Grazing will be allowed to continue in the buffer area.

Across the INEEL it is anticipated that there will be a mix of land uses to include unrestricted industrial uses, government-control led industrial uses, unrestricted areas, controlled areas for wildlife management and conservation, and waste management areas. However, the unrestricted areas are not planned for residential development during the next 100 years. Future land use scenarios are identified in the *Long-term Land Use Future Scenarios for the Idaho National Engineering Laboratory* (DOE-ID 1995d). This document was developed using, a stakeholder process that involved a public participation forum, a public comment period, and the INEEL Citizens' Advisory Board (CAB). The public participation forum membership included members from the local counties and cities, the

Shoshone-Bannock Tribes. the BLM, DOE, U.S. Forest Service, U.S. National Park Service, Idaho Department of Transportation, Idaho Fish and Game, and eight business, education, and citizen organizations. In addition, the EPA, and IDHW participated in an ex-officio capacity. Following review and comment by the public participation forum, the document underwent a 30-day public comment period and was subsequently submitted to the CAB for review and recommendations. No recommendations for residential use of any portions of the INEEL until at least year 2095 have been received to date.

Areas of the INEEL are expected to be either industrial or non-industrial for the next 100 years. In the northern area of the INEEL. potential industrial use of the land for a spaceport is being considered. The non-industrial areas are expected to involve grazing and similar activities. In addition. the INEEL is currently a National Environmental Research Park and is expected to remain so for the foreseeable future. This future use is expected to last until at least 2095.

The reasonably anticipated future use for WAG 3 until 2095 is as a government-control led industrial facility. The industrial area is expected to involve activities such as national laboratory research and development or handling, treatment, and disposal of radioactive materials. The industrial operations assumptions include a 10-ft basement scenario. Section 11 of this document discusses institutional controls to be implemented at OU 3-13 CERCLA sites. An Institutional Control Plan for specific sites will be developed during RD. Section 21.1 of the FFA/CO provides EPA site access with or without prior notification. The Institutional Control Plan will include provisions that any lease or privatization effort by DOE will include EPA access.

6.3 Basis for Future Land Use Assumptions

The projection for future land use at INTEC is based upon:

- DOE projections for the future of its national laboratory research and development activities and nuclear reactor programs
- The presence of active industrial and research facilities
- The presence of an industrial infrastructure
- No apparent non-industrial uses, other than grazing within the INEEL
- Recommendations from the INEEL CAB and other stakeholders regarding future use assumptions.

6.4 Groundwater Uses

Current SRPA groundwater use at INTEC is for drinking, and irrigation. Groundwater is extracted from several production wells. which are located upgradient of WAG 3 groundwater contamination. There is no current water usage from regions of the aquifer that have been contaminated above MCLs immediately downgradient of INTEC. Future groundwater use from contaminated portions of the SRPA outside of the current INTEC security fence will be restricted by institutional controls until 2095. Following 2095, it is anticipated that groundwater in the SRPA will be a available for all uses. Groundwater contamination from INTEC is not expected to migrate past INEEL boundaries. Water use restrictions during the restoration time frame will apply only inside the INEEL boundaries.

There is no current or future planned groundwater use from the perched water zones. The perched water zones are transient and are not capable of producing sufficient water for domestic or other uses.

6.5 Groundwater Classification and Basis

The INTEC is located above the SRPA. The eastern portion of the aquifer was granted sole source aquifer status by the EPA on October 7. 1991. Three categories of aquifer protectiveness are applied under Idaho regulations: (1) Sensitive Resources, (2) General Resources, and (3) Other Resources. Since no previous action to categorize the SRPA under state regulations has occurred, the aquifer defaults to the "General Resources" category. General Resource aquifers are protected to ensure that groundwater quality standards are not exceeded. State water quality standards are specified by the Idaho Groundwater Quality Rule, the Idaho Water Quality Standards, and Wastewater Treatment Requirements. Idaho's groundwater standards incorporate 10 CFR 20 Appendix B, Table 2 and 40 CFR 141 and 143.

7. SUMMARY OF SITE RISKS

7.1 Human Health Risk Evaluation

The purpose of a human health risk assessment (HHRA) is to evaluate potential adverse impacts to human health resulting from exposure to site-related radioactive and nonradioactive contamination. The HHRA approach and results are summarized in this section. First, Section 7.1.1 summarizes the conservative screenings performed to identify sites or sources of contamination and COPCs by media. Contaminated media evaluated in the HHRA at OU 3-13 include soil, groundwater, and air. The release sites sources. COPCs, and COPC concentrations for each of these media were evaluated independently, primarily due to the complexity of the groundwater evaluation and the number of soil sites. These screenings were summarized and the results were then used as input in the performance of the baseline HHP,A. This assessment is summarized in Section 7.1.2. A somewhat different grouping of sites was used in the RI/BPA (DOE-ID 1997b); however, the risk results are presented herein by the seven groups described in Section 4 of this ROD.

7.1.1 Derivation of Exposure-Point Concentrations

Generally, the analytical results of the field investigations conducted since 1991 were used to estimate exposure point concentrations for each site-related chemical. This was accomplished by implementing the measures below for each retained site:

- Extract (by site) contaminant of potential concern (COPC) concentration data from the Environmental Restoration Information System (ERIS) or from appropriate information sources
- Eliminate data that were rejected per the method validation
- Eliminate data that indicated probable blank contamination
- Segregate quality control data (e.g., blanks, duplicates)
- Average duplicate results
- Assume nondetects are one-half the reported sample quantitative limit
- Aggregate data by individual COPC
- Aggregate COPC data by select depths. i.e.. surface and surface - subsurface (see Table 7-1)
- Calculate the 9510 upper confidence level (UCL) of the arithmetic mean for each COPC by select depths (EPA 1992a)
- Assess appropriateness of the 95% UCL versus maximum concentration (EPA 1992a)
- Select appropriate concentration estimate
- Calculate contaminant concentration and or contaminant mass.

Table 7-1. Results of the site and chemical screening processes.

OU/Site	COPCs
3-01/CPP-61 PCB Spill in CPP-718 Transformer Yard-Radiological Contamination	Cesium-137 Strontium-90 Technicium-99
3-02/CPP-23 CPP Injection Well	Osmium[a] Cesium-137 Europium-152 Europium-154 Strontium-90
3-02/CPP-37A CPP Gravel Pit #1	Arsenic Americium-241 Cesium-137 Cobalt-60 Neptunium-237 Plutonium-238 Strontium-90 Uranium-235 Uranium-238
3-02/CPP-378 CPP Gravel Pit #2	Aroclor-1260 Kepone[a] Arsenic Americium-241 Cesium-137 Iodine-129 Neptunium-237 Plutonium-238 Strontium-90 Uranium-235 Uranium-238
3-02/CPP-65 Sewage Treatment Plant	Will be evaluated only as a source of recharge to perched zones and SRPA.
3-03/CPP-67 CPP Percolation Ponds #1 and #2---Sediments	Americium-241 Cerium-144 Cobalt-60 Cesium-134 Cesium-137 Iodine-129 Neptunium-237 Plutonium-238 Plutonium-239 -240 Ruthenium-106 Antimony-125 Strontium-90

Table 7-1. (continued)

OU/Site	COPCs
	Tritium Uranium-234 Uranium-235 Uranium-238
3-05/CPP-14 Imhoff Tanks	Aroclor-1260 Benzo(a)pyrene Phenanthrene[a] Cadmium Cesium-137 Neptunium-237 Strontium-90 Uranium-235
3-05/CPP-14 Plant Site	Aroclor-1260 Americium-241 Cesium-137 Neptunium-237 Antimony-125 Strontium-90 Uranium-234 Uranium-235 Uranium-238
3-05/CPP-14 Drain Field	Phenanthrene[a] Arsenic Neptunium-237 Strontium-90
3-06/CPP-33 Contaminated soil in the Tank Farm Area NE of CPP-604	Arsenic Americium-241 Cesium-137 Neptunium-237 Plutonium-238 Plutonium-239/240 Strontium-90
3-06/CPP-34 Soil Storage Area in the NE Corner of the ICPP	Arsenic Cesium-137 Neptunium-237 Plutonium-238 Strontium-90 Uranium-234 Uranium-238
3-06/CPP-40 Lime Pit at the Base of the CPP-601 Berm and French Drain–Radiological Contamination	Cesium-137
3-07/CPP-20 CPP-604 Radioactive Waste Unloading Area	Americium-241 Cesium-134 Cesium-137

Table 7-1. (continued).

OU/Site	COPCs
	Cobalt-60 Europium-154 Neptunium-237 Plutonium-238 Strontium-90 Technicium-99
3-07/CPP-25 Contaminated Soil in Tank Farm Area North of CPP-604	Americium-241 Cesium-134 Cesium-137 Cobalt-60 Europium-154 Neptunium-237 Plutonium-238 Strontium-90 Technicium-99
3-07/CPP-26 Contaminated Soil in Tank Farm Area Steam Flushing–Operation inside the Tank Farm perimeter	Americium-241 Cesium-137 Europium-154 Plutonium-238 Plutonium-239 Strontium-90 Uranium-234 Uranium-235
3-07/CPP-28 Contaminated Soil in the Tank Farm Area South of WM-181 by Valve Box A-6	Cerium-144 Cesium-134 Cesium-137 Cobalt-60 Europium-154 Neptunium-237 Plutonium-239 Plutonium-240 Plutonium-241 Plutonium-242 Ruthenium-106 Strontium-90 Tritium Uranium-234 Uranium-235 Uranium-236
3-07/CPP-31 Contaminated Soil in Tank Farm Area South of Tank WM-183	Cesium-134 Cesium-137 Cobalt-60 Europium-154 Plutonium-239/-240 Ruthenium-106 Strontium-90

Table 7-1. (continued).

OU Site	COPCs
	Uranium-235
3-07/CPP-32W/E Contaminated soil in the Tank Farm area of Valve Box B-4	Cesium-137 Europium-154 Strontium-90
3-07/CPP-79 Tank Farm Release Near Valve Box A-2	Americium-241 Cesium-137 Plutonium-238 Strontium-90 Uranium-234 Uranium-235
3-07/CPP-83 Perched Water	Arsenic Chromium Americium-241 Strontium-90 Technicium-99 Tritium Uranium-234 Uranium-238
3-08/CPP-13 Pressurization of the Solid Storage Cyclone NE of CPP-13	Arsenic Zirconium[a] Cobalt-60 Cesium-134 Cesium-137 Europium-154 Strontium-90 Technicium-99
3-08/CPP-15 Solvent Burner East of CPP-605–Radiological Contamination	Thallium[a] Zirconium[a] Americium-241 Cesium-137 Europium-154 Neptunium-237 Plutonium-238 Plutonium-239/-240 Technicium-99 Uranium-235
3-08/CPP-27 Contaminated Soil in Tank Farm Area East of CPP-604 and CPP-33	Americium-241 Cesium-137 Europium-154 Neptunium-237 Plutonium-238 Plutonium-239-240 Strontium-90 Uranium-235
3-08/CPP-35	Americium-241

Table 7-1. (continued).

OU Site	COPCs
CPP-633 Decontamination Spill	Cesium-137 Europium-154 Plutonium-238 Plutonium-239 Strontium-90 Uranium-235
3-08/CPP-36 Transfer Line Leak from CPP-633 to W1-102	Americium-241 Cesium-134 Cesium-137 Europium-154 Plutonium-238 Plutonium-239 Potassium-40 Strontium-90 Uranium-234 Uranium-235 Uranium-238
3-09/CPP-01 Horizontal Settling Basin, and Vertical Settling Pit and Soil Adjacent to SW-048 Dry Well and CPP-303 Dry Well–Environmental Release.	Americium-241 Cobalt-57 Cobalt-60 Cesium-137 Europium-152 Europium-154 Europium-155 Plutonium-239 Strontium-90 Uranium-235
3-09/CPP-02 French Drain West of CPP-603	Suspected Cesium-137 Suspected Strontium-90 Suspected Tritium
3-09/CPP-03 Temporary Storage Area SE of CPP-603 Stockpiled Soil	Cesium-137 Europium-152 Strontium-90
3-09/CPP-04 and CPP-05 Contaminated Soil Around CPP-603 Settling Tank	Cerium-144 Cobalt-60 Cesium-134 Cesium-137 Europium-152 Europium-154 Europium-155 Uranium-235
3-09/CPP-06 Trench East of CPP-603 Fuel Storage Basin	Cesium-137 Strontium-90

Table 7-1. (continued).

OU Site	COPCs
3-09/CPP-08 and CPP-09 CPP-603 Basin Filter System Line Failure and Soil Contamination Near NE Corner of CPP-603 South Basin	Cesium-137 Europium-152 Europium-154 Strontium-90 Uranium-235
3-09/CPP-10 CPP-603 Plastic Pipeline Break	Cobalt-60 Cesium-137 Europium-152 Europium-154 Europium-155 Strontium-90 Uranium-235
3-09/CPP-11 CPP-603 Sludge and Water Release	Arsenic Thallium[3] Cesium-137 Cobalt-60 Europium-154 Neptunium-237 Strontium-90
3-09/CPP-17a Soil Storage Area South of CPP Peach Bottom Fuel Storage Area	Cesium-137 Europium-152 Europium-154 Strontium-90
3-09/CPP-17b Soil Storage Area South of CPP Peach Bottom Fuel Storage Area	Cobalt-57 Cesium-137
3-09/CPP-19 Cpp-603 to CPP-604 Line Leak	Arsenic Calcium[a,b] Americium-241 Cobalt-60 Cesium-134 Cesium-137 Europium-152 Europium-154 Europium-155 Niobium-95 Plutonium-239 Strontium-90 Uranium-235
3-09/CPP-22 Particulate Air Release South of CPP-603	Cesium-137 Strontium-90 Technicium-99
3-09/CPP-69 Abandoned Liquid Radioactive Waste Storage Tank CPP VES-SFE-20	Cobalt-60 Cesium-134

Table 7-1. (continued)

OU Site	COPCs
	Cesium-137 Europium-152 Europium-154 Europium-155 Plutonium-239/-240 Antimony-125 Strontium-90
3-09/CPP-78 Contaminated Soil West of CPP-693, East of Dry Fuel Storage Area	Strontium-90
3-10/CPP-46 CPP-637 Courtyard Pilot Plant Release–Radiological Contamination	Cesium-134 Cesium-137 Strontium-90 Technicium-99
3-11/CPP-58W/E Subsurface release of contaminants associated with PEW spills and CPP Pew Evaporator Overhead Pipeline Spills	Americium-241 Cesium-137 Europium-154 Plutonium-238 Plutonium-239 Strontium-90 Uranium-235
3-12/CPP-80 CPP-601 Vent Tunnel Drain Leak (VT-300)	Chloride[a] Sulfate[a] Zirconium[a] Cesium-144 Cesium-134 Cesium-137 Europium-154 Europium-155 Plutonium-238 Plutonium-239/-240 Ruthenium-106 Antimony-125 Strontium-90
3-13/CPP-85 WCF Blower Corridor	Cobalt-60 Cesium-134 Cesium-137 Europium-154 Strontium-90
3-13/CPP-87 VOG Blower Cell Floor Drain Sump and PEW Evaporator Feed Pump Cell	Arsenic Barium Cadmium Chromium Lead[a] Mercury Cobalt-60 Cesium-134

Table 7-1. (continued).

OU Site	COPCs
	Cesium-137
3-13/CPP-88 Radiologically Contaminated Soils Map	Arsenic Thallium[a] Cesium-137 Strontium-90
3-13/CPP-89 CPP-604/605 Tunnel Excavation	Americium-241 Cesium-134 Cesium-137 Cobalt-60 Iodine-129 Neptunium-237 Plutonium-238 Plutonium-239/240 Strontium-90 Antimony-125 Uranium-234 Uranium-235
3-13/CPP-90 CPP-709 Ruthenium Detection	Benzo(a)pyrene Phenanthrene[a] Arsenic Thallium[a] Cobalt-58 Cesium-134 Cesium-137 Europium-155 Niobium-95 Strontium-90
3-13/CPP-91 CPP-633 Blower Pit Drain	Arsenic Manganese Thallium[a] Cesium-137 Strontium-90
3-13/CPP-92 Soil Boxes West of CPP-1617	Americium-241 Cesium-134 Cesium-137 Cobalt-60 Europium-152 Europium-154 Iodine-129 Neptunium-237 Plutonium-238 Plutonium-239/240 Strontium-90 Antimony-125 Uranium-234 Uranium-235

Table 7-1. (continued).

OU Site	COPCs
3-13/CPP-93 Simulated Calcine Trench	Aluminum Mercury
3-13/Windblown Area (OU 10-06)	Americum-241 Cesium-134 Cesium-137 Potassium-40 Plutonium-238 Plutonium-239 Plutonium-240 Strontium-90 Uranium-233 Uranium-235

a. No toxicity value is available. This will be further discussed in the uncertainty section.
b. Calcium is further evaluated since its concentration is about 9.67 times greater than background concentrations.

7.1.2 Site/Source and Contaminant Identification

7.1.2.1 Soil. This section summarizes the identification of sites and COPCs assessed in the HHRA for soil contamination. First, the sites that were designated "No Action" or "No Further Action" in the Track 1, Track 2, or RI/BRA were eliminated based on whether the soil concentration exceeded the PRGs. These sites either: (a) contain no source of contamination, either through process knowledge or as a result of sampling activity, or, (b) contain no source of contamination because of remediation. All signed and pending decision statements were reviewed during the RI/BRA to ensure that the assumptions on which these recommendations were based remain valid (see Section 4.8). The second step of the site screening process was based on the results of previous risk evaluations. All sites for which preliminary risk evaluations using Track 1 or Track 2 methods have shown cancer risk or hazard levels to be less than 1 x 10^{-6} or an HI < 1.0, respectively, were eliminated from further evaluation. The contamination screening process was performed for each of the retained WAG 3 release sites. Historical sampling data were used to identify COPCs present in soils at the WAG 3 sites. The list of contaminants was reduced by eliminating contaminants with observed concentrations less than INEEL background concentrations, by eliminating contaminants with detection frequencies less than 5% (i.e., one detect in 20 samples equals a 5% frequency of detection) and without evidence of release at the site, and by consideration of whether or not the contaminant is an essential nutrient. Because substances that are essential nutrients can be toxic at high concentrations, the latter screening step was only applied at sites where essential nutrient concentrations are less than 10 times the background concentration. The results of the site and contaminant screening are presented in Table 7-1. Soil concentrations for assessment were then calculated for sites of concern as discussed in Section 7.1.3 of the RI/BRA (DOE-ID 1997b).

7.1.2.2 Groundwater. This section summarizes the identification of COPCs and sources, and the modeling to determine groundwater contaminant concentrations. Groundwater COPCs were identified using three steps. First, an initial set of contaminants was identified by comparing the maximum concentrations measured in the aquifer and perched water to the I imiting concentration defined by either the water concentration based on a IE-06 risk level, an HI of 1, or the applicable MCL. The second identification step designed and applied a screening process to evaluate the potential for groundwater contamination from contaminated soils. Soil contaminants were evaluated for their maximum risk in the alluvium pore-water, their propensity to infiltrate through the alluvium, and the predicted reduction in activity due to radioactive decay. These first two steps used field data presented in Section 5.1 of Appendix F of the OU 3-13 RI/BRA, including maximum observed concentrations of individual chemical species and the associated risk. The field data included: (1) sampling and analysis of aquifer and perched water, (2) service wastewater source logs, and (3) sampling and analysis of soil contamination. Contaminants of concern based on other factors such as water sample information and soil contamination screens, were identified in the third step. As a result, three nonradionuclides and 10 radionuclides were identified as COPCs in groundwater as shown in Table 7-2. The identification and evaluation of the contaminant sources for the groundwater pathway are discussed in Section 5.2 of Appendix F of the OU 3-13 RI/BRA (DOE-ID 1997b).

The contaminant transport modeling was linilted to three nonradionuclides (arsenic, chromium, and mercury) and 10 radionuclides (Am-241, Co-60, Cs-137, H-3, I-129, Np-237, Total Pu, Sr-90, Tc-99, and combined uranium). Each COPC was incorporated in the model using the mass (radionuclide activity is converted to mass units) defined from the known releases, service waste, soil contamination, or TRA discharge to the aquifer. These contaminant mass sources were modeled as either a uniform release over a known time frame, or a variable release over a known time frame, or a one-time release at a particular time. For the simulations, the plutonium isotopes were combined into a Total Pu run and the uranium isotopes are combined into a Total U run.

Table 7-2. Summary of the identified groundwater COPCs.

COPCs Based on Water Samples				
Aquifer Based COPCs	Additional COPCs Based on Perched Water	Additional COPCs Based on Soil Contamination	Additional COPCs Based on Other Considerations	Final List of the COPCs for the Groundwater Pathway
AM-241	None	Arsenic	Cs-137	Arsenic
H-3		Chromium	Mercury	Chromium
I-129		Co-60		Mercury
Np-237		U-235		Am-241
Sr-90		Pu-238		Co-60
Te-99		Pu-239		Cs-137
u-234		Pu-240		H-3
U-238				I-129
				Np-237
				Total Pu
				Sr-90
				Tc-99
				Total U

The total mass or activity of the contaminants at the general source location was divided into more specific locations and given the best estimate of time during which the releases occurred. Table 6-1 and Figure 6-1 of Appendix F of the OU 3-13 RI/BRA report summarize source locations and simulation time frames for each of the contaminant sources. Section 7 of Appendix F of the OU 3-13 RI/BRA presents the vadose zone and aquifer simulation results. Table 6-4 of the OU 3-13 RI/BRA (DOE-ID 1997b) presents a summary of the results by COPC.

The aquifer transport simulation results consist of contour plots of the peak concentration at eight different time frames centered about the MCL, contours of either the HI or risk number, depending on applicability, for eight time frames centered on the 10^6 risk (or HI = 1), and the time history of the peak concentration and corresponding risk for the entire aquifer for the Test Reactor Area footprint and the INTEC footprint. (TRA is an upgradient source of tritium and chromium to INTEC.) Tables 6-5 to 6-8 of the RI/ BRA present result summaries by COPC.

Concentrations for each contaminant were calculated as maximum values to coincide with the 100-year future residential scenario time frame over the entire WAG 3 and therefore is the same regardless of location within the INTEC. This has the only scenario for which groundwater was considered a pathway. The risk calculated for the SRPA are on-Site risks. There are no projected off-INEEL impacts to downgradient SRPA users.

7.1.2.3 Air. Area-weighted concentrations were calculated using the soil concentration terms prepared for each group and site within INTEC that are presented i n Sections 8 through 26 of the OU 3-13 RI/BRA (see Table 7-3 of this ROD). For the onsite worker scenarios, COPC concentrations in the 0- to 3.05-m (0- to 0.5-ft) depth range were used. For the future residential scenario, CQPC concentrations in soil in the 0- to 3.05-m (0- to 10-ft) depth range were used. The individual site concentrations were then used to estimate the contaminant air concentrations due to emissions that may result from multiple sites of concern within WAG3. This methodology is presented in Section 7.1.3.2 and 27.2 of the OU 3-13 RI/BRA (DOE-ID 1997b). Each COPC concentration term was calculated as an

Table 7-3. COPC exposure-point concentrations in air.

COPCs	Current Onsite Worker		Future Onsite Worker		Future Onsite Resident	
	Fugitive Dust (mg/m^3 or pCi/m^3)	Volatiles ($mg\ m^3$)	Fugitive Dust (mg/m^3 or pCi/m^3)	Volatiles ($mg/m^{3)}$	Fugitive Dust (mg/m^3 or pCi/m^3)	Volatiles (mg/m^3)
Aroclor-1260	–	–	–	–	1.9E-11	1.6E-13
Benzo(a)pyrene	1.5E-12	8.4E-16	1.5E-12	8.4E-16	1.6E-12	5.7E-16
Aluminum	–	–	–	–	7.1E-07	–
Arsenic	1.2E-09	–	1.2E-09	–	7.4E-08	–
Manganese	3.2E-09	–	3.2E-09	–	3.4E-09	–
Mercury	–	–	–	–	8.3E-10	–
Uranium	5.1E-09	–	5.1E-09	–	4.3E-09	–
Am-241	4.5E-06	–	3.9E-06	–	1.1E-05	–
Ce-144	4.6E-07	–	9.5E-46	–	1.3E-45	–
Co-57	4.4E-10	–	1.2E-50	–	1.7E-50	–
Co-58	–	–	–	–	–	–
Co-60	5.1E-06	–	1.0E-11	–	7.4E-11	–
Cs-134	1.5E-06	–	3.6E-21	–	8.5E-21	–
Cs-137	5.0E-04	–	5.0E-05	–	2.3E-03	–
Eu-152	1.3E-04	–	8.1E-07	–	2.4E-06	–
Eu-154	1.0E-04	–	3.9E-08	–	1.0E-07	–
Eu-155	1.4E-05	–	1.2E-11	–	2.2E-11	–
H-3	2.7E-07	–	9.7E-10	–	5.4E-09	–
I-129	3.1E-06	–	3.1E-06	–	1.2E-06	–
K-40	–	–	–	–	3.0E-07	–
Nb-95	4.4E-12	–	–	–	–	–
Np-237	1.3E-06	–	1.3E-06	–	1.4E-06	–
Pu-238	5.5E-06	–	2.5E-06	–	4.2E-06	–
Pu-239/240	1.7E-06	–	1.7E-06	–	3.2E-06	–
Pu-241	–	–	–	–	5.4E-07	–
Pu-242	–	–	–	–	3.8E-09	–
Ru/Rh-106	2.9E-07	–	4.6E-37	–	1.8E-37	–
Sb-125	1.7E-07	–	2.3E-18	–	1.8E-18	–
Sr-90	2.1E-04	–	1.9E-05	–	6.3E-04	–
Te-99	6.5E-07	–	6.4E-07	–	1.6E-06	–
U-234	2.1E-06	–	2.1E-06	–	1.5E-06	–
U-235	5.6E-08	–	5.6E-08	–	5.8E-08	–
U-236	–	–	–	–	9.0E-11	–
U-238	1.7E-06	–	1.7E.06	–	1.4E-06	–

Indicates that the contaminant is total COPC in the medium or at the site.

7.1.2.4 Average value over the entire WAG3 are and therefore, the same value is used regardless of location within INTEC.

7.1.3 Human Health Risk Assessment

The OU 3-13 HHRA methodology is presented in Section 7 of the OU 3-13 RI/BRA (DOE-ID 1997b). This methodology was applied consistently for all retained sites within WAG 3. The HHRA evaluated risks due to exposure to COPCs through soil ingestion, fugitive dust inhalation, VOC inhalation, external radiation exposure, groundwater ingestion, ingestion of homegrown produce, dermal absorption of groundwater, and inhalation of water vapors during indoor water use. The approach is described in the following sections.

7.1.3.1 Exposure Assessment. The exposure assessment stage of the human health risk evaluation process estimates the exposure route, magnitude, frequency, and duration of exposures that receptors may experience due to contact with contaminants at a specific site or group of sites. The primary purpose of the exposure assessment is to estimate total dose for a receptor that can later be compared with chemical-specific dose response data to estimate cancer risk and the likelihood of other noncancer adverse health effects. A conceptual site model (CSM) was prepared to identify receptors and exposure routes under current and future land use conditions (Figure 7-1). The CSM illustrates the contaminant sources, primary release mechanisms, secondary sources and release mechanisms, exposure pathways, exposure routes, and receptors specific to WAG 3. Aspects of the exposure assessment process are described in more detail below.

7.1.3.2 Identification of Potentially Exposed Receptor Populations. The identification of potentially exposed receptor populations includes consideration of applicable current and future land use scenarios. A discussion of these scenarios at the INEEL is found in Section 7 of the BRA. As shown by the CSM, potential receptor populations include occupational site workers and hypothetical future residents. The current land use includes continued use of operating facilities. Access to these facilities is controlled; therefore, the only potential receptor is an occupational worker during the current land use scenario.

Because current industrial uses at WAG 3 are expected to continue in the future, the future land use scenario included occupational workers. Also, for the purposes of the WAG 3 HHRA, it was assumed that residential development may occur and thus, exposures to hypothetical future on-Site residents may occur and were evaluated. The residential receptor is assumed to be an adult for all potentially complete pathways; additionally, a child receptor was included in the soil ingestion pathway assessment. For this pathway, the child and adult parameters were averaged on a time-weighted basis. Child exposures were evaluated specifically for the soil ingestion exposure route because children have the potential for much greater exposure via this route. The timing for the future land use exposure scenarios was assumed to be 100 years in the future for both receptor populations.

7.1.3.3 Identification of Potential Exposure Pathways. The CSM for WAG 3 includes several exposure pathways and associated routes that were selected for further evaluation based on process and release history. The completeness of exposure pathways and routes are expected to vary between release sites according to the presence or absence of site-related chemicals or the presence of engineering features or artifacts that prevent exposure from taking place. Exposure pathways evaluated at each site of concern are summarized in Table 7-4. Site-specific features that influenced the completeness of pathways and exposure routes are described separately for each site in Sections 8 through 26 of the OU 3-13 RI/BRA.

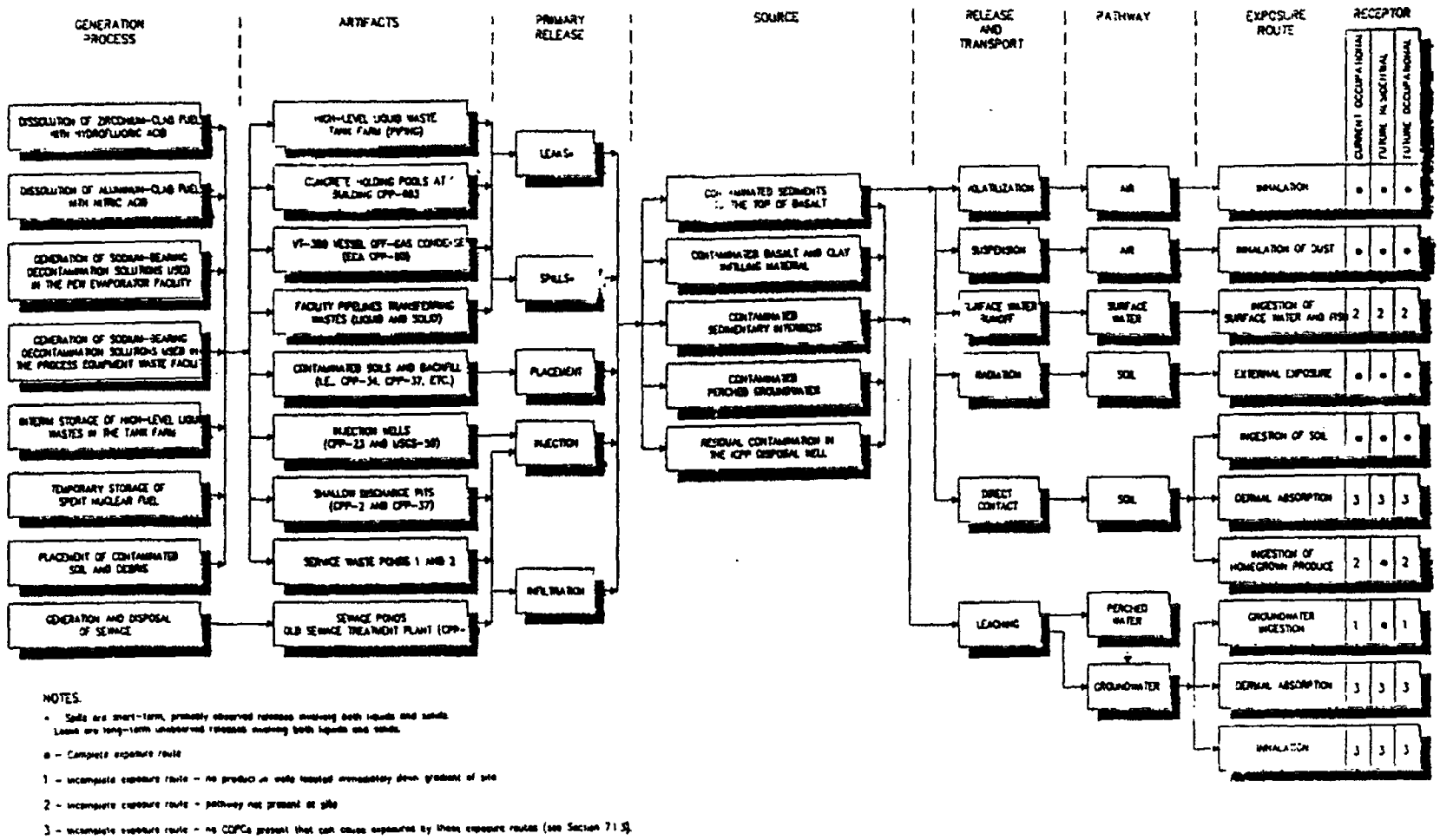


Figure 7-7WAG 3 conceptual site model.

Figure 7-1 WAG 3 conceptual site model.

Table 7-4. Potentially complete exposure pathways quantitatively evaluated for WAG 3 and associated soil depths by exposure route.

Potentially Exposed Receptor	Scenario	Potentially Complete Exposure Pathways and Soil Depths by Exposure Route
Occupational worker	Current land use	Inhalation of VOCs (0-15 cm [0-6 in.])[a] Inhalation of airborne particulates (0- 15 cm [0-6 in.])[a] Ingestion of surface soil (0- 15 cm [0-6 in.])[a] External radiation (0-1.22 m [0-4 ft])[b]
Residential	Future land use	Inhalation of VOCs (0-3.05 m [0- 10 ft])[c] Inhalation of airborne particulates (0-3.05 m [0-10 ft])[c] Ingestion of surface soil (0-3.05 m [0-10 ft])[c] Ingestion of homegrown produce (0-3.05 m [0- 10 ft])[c] Ingestion of groundwater External radiation (0-3.05 m [0-10 ft])c
Occupational worker	Future land use	Inhalation of VOCs (0-15 cm [0-6 in.])[a] Inhalation of airborne particulates (0-15 cm [0-6 in.])[a] Ingestion of surface soil (0-15 cm [0-6 in.])[a] External radiation (0-1.22 m [0-4 ft])[b]

a. Exposure is assumed to be limited to surface soil. Surface soil is considered as the top 0-15cm (0-6 in.).

b. Exposure is assumed to be limited to the 0 to 1.22-m (0-4-ft) interval for undisturbed soil. Contamination below that depth is assumed to be shielded by the top soil.

c. Exposure is assumed to be possible for all contamination within the 0 to 3.05-m(0 to 10-ft) interval because of the excavation required for a basement. Conceivably, soils across the interval have the potential to become surface soil thus allowing exposure to occur to the hypothetical resident.

7.1.4 Toxicity Assessment

Toxicity values were used to assess potential adverse effects to humans from COPCs at WAG 3. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values for the COPCs, consisting of slope factors for carcinogens, and reference doses for noncarcinogens, were obtained primarily from HEAST and the IRIS database. Slope factors and reference dose values are presented in Section 7.2 of the OU 3-13 RI/BRA (DOE-ID 1997b).

7.1.5 Human Health Risk Characterization

The human health risk characterization is presented as both cancer risk and noncarcinogenic hazard to a potential receptor. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the HQ, which is the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose (RfD). A RfD is defined as a daily exposure level of a contaminant for humans that will not produce deleterious effects during a lifetime. By adding the HQs for all contaminants within a medium or across all media to which a given population may be reasonably exposed, the HI can be calculated. The HI expresses noncarcinogenic effects of multiple contaminant exposures within a single medium or across media. Potential carcinogenic risks are expressed as an estimated probability that an individual might develop cancer in their lifetime from exposure. This probability is based on projected intakes and chemical-specific, dose-response data called slope factors (SFs). Slope factors and the estimated daily intake of a compound, averaged over a lifetime of exposure, are used to estimate the incremental risk that an individual exposed to that compound may develop cancer.

7.1.5.1 Potential Human Health Risks Due to Soil Exposures. The intake equations used to calculate the scenario-specific intakes from contaminated soils are presented in Section 7 of the OU 3-13 RI/BRA (DOE-1D 1997b). These intakes and the available toxicity information were then used to estimate the increased cancer incidence and noncarcinogenic hazards. The results of the soil exposure risk calculations are presented by site in Sections 8 through 26 of the OU 3-13 RI/BRA (DOE-ID 1997b). As discussed below, these risks were evaluated cumulatively in Section 28 of the OU 3-13 RI/BRA (DOE-ID 1997b). There are no noncarcinogenic risks above unity for the future on-Site resident. The projected excess risk of incurring cancer for a future onsite resident from soil exposure is 2 in 100.

7.1.5.2 Potential Human Health Risks Due to Groundwater Exposures. The current cancer risk and noncarcinogenic hazard associated with ingestion of the contaminated groundwater by a future on-Site resident at the year 2095 are presented in the OU 3-13 RI/BRA (DOE-ID 1997b), Table 27-3. The predicted increased cumulative cancer risk due to all COPCs in groundwater south of the INTEC fenceline are 5 in 100,000, and exist only if no action is taken under OU 3-14. Plutonium is predicted to have a peak concentration of 36.2 pCi/L in the year 3085. The predicted activity and related risk was based on conservative groundwater transport modeling that will be further evaluated in the OU 3-14 RI/FS. The dermal and inhalation routes from groundwater exposure were evaluated, but were eliminated because the contaminants are not volatile and are not readily absorbed through the skin. Therefore, the risk associated with these exposure routes was determined to be insignificant.

7.1.5.3 Potential Human Health Risks Due to Air Exposures. The intake equations used to calculate the scenario-specific intakes from the inhalation of fugitive dust and volatilized contaminants are presented in Section 7 of the OU 3-13 RI/BRA. These intakes and the available toxicity information were used to estimate the increased cancer incidence and noncarcinogenic hazards (Tables 7-5 and 7-6). The results indicate that the increased cancer risk from exposure to area-weighted air concentrations is less than 1E-06 under all three scenarios. The noncarcinogenic hazard for this pathway was found to be well below a HI of 1 for all three scenarios. As discussed below, these risks were evaluated cumulatively in Section 27 of the OU 3-13 RI/BRA report (DOE-ID 1997b).

7.1.5.4 Cumulative Risk Presentation. Cumulative cancer risks and noncarcinogenic hazards associated with WAG 3 were estimated by summing all risk contributions across all pathways and exposure routes for all contaminants. Risk contributions from the groundwater and air pathways were added to risk contributions from the soil pathway at each group and site within WAG 3. The results are presented visually in Section 27 of the OU 3-13 RI/BRA (DOE-ID 1997b). From these results Tables 7-7 and 7-8 were developed. This table presents the COCs identified by the HHRA and the corresponding cancer risk for each group of sites by exposure scenario at WAG 3.

7.1.6 Human Health Risk Uncertainty

Many sources of uncertainty are introduced during the risk assessment process, beginning with site investigations and sampling and analysis through risk characterization. Site-specific uncertainty is discussed separately for each release site in Sections 8 through 26 of the OU 3-13 RI/BRA. A summary of uncertainty sources and their potential effects on the risk evaluation is given in the following paragraphs.

7.1.6.1 Exposure Pathways. Generally, pathways and exposure routes were evaluated in the OU 3-13 RI /BRA according to their potential risk contribution. Exclusion of less significant pathways may underestimate the total risk to human health. However, those pathways not quantified were estimated to represent small sources of exposure and were not expected to influence risk management decisions.

Many of the sites are rarely, if ever, visited by onsite workers. The actual exposure time is significantly lower than the values used in human health risk assessments (i.e., 10 hr/d) and therefore risk calculations likely represent an overestimate of the actual risk.

7.1.6.2 Contaminant Fate and Transport. With the exception of radionuclides the evaluation of human health risks assumed that environmental media concentrations determined from sampling will remain at the same levels over the assumed periods of exposure. This assumption is likely to result in an overestimation of risk, since concentrations are expected to decline over the long-term as natural processes degrade, dilute, or remove site contaminants. The rate of the these natural processes in the contaminated media are unknown, therefore, the magnitude of the overestimate is difficult to determine.

7.1.6.3 Exposure-Point Concentration. The exposure-point concentrations used for assessing risks associated with the reasonable maximum exposure case were either the maximum detected value or the upper 95th percentile of the mean value (whichever is less). Nondetected values were treated as concentrations equal to half the detection limit. This procedure would overestimate the risk except in cases where the actual concentration of the chemicals is below the detection limits.

7.1.6.4 Exposure Levels. The amount of exposure that an individual receives is highly dependent on their activity patterns. There is considerable variability regarding the values assumed in calculating human intake factors. For instance, estimates of soil ingestion rates for all populations are subject to ongoing debate. This may again result in overestimating or underestimating the risk on an individual basis. Additionally, exposure levels estimated for this project did not take into account the fact that individuals such as onsite workers would be required to wear personal protective equipment (PPE) when working in contaminated areas. This results in an overestimation of risk for these potential receptors.

7.1.6.5 Cancer-Risk Estimates. The predicted cancer risk in humans due to chemical exposure (i.e., nonradiological) is often based on cancer dose-response data in animals. There is a long-standing controversy in the scientific community as to the best way by which cancer-dose response data obtained from animal studies should be extrapolated to humans. In general, the EPA follows a conservative procedure in deriving slope factors, so cancer risk estimates due to chemical exposure based on these values are likely considerably higher than the true risks.

7.1.6.6 Computer Modeling. A computer model was used to estimate exposure concentrations of site-related chemicals in groundwater. These values were subsequently used to estimate chronic daily intakes, and subsequent total cancer risk and noncarcinogenic hazard. Numerical predictions of contaminant fate and transport in the vadose zone and the aquifer were based on: (1) hydrogeologic data forming , the conceptual models for both zones: (2) contaminant release source term estimates; and (3) estimates of the contaminant-soil-basalt chemical interactions. The uncertainty in the conceptual model and its parameterization was qualitatively assessed. This uncertainty may have lead to either an over estimation or under estimation of risk. Uncertainty in source term estimates, including the volume, mass and content; and in the interaction of the contaminant with the soil and basalt, parameterized as the distribution coefficient or K_d; cannot be quantified accurately. The predicted contaminant concentrations are much more sensitive to these latter two parameter values than the first. The uncertainty associated with the use of a computer model to estimate groundwater exposure concentrations is discussed in detail in Section 6 of the OU 3- 13 RI/BRA.

Table 7-5. Cancer risks due to COPC concentrations in air.

COPCs	Current Onsite Worker		Future Onsite Worker		Future Onsite Resident	
	Inhalation of Fugitive Dust	Inhalation of Volatiles	Inhalation of Fugitive Dust	Inhalation of Volatiles	Inhalation of Fugitive Dust	Inhalation of Volatiles
Aroclor-1260	—	—	—	—	NTD	NTD
Benzo(a)pyrene	2E-14	1E-17	2E-14	1E-17	2E-14	8E-18
Aluminum	—	—	—	—	NTD	—
Arsenic	1E-15	—	1E-15	—	1E-13	—
Manganese	NTD	—	NTD	—	NTD	—
Mercury	—	—	—	—	NTD	—
Uranium	NTD	—	NTD	—	NTD	—
Am-241	4E-15	—	3E-15	—	1E-14	—
Ce-144	1E-18	—	2E-57	—	3E-57	—
Co-57	3E-23	—	8E-64	—	1E-63	—
Co-58	—	—	—	—	—	—
Co-60	8E-18	—	2E-23	—	1E-22	—
Cs-134	1E-18	—	2E-33	—	6E-33	—
Cs-137	2E-16	—	2E-17	—	1E-15	—
Eu-152	2E-16	—	1E-18	—	4E-18	—
Eu-154	2E-16	—	8E-20	—	2E-19	—
Eu-155	3E-18	—	3E-24	—	5E-24	—
H-3	6E-22	—	2E-24	—	1E-23	—
I-129	9E-18	—	9E-18	—	3E-18	—
K-40	—	—	—	—	5E-20	—
Nb-95	3E-25	—	—	—	—	—
Np-237	1E-15	—	1E-15	—	1E-15	—
Pu-238	3E-15	—	2E-15	—	3E-15	—
Pu-239/240	1E-15	—	1E-15	—	2E-15	—
Pu-241	—	—	—	—	5E-16	—
Pu-242	—	—	—	—	2E-18	—
Ru Rh-106	8E-19	—	1E-48	—	5E-49	—
Sb-125	2E-20	—	3E-31	—	2E-31	—
Sr-90	3E-16	—	3E-17	—	1E-15	—
Tc-99	4E-20	—	4E-20	—	1E-19	—
U-234	7E-16	—	7E-16	—	5E-16	—
U-235	2E-17	—	2E-17	—	2E-17	—
U-236	—	—	—	—	3E-20	—
U-238	5E-16	—	5E-16	—	4E-16	—
Total Cancer Risk	3E-14	1E-17	3E-14	1E-17	2E-13	8E-18

Indicates that the contaminant is not a COPC in the medium or at the site
NID indicates that the toxicity data is not available

Table 7-6. Cancer risks due to COPC concentrations in air.

COPCs	Current Onsite Worker		Future Onsite Worker		Future Onsite Resident	
	Inhalation of Fugitive Dust	Inhalation of Volatiles	Inhalation of Fugitive Dust	Inhalation of Volatiles	Inhalation of Fugitive Dust	Inhalation of Volatiles
Aroclor-1260	—	—	—	—	NTD	NTD
Benzo(a)pyrene	NTD	NTD	NTD	NTD	NTD	NTD
Aluminum	—	—	—	—	NTD	—
Arsenic	NTD	—	NTD	—	NTD	—
Manganese	4E-06	—	5E-07	—	5E-07	—
Mercury	—	—	—	—	1E-07	—
Uranium	NTD	—	NTD	—	NTD	—
Am-241	—	—	—	—	—	—
Ce-144	—	—	—	—	—	—
Co-57	—	—	—	—	—	—
Co-58	—	—	—	—	—	—
Co-60	—	—	—	—	—	—
Cs-134	—	—	—	—	—	—
Cs-137	—	—	—	—	—	—
Eu-152	—	—	—	—	—	—
Eu-154	—	—	—	—	—	—
Eu-155	—	—	—	—	—	—
H-3	—	—	—	—	—	—
I-129	—	—	—	—	—	—
K-40	—	—	—	—	—	—
Nb-95	—	—	—	—	—	—
Np-237	—	—	—	—	—	—
Pu-238	—	—	—	—	—	—
Pu-239/240	—	—	—	—	—	—
Pu-241	—	—	—	—	—	—
Pu-242	—	—	—	—	—	—
Ru Rh-106	—	—	—	—	—	—
Sb-125	—	—	—	—	—	—
Sr-90	—	—	—	—	—	—
Tc-99	—	—	—	—	—	—
U-234	—	—	—	—	—	—
U-235	—	—	—	—	—	—
U-236	—	—	—	—	—	—
U-238	—	—	—	—	—	—
Total Noncarciogenic Hazard	4E-06	0E-00	5E-07	0E-00	6E-07	0E-00

— Indicates that the contaminant is not a COPC in the medium or at the site
NID indicates that the toxicity data is not available

Table 7-7. Summary of RI/BRA conclusions and recommendations for groups and sites of concern.

Group Site	Contaminants Identified	Risk Assessment Results[a]	Conclusions and Recommendations
Sites of Exclusive Groundwater Concern (CPP-02, -23, -65, -69, -80, -83, -87, -89)	CPP-02: Radionuclides	CPP-02: Unknown potential for groundwater contamination, site included in the groundwater model.	These sites were evaluated in the RI/BRA to the extent that they are a source of recharge and/or contamination to the SRPA and will be evaluated further in the OU 3-13 Feasibility Study.
	CPP-23: Radionuclides	CPP-23: Significant potential source of groundwater contamination, site included in the groundwater model.	
	CPP-65: Low levels of radionuclides and inorganics	CPP-65: Significant source of water, insignificant source of ground-water contamination, site included in the groundwater model.	
	CPP-69: Radionuclides and metalsCPP-80: Radionuclides	CPP-69: No identified source, site not included in the groundwater model.	
		CPP-80: Unknown potential for groundwater contamination, site included in the groundwater model.	
	CPP-83: Radionuclides and metals	CPP-83: Significant potential source of groundwater contamination, site included in the groundwater model.	
	CPP-87: Radionuclides	CPP-87: No identified route for contamination transport to the aquifer, site not included in the groundwater model.	
	CPP-89: Radionuclides and metals	CPP-89: Unknown potential for groundwater contamination, site. Included in the groundwater model.	
Tank Farm (CPP-20 25, -26, -28, -31, -32W/E, -79)	Radionuclides at all sites	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137)	The potential increased cancer risk is unacceptable regardless of land use assumptions. Alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this group.
		Future occupational: surface risk >1E-04 due to external radiation exposure (Cs-137)	
		Future residential: surface risk >1E-04 due to external radiation exposure (Cs-137)	

Table 7-7. (continued).

Group Site	Contaminants Identified	Risk Assessment Results[a]	Conclusions and Recommendations
Tank Farm South (CPP-15, -27 33, -58W 1)	Radionuclides at all sites	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future residential: surface risk >1E-04 due to external radiation exposure (Cs-137) and ingestion of homegrown produce (Cs-137)	The potential increased cancer risk is unacceptable regardless of land use assumptions. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this group.
Waste Calcine Facility (CPP-35, -36 91, -85)	CPP-35: Radionuclides CPP-36/91: Radionuclides CPP-85: No release identified	Current occupational: surface risk > 1E-04 due to external radiation exposure (Cs-137) Future occupational: surface risk > 1E-04 due to external radiation exposure (Cs-137) Future residential: surface risk > 1E-04 due to soil ingestion (Am-241, Cs- 137, Sr-90), homegrown produce ingestion (Cs-137 and Sr-90), and external radiation exposure (Cs-137)	The potential increased cancer risk is unacceptable regardless of land use assumptions. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this group.
Old Storage Pool (CPP-01 04 05, -08 09, -10, -11)	Radionuclides for all sites	Current occupational: surface risk > 1E-04 due to external radiation exposure (Co-60, Cs-134, Cs-137, Eu-152, Eu-154) Future occupational: surface risk > 1E-04 due to external radiation exposure (Cs-137, Eu-152) Future residential: surface risk > 1E-04 due to external radiation exposure (Cs-137, Eu-152, Eu-154)	The potential increased cancer risk is unacceptable regardless of land use assumptions. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this group.
Storage Yard East of CPP-603 (CPP-03, -17A, -17B)	Radionuclides for the 3 sites	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: 1E-04 > surface risk > 1E-06 due to radiation exposure (Cs-137) Future residential: surface risk > 1E-04 due to external radiation exposure (Cs-137)	The potential increased cancer risk is slightly greater than 1E-04 under current occupational and future residential assumptions. Only site CPP-03 should be evaluated further in the OU 3-13 Feasibility Study.

Table 7-7. (continued).

Group Site	Contaminants Identified	Risk Assessment Results[a]	Conclusions and Recommendations
CPP 37A B	Radionuclides and arsenic	Current occupational: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137) Future occupational: 1E-04 > surface risk > 1E-06 from external radiation exposure (Cs-137, Np-237) Future residential: 1E-04 > surface risk > 1E-06 due to soil ingestion (arsenic) and external radiation exposure (Cs-137, Np-237)	The potential increased cancer incidence at this release site is less than 1E-04 under all land use assumptions; therefore, further evaluation in the OU 3-13 Feasibility Study is not warranted.
CPP-67	Radionuclides	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137, Np-237) Future residential: surface risk >1E-04 due to external radiation exposure (Cs-137)	The potential increased cancer risk is unacceptable under future residential land use assumptions. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this site.
CPP-14	Radionuclides	Current occupational: 1E-04>surface risk > 1E-06 due to external radiation exposure (Cs-137, Np-237) Future occupational: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137, Np-237) Future residential: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137, Np-237)	The potential increased cancer incidence at this release site is less than 1E-04 under all land use assumptions; therefore, further evaluation in the OU 3-13 Feasibility Study is not warranted.
CPP-34	Radionuclides	Current occupational: 1E-04> surface risk > 1E-06 external radiation exposure (Cs-137) Future occupational: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137) Future residential: surface risk > 1E-04 due to homegrown produce ingestion (Sr-90) and external radiation exposure (Cs-137)	The potential increased cancer risk is unacceptable under future residential land use assumptions. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this site.

Table 7-7. (continued).

Group Site	Contaminants Identified	Risk Assessment Results[a]	Conclusions and Recommendations
CPP-13	Radionuclides	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137, Eu-154) Future occupational: surface risk > 1E-04 due to external radiation exposure (Cs-137) Future residential: surface risk >1E-04 due to homegrown produce ingestion (Sr-90) and external radiation exposure (Cs-137)	The potential increased cancer risk is unacceptable under all land use assumptions evaluated. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this site.
CPP-06	Radionuclides	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137) Future residential: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137)	The potential increased cancer incidence at this release site is greater than 1E-04 under current land use but less than 1E-04 under future occupational and residential land use assumptions; therefore, further evaluation of this site in the FS is not warranted
CPP-19	Radionuclides	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137) Future residential: surface risk > 1E-04 due to soil ingestion (Cs-137, Sr-90), homegrown produce ingestion (Cs-137, Sr-90) and external radiation exposure (Cs-137, Eu-152, Eu-154)	The potential increased cancer incidence at this release site is greater than 1E-04 under current and future residential land use assumptions but less than 1E-04 under future occupational land use. Remedial alternatives protective of future residents should be evaluated during the OU 3-13 Feasibility Study for this site.
CPP-22	Radionuclides	Current occupational: surface risk >1E-04 due to external radiation exposure (Cs-137) Future occupational: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137) Future residential: 1E-04 > surface risk > 1E-06 due to external radiation exposure (Cs-137)	The potential increased cancer incidence at this release site is greater than 1E-04 under current land use but less than 1E-04 under future occupational and residential land use assumptions; therefore, further evaluation of this site in the OU 3-13 Feasibility Study is not warranted.

Table 7-7. (Continued).

Group /Site	Contaminants Identified	Risk Assessment Result[a]	Conclusions and Recommendations
CPP-90	Radionuclides	Current occupational: 1E-04> surface risk > 1E-06 due to radiation exposure (Cs-137) Future occupational: 1E-04> surface risk > 1E-06 due to radiation exposure (Cs-137) Future residential: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137)	The potential increased cancer incidence at this release site is less than 1E-04 under all land use assumptions; therefore, further evaluation of this site in the OU3-13 Feasibility Study is not warranted.
CPP-88	Radionuclides	Current occupational: 1E-04> surface risk > 1E-06 due to radiation exposure (Cs-137) Future occupational: 1E-04> surface risk > 1E-06 due to radiation exposure (Cs-137) Future residential: 1E-04> surface risk > 1E-06 due to external radiation exposure (Cs-137)	The potential increased cancer incidence at this release site is less than 1E-04 under all land use assumptions; therefore, further evaluation of this site in the OU3-13 Feasibility Study is not warranted.
CPP-92	Radionuclides	The waste boxes that contain radioactive soil were not evaluated quantitatively in the RI/BRA Report.	The disposition of these boxes will be deferred to the OU 3-13 Feasibility Study.
CPP-93	Mercury	Current occupational: H1 > 1 Future occupational: H1 > 1 Future residential: non-carcinogenic hazard > 1 due to ingestion of home grown produce	The noncarcinogenic hazard under future residential assumptions is > 1: therefore, further evaluation of this site in the OU 3-13 FS is warranted.

a The risk assessment results in this table do not include the air and groundwater contribution. The contaminant in parenthesis is the risk driver for the predominant exposure route.

Table 7-8. Human health baseline risk assessment summary for WAG 3 sites of concern.

Group	COC	Half-life*	Exposure Scenario Excess Risk of Incurring Cancer: Current Worker	Future Worker (in 2095)	Future Resident (in 2095)
Group 1—INTEC Tank Farm[a]	Cs-137**	30	6 in 10	6 in 100	3 in 10
	Sr-90***	29	5 in 10,000	5 in 100,000	2 in 10,000
	U-235	10^9	5 in10,000	5 in 10,000	2 in 1,000
Group 2—Soils Under Buildings and Structures	NSR[c]		NSR[c]	NSR[c]	NSR[c]
Group 3—Other Surface Soils	Cs-137	30	5 in 100	5 in 1,000	2 in 100
	Eu-152	13.3	2 in 1,000	1 in 100,000	6 in 100,000
	Eu-154	8.8	2 in 1,000	8 in 10,000,000	4 in 1,000,000
	Sr-90	29	1 in 100	1 in 1,000	4 in 1,000
Group 4—Perched Water	Total Pu	10^4	NR[d]	NR[d]	NR[d]
	Sr-90	29	NR[d]	NR[d]	NR[d]
Group 5 – Snake River Plain Aquifer[a,b]	Am-241	432	NR	NR[j]	4 in 2,000,000[e]
	Cs-137	30	NR	NR[j]	4 in 1,000,000[e]
	I-129	1.57×10^7	NR	NR[j]	2 in 100,000[e]
	Np-237	2.1×10^6	NR	NR[j]	8 in 1,000,000[e]
	Sr-90	29	NR	NR[j]	9 in 1,000,000[e]
Group 6—Buried Gas Cylinders	—		NRC[f]	NRC[f]	NRC[f]
Group 7—SFE-20 Hot Waste Tank System[gh]	Pu	2×10^4	NRC[h]	NRC[h]	NRC[h]
	U	10^9	NRC[h]	NRC[h]	NRC[h]

* Half-life (in years) used in modeling for OU 3-13 risk assessment.

** Cs-137 contributes to risk only via direct exposure.

*** Sr-90 contributes to risk via groundwater, soil direct exposure, and ingestion

a Pu, which primarily originates from the Tank Farm soils, is predicted to exceed SRPA MCLs and pose a groundwater ingestion risk in the year 2750. Pu is not predicted to exceed MCLs or pose a risk in 2095. Refinement of those predictions and remediation, if necessary, will be addressed in the OU 3-14 RI/FS.

b Key COCs and their concentrations are assumed to be the same as for Group 3 soils

c No surface risks (NSR) due to incomplete exposure pathway while buildings are in place. No risk to future residential receptor if buildings are left in place, or removed with subsequent capping or removal of underlying soil. Release sites pose a potential risk to groundwater via soil contaminant leaching and transport. Risks to groundwater are presented under Group 5. The contaminants from soils are not a significant future impact to groundwater

d No risk because perched water is not capable of sustaining a pumping rate needed for future domestic water supplies, therefore, it is not a source of potable water. However, perched water is a source of contamination for the SRPA. Risk calculations on future impacts will be refined under the Tank Farm RI/FS (OU 3-14).

e These values are predicted risk to future residential in 2095 and beyond. Cumulative groundwater risk to future residential in 2095 and beyond is 5 in 100,000 outside the current INTEC security fence. Risk calculations on future impacts inside the current INTEC security fence will be refined under the Tank Farm RI/FS (OU 3-14).

f No risks were calculated (NRC) for these sites. These sites present a safety risk and threaten future release of contaminants

g High concentrations of radionuclides exist in the tank sludge.

h No risks were calculated because no exposure pathways currently exist. The tank is housed with a concrete secondary containment vault that may pose a future risk to groundwater if a release occurs.

i Although workers drink SRPA, the drinking water wells do not intersect the plume

j No risk to future worker if institutional controls remain in place or water treatment is implemented

7.2 Ecological Evaluation

The assessment was performed using the results of a previously conducted screening level ecological risk assessment (SLERA) and the same basic methodology developed in the *Guidance. Mannual for Conducting Screening Level Ecological Risk Assessment at the Level* (VanHorn et al. 1995), subsequently referred to as the Guidance Manual. The SLERA was conducted to screen sites identified in the FFA CO (DOE-ID 1991) and to identify those contaminants present at WAG 3 that have the potential to cause undesirable ecological effects. The sites and contaminants identified as a result of that assessment. in addition to those sites for which inadequate sampling information existed for inclusion in the SLERA, were analyzed. The SLERA approach and results are described in the sections below. The results of this assessment will be integrated with similar assessments for other INEL WAGs to support the performance of the INEL wide baseline ERA. The identification of these sites of concern and the associated contaminants also provided input to the data gap analysis for the OU 10-04 ERA.

7.2.1 Site and Contaminant Screening

As discussed in Section 28.2.2 of the OU 3-13 RI/BRA (DOE-ID 1997b), for potentially contaminated soil sites, a preliminary site screening was performed to identify sites of concern to ecological receptors. Sites with contamination at greater than 3-m (10-ft) bgs (no pathway to the environment) or sites that were determined to be uncontaminated (no known source) were eliminated. This screening identified 37 sites of concern. As discussed in Section 28.2.7, any contaminant identified at these sites was initially screened from concern if the maximum contaminant concentrations was less than the 95/95% upper tolerance level (UTL) for background concentrations for composite samples (Rood et al. 1995) and/or was less than ecologically based screening levels (EBSLs). As a result 27 sites of concern remained to be evaluated in the ERA.

Contaminant concentrations in water at CPP-65 and CPP-67 were compared to toxicology benchmarks for nonradionuclides and developed EBSLs for water ingestion for radionuclides as discussed in Section 28 of the OU 3-13 RI/BRA (DOE-ID 1997b). The results of this assessment are presented in Tables 7-9 and 7-10. Any contaminant exceeding these benchmarks for water contamination was retained for discussion in the risk characterization. A list of threatened and endangered species, species of special concern, and sensitive species that may be found on the INEEL is given in Table 7-11.

7.2.2 Exposure Assessment

As discussed in 28.3 in the OU 3-13 RI/BRA (DOE-ID 1997b), the remaining contaminants at each site of concern were then evaluated to determine a dose to the receptor from soil exposure. The magnitude, frequency, and duration of exposure between the environment and the ecological receptors was modeled as discussed in Section 28.3 of the OU 3-13 RI/BRA (DOE-ID 1997b). The 95% UCL of the arithmetic mean of the contaminant concentration was used when available. Many sites previously evaluated for human health in Track 1 or 2 efforts did not have these calculations performed and for this step of the ERA the maximum value reported in these documents was used.

7.2.3 Toxicity Assessment

Each contaminant was evaluated to determine a chronic dose that may have potential adverse effects to ecological receptors. The toxicity reference value (TRV) is defined as the dose for a receptor that is likely to be without appreciable risk or deleterious effects from chronic exposure. The TRVs development is presented in Appendix 1 of the OU - 13 RI BRA report (DOE-ID 1997b).

Table 7-9. Screening of liquid effluent concentrations at the Sewage Treatment Plan. CPP-65.

COPC	Liquid Effluent Concentration (mg/L)[a]	Toxicological Benchmark (mg/L or pCi/L)[b]	Water Concentration of Concern(mg/L)[c]
As	1.0E-03	1.6E-01	X
Ba	8.4E-02	1.56E+01	X
Cd	5.0E-03	2.3E-02	X
Cl	9.5E+01	2.3E+05[e]	X
Cr	6.0E-03	9.36E+00	X
Cu	1.7E-02	4.7E+01	X
Pb	2.8E-03	1.01E+01	X
Hg	1.0E-04	9.1E-02	X
Mo	1.7E-02	3.3E-01	X
Ni	1.5E-02	1.14E+02	X
Se	2.0E-03	9.6E-02	X
Ag	1.0E-03	NA	1.0E-03[d]
Zn	2.7E-02	3.04E+02	X
Nitrate	1.21E+01	1.9E+03	X
Total phosphorous	2.9E+00	NA	2.9E+00[e]
Plutonium-239/240	1.9E-03[f]	NA	X
Strontium-90	3.6E-01[f]	NA	X

a. Effluent concentrations are mean concentrations, except Cl, nitrate, and total phosphorous are maximum observed concentrations. Units are mg/ L, except for radionuclides, which are pCi/L.

b. These are toxicological benchmarks for wildlife exposure through drinking water from Opresko et al., (1995) unless otherwise noted. The lowest applicable NOAEL-based benchmark was selected from the Opresko et al. (1995) database for conservative screening purposes. NA = not available.

c. Based on EPA Region IV Water Management Division. Water Quality Standards Unit=s Screening List (Suter 11 and Tsao, 1966). This contaminates was eliminated form the assessment based on this criteria.

d. Silver toxicity is related to water hardness. At water hardness of 50, 100 and 200 mgAL[4] as CaCo., the U.S. EPA (1980) recommended that the concentration of total recoverable silver not exceed 1,2, 4,1 and 13 µgAL[4], respectively, at any time. The water hardness at INEEL has a maximum of 500 mg/L. Therefore toxicity would be lower. Also the concentration in the effluent is within the range seen as background nationally. Kopp (1969) found silver in 6.6% of 1.577 surface waters sampled with a mean detected concentration of 2.6 µg/L (range: 0.1E 38 µg/L). For 1970B1979, according to U.S. surface water sampling data from EPA's STORET database, the annual mean levels ranged from 1 to 9 µg/L and annual maximum concentrations were 94 to 790 µg/L (Scow et al. 1981). Based on this rationale the silver at the concentration in the effluent was eliminated as a concern.

e. Phosphorous is an essential component of the annual body and eliminated as a concern at the level. Excess phosphorous is excreted in the urine (NAS, 1980). This contaminant will be eliminated as a concern based on this rationale.

f. Radionuclide levels acceptable as drinking water for human receptors should be acceptable for ecological receptors as well. These contaminants will be eliminated based on this criterion.

Table 7-10. Screening of nonradionuclide liquid effluent concentrations at CPP-67, Percolation Ponds.

COPC	Liquid Effluent Concentration (mg/L)[4]	Sediment Concentration (mg/kg)	K_d (cm^3/g)[c]	Calculated Water Concentration (mg/L)	Toxicological Benchmark (mg/L)[b]	Results of Screening[d]
Al	ND (4E-02)	X	X	X	2.45E+00	E
As	ND (1.5E-03)	X	X	X	1.6E-01	E
Ba	1.04E-01	X	X	X	1.56E+01	E
Be	X	5.00E-01	250	3.3E-03	1.88E+00	E
Cd	ND (1E–03)	X	X	X	2.3E-02	E
Cl	2.98E+02	X	X	2.98E+02	NA	NB
Cr	6.30E-02	X	X	X	9.36E+00	E
Co	X	4.60E+00	55	8.33E-02	NA	NB
Cu	6.30E-03	X	X	X	4.7E+01	E
Fe	5.70E-02	X	X	X	NA	NB
Pb	ND (1.5E-02	X	X	X	1.01E+01	E
Mn	1.60E-03	X	X	X	2.51E+02	E
Hg	ND (2.5E-04	X	X	X	9.1E-02	E
Ni	4.50E-03	X	X	X	1.14E+02	E
Se	ND (1E-03)	X	X	X	9.6E-02	E
Ag	ND (2E-03)	X	X	X	NA	NB
Tl	X	2.10E-01	3.300	6.36E-05	2.1E-02	E
V	X	1.88E+01	1.000	1.88E-02	5.4E-01	E
Zn	X	4.58E+01	18	2.51E+00	3.04E+02	E
Cyanide	X	1.20E-01	0.0000	5.63E-01	1.8E+02	E
Fluoride	ND (5.4E-01)	X	X	X	7.48E+01	E
Nitrate	5.58E+00	X	X	X	1.9E+03	E
Nitrite	ND (8E-0)	X	X	X	NA	NB
Phosphate	5.22E+00	X	X	X	NA	NB
Sulfate	5.15E+01	X	X	X	NA	NB
Sulfide	X	1.57E+01	0.0000	7.34E+01	NA	NB
Anthracene	X	2.40E-01	0.0000	1.13E+00	NA	NB
Benzo(a)anthrace	X	6.20E-01	0.0000	2.91E+00	NA	NB
ne	X	3.50E-01	0.0000	1.64E+00	1.27E+00	X
Benzo(a)pyrene	X	4.40E-01	0.0000	2.06+00	NA	NB
Benzo(b)fluorant	X	2.50E-01	18.0000	1.37E-02	1.0E+01	E
hene	X	6.00E-01	0.0000	2.81E+00	NA	NB
Bis(2-	X	1.50E+00	0.0000	7.03E+00	NA	NB
ethylhexyl)phthala	X	1.10E-02	0.0000	5.16E-02	1.67E+01	E
te	X	8.10E-01	0.0000	3.80E+00	NA	NB
Chrysene	X	9.30E-01	100	8.08E-00	NA	NB
Fluoranthene						
Methylene chloride						
Phenanthrene						
Pyrene						

a. Effluent concentrations are maximum observed concentrations. ND = not detected, detection limit is in parentheses.

b. These are toxicological benchmarks for wildlife exposure through drinking water from Opresko et al. (1995). The lowest applicable NOAEL-based benchmark was selected from the Opresko et al (1995) database for conservative screening purposes. Concentrations are given if the observed or calculated water concentration exceeds the toxicological benchmark. The resulting final concentrations are used as the water concentrations in the internal ingestion route at exposure NA Not available.

c. The K values are based on a compilation of available K values in the literature, except for Be and V, which are from the Track 2 guidance manual. When the A value is available, it is conservatively assumed to be zero.

4 1 Eliminated NB benchmark K exceeds benchmark.

Table 7-11. Threatened and endangered species, species of concern, and sensitive species that may be found on the INEEL.*

Common Names	Scientific Name	Federal Statusble	State Statuse	BLM Statuse	USFSf Statuse	INPS Statuse
Plants						
Lemhi milkvetch	*Astragalus aquailonus*	X	X	S	S	S
Painted milkvetch	*Astragalus ceramics var apus*	3e	X	X	X	R
Plains milkvetch	*Astragalus gilvitlorus*	NL	X	S	S	I
Winged-seed evening	*Camissoma pterosperma*	NL	X	X	X	S
primrose	*Coryphantha missouriensis*	NL	X	X	X	R
Nipple cactus[e]	*Ipomopsis (Gilia) polyeladon*	NL	X	S	X	2
Spreading glia	*Lesquerella kingii var cobrensis*	X	X	X	X	M
King's bladderpod	*Owtheca dendrotdea*	NL	X	R	X	R
Tree-like oxytheca[e]	*Phacelia inconsptctra*	C2	SSC	S	S	
Inconspicuous phacelia[c]	*Halimolobos perplexa var*	X	X	X	S	M
Puzzling halimolobos	*perplexa*	LT	X	X	X	X
Ete=s ladies tresses[d]	*Spiranthes diluvtalis*					
Birds		LE	E	X	X	
Peregrine falcon	*Falco peregrinus*	NL	X	S	X	
Merlin	*Falco columbarius*	NL	SSC	S	X	
Gyrfalcon	*Falco rusticolus*	**LT**	**T**	**X**	**X**	
Bald eagle	***Haliaeetus leucocephalus***	**C2**	**SSC**	**S**	**X**	
Ferruginous hawk	***Buteo regalis***	**C2**	**X**	**X**	**X**	
Black tern	***Chlidonias niger***	X	SSC	X	X	
Northern pygmy owl[d]	*Glaucidium gnoma*	**C2**	**X**	S	X	
Burrowing owl	***Athene cunicularia***	X	SSC	X	X	
Common loon	*Gavia immer*	X	SSC	X	X	
American whiter pelican	*Pelicanus erythrorhynchos*	X	SSC	X	X	
Great egret	*Casmerodius albus*	**C2**	**X**	X	X	
White-faced ibis	***Ptegadis chihi***	3e	X	S	X	
Long-billed curlew	*Numenius americanus*	**C2**	**NL**	**S**	**X**	
Loggerhead shrike	***Lanius ludovicianus***	**C2**	**S**	**X**	**S**	
Northern goshawk	***Accipiter gentilis***	X	X	S	X	
Swainson's hawk	*Buteo swamsom*	**C2**	**SSC**	**S**	**S**	
Trumpeter swan	***Cygnus buccinator***	C2	X	S	S	
Sharptailed grouse	*Tympanuchus phasianellus*	X	SSC	S	S	
Boreal owl	*Aegolius hoterus*	X	SSC	X	S	
Flammulated owl	*Otus flammeolus*					
Mammals		LE XN	E	X	X	
Gray wolf	*Canes lupus*	**C2**	**SSC**	**S**	**X**	
Pygmy rabbit	***Brachylagus (Sylvilagus) idaltoensis***	**C2**	**SSC**	**S**	**S**	
Townsend's western big-cared bat	*Plecotus townsendii*					

Table 7-11. (Continued).

Common Names	Scientific Name	Federal Statusble	State Statuse	BLM Statuse	USFSf Statuse	INPS Statuse
Merriam's shrew	*Sorex merriami*	X	S	X	X	
Long-eared myotis	***Myotis evotis***	**C2**	**X**	**X**	**X**	
Small-footed myotis	***Myotis subulatus***	**C2**	**X**	**X**	**X**	
Western pipistrelle[d]	*Pipistrellus hesperus*	NL	SSC	X	X	
Fringed myotis[d]	*Myotis thysanodes*	X	SSC	X	X	
California myotis[d]	*Myotis californicus*	X	SSC	X	X	
Reptiles and Amphibians						
Northern sagebrush	***Sceloporus graciosus***	**C2**	**X**	**X**	**X**	
lizard	*Diadophis punctatus*	C2	SSC	S	X	
Ringneck snake[d]	*Hypsiglena torquata*	X	X	R	X	
Night snake[e]						
Insects	*Acrolophitus punchellus*	C2	SSC	**X**	**X**	
Idaho pointheaded grasshopper[d]						
Fish	*Cottus confusus*	X	SSC	X	X	
Shorthead sculpin[d]						

* Species in bold are those T E and Category 2 (C2)[h] species included for the WAG 3 ERA.

a. This list was compiled from the U.S. Fish and Wildlife Service (USFWS) (letter dated July 16,1997) the Idaho Department of Fish and Game Conservation Data Center threatened, endangered, and sensitive species for the State of Idaho (CDC 1994), and RESL documentation for the INEEL (Reynolds 1994; Reynolds et al. 1986).

b. The USFWS no longer maintains a candidate (C2)species listing but addresses former listed species as "species of concern" (USFWS April 30, 1996). The C2 designation is retained here to maintain consistency between the SLERA and WAG ERA assessments.

c. Status Codes: S - sensitive; 2 = State Priority 2; 3c = no longer considered for listing; M = State monitor species; NL = not listed; 1 = State Priority 1. LE = listed endangered; E = endangered; SSC = species of special concern and C2 = Category 2 (defined in CDC 1994). BLM = Bureau of Land Management INPS = Idaho Native Plant Society; XN=Experimental, non-essential, R = removed from sensitive list (non-agency code added here for clarification).

d. No documented sightings at the INEEL, however, the ranges of these species overlap the INEEL and are included as possibilities to be considered for field surveys.

e. Recent updates resulting from Idaho State Sensitive Species meetings (BLM, USFWS, INPS, USFS) - (INPS 1995; 1996).

f. United States Forest Service (USFS) Region 4.

Plant uptake factors for contaminants were estimated using reported values in literature and analogous procedures of physicochemical properties. None of these studies were performed at the INEEL and, therefore. are not necessarily representative of local conditions. This may result in overestimation or underestimation of potential health impacts.

7.2.4 Risk Characterization

As discussed in Section 28.4 of the OU 3-13 RI/ BRA (DOE-ID 1997b) the modeled exposure dose is divided by the TRV to calculate a HQ. The results are reported in terms of HQs for each contaminant at each site. Any contaminant with a HQ greater than the target value (one for nonradionuclide and 0. 1 for radionuclide) was presented in the risk characterization.

Twenty-two sites remained after the HQ analysis. All these sites have nonradiological contamination and eight have radiological contamination with HQ's greater than the target value. This includes CPP-13, 14 (Imhoff tanks, Area 1), -19, -34, -37a, -39, -40, -42, -44, -55, -66, -67, -84, -88, -90, -93, Old Storage Pool Group (CPP-01, -04, -05, -08, -09.,-10, -11, -88). Storage Yard Group (CPP-03, - 17a, -17b, -88), Tank Farm Group (CPP-20, -25, -26, -28, -31, -32E/W, -79, excavated soil), Tank Farm South Group (CPP- 15, -27, -33, -58, -88), and WCF Group (CPP-35, -36, -85, -88, -91). With the exception of the facility ponds (Cieminski 1993, Cieminski and Flake 1995), no formal surveys for presence and use of WAG 3 facilities by threatened and/or endangered T/E) and species of concern have been conducted. In 1997, a field survey was conducted for individual sites of concern for habitat qualities and potential to support INEEL T/E species or other species of special concern. A low overall site rating for loggerhead shrike, peregrine falcon, and ferruginous hawk was given to sites CPP-34 and CPP-37a. A low overall rating for bats was given at CPP-34 and CPP-37b. Big game was also given a low overall rating at site CPP-34. Sites rated overall as "low" are those having one or two positive attributes and therefore potential for incidental use by wildlife. These sites may generally be discounted as contributing significantly to chronic wildlife contaminant exposures. This survey was conducted to allow evaluation of WAG sites of concern in an ecological context. The duration and rigor of these surveys were not adequate to verify presence or frequency of occurrence. The rankings for sites are subjective, based on professional opinion supported by limited observation.

7.2.5 Additional Screening

An additional screening was used for the further elimination of sites and contaminants for consideration in the FS. It was determined that the evaluation should eliminate unnecessary and undesirable remediation for ecological receptors based on the following rationale.

The exposure scenario used for ecological receptors assumes that the fences are down and the site has a viable habitat that is completely accessible to receptors. However, many of the sites of concern are currently within the fenced area that defines the industrial complex that is the INTEC. Both the fence and the activities associated with this currently active facility should limit the exposure of receptors to much less than that modeled in the ERA. Additionally, (with some exceptions [particularly sites with water sources]) most of these sites are gravel and unsuitable habitat at the present time and would not provide any special attraction to ecological receptors.

It is accepted in the risk assessment process that many of the input parameters are developed to be conservatively protective of the receptors. Particularly, based on limited knowledge and the uncertainty of extrapolating to multiple species. TRV development is very conservative. This is particularly true for native metals, which can vary greatly regionally.

Based on this rationale. an additional screening was determined appropriate for the WAG 3 sites as agreed on in an October 20, 1997 conference call between DOE-ID, EPA, and IDHW.

This screening was composed of two steps:

1. As a risk management decision, it was decided to eliminate ecological contaminants as a concern if the exposure point concentration was less than 10x the background value (Rood et al. 1995). For those contaminants that have no site-specific background the mean for the western United States presented in Shacklette and Boerngen (1984) or other sources was considered acceptable.

2. For those sites that initially used the maximum values, if possible, the 95% UCLs were calculated (see Table 7-12) for each contaminant that was not eliminated in the HQ evaluation of the ERA. This value was also eliminated if the 95% UCL was less than the 10x background.

This screening resulted in eliminating Sites CPP-37A, -39, -40, -42, -84, -88, and -90 as sites of concern. The sites and COCs remaining after the screening are listed in Table 7-13. Four sites pose solely an ecological risk, CPP-14 (the Imhoff Tank), CPP-44, -55, and -66.

Because Sites CPP- 14, -44, and -55 presented an unacceptable risk for ecological receptors only, these sites were added to the Other Surface Soils Sites (Group 3) for alternative evaluation. The ecological risk screening approach resulted in establishing conservative risk assumptions. Actions undertaken at sites CPP-44, -14, and -55 are based on the small volume of COC contaminated material and the cost benefit of action now rather than further study. Final assessment for site CPP-66 will be conducted under OU 10-04. For sites that pose a potential threat to both human and ecological receptors, it is assumed that remedial alternatives developed to address human health risks will also be designed to adequately address ecological concerns. This WAG ERA represents the second phase of the three-phased approach to ERA. The first phase is the "preassessment" performed at the WAG level. This screen is performed to reduce the number of sites and contaminants to be addressed in subsequent assessments. This screen for WAG 3 is presented in Section 28 of the RI/BRA (DOE-ID 1997b).

In phase two, the WAG sites and COCs identified by the initial screening are assessed for potential risks to ecological receptors using an approach that parallels the human health risk assessment methodology.

The third phase of the ERA process is the OU 10-04 (INEEL Site-wide) ERA, which is performed to integrate the results of the WAG ERAs to evaluate risk to OU 10-04 ecological resources. The OU 10-04 ERA will integrate the results of the WAG ERAs for all INEEL WAGs to determine whether contamination at the WAGs contributes to potential risk to populations and communities on an ecosystem-wide basis. Those sites previously screened at the WAG level based on either 10x background or 10x HQ will be reevaluated at a population level at this time. If the OU 10-04 ERA determines that those WAG 3 sites screened at less than 10x background or HW less than 10. require further action. that action will be determined during the WAG 35-year reviews.

7.3 Basis for Response

Forty-nine sites within WAG 3 have actual or threatened releases of hazardous substances that if not addressed by implementing the response actions selected in this ROD, may pose unacceptable risks to human health or the environment. For analysis of remedial alternatives, release sites were combined into

Table 7-12. Results of additional site/contaminant evaluation and screening.

Site	COC	Maximum Concentration	95% USC	10X Background	Elimination Rationale
CPP-13	Arsenic	830E+00		5.80E+01	Below 10X background
	Mercury	5.95E-01	4.70E+01	5.00E+01	95% UCL below 10X background
CPP-14					
Area 1	Chromium III	5.12E-01		5.80E+01	Below 10X background
	Lead	3.56E+01		1.70E+02	Below 10X background
Area 2	Mercury	1.20E+01		5.00E+01	Sample was taken at approximately 9 ft bgs
	Silver	1.22E+01		3.7E+01	Below 10X background
CPP-19	Arsenic	6.30E+00		5.80E+001	Below 10X background
CPP-34	Arsenic	7.10E+00		5.80E+01	Below 10X background
	Mercury	6.00E+01	2.80E+01	5.00E+01	95% UCL below 10X background
CPP-37A	Mercury	9.60E+01	0.40E+01	5.00E+01	95% UCL below 10X background
CPP-39	Barium	1.10E+03		3.00E+03	Below 10X Background
	Di-2-	1.40E+01			Contaminant below 15 ft
	ethlhexylphthalate	9.29E+02		2.80E+03[4]	Below 10X background
	Fluoride	1.70E+01		5.00E+01	Below 10X background
	Mercury	187E+01		3.7E+01	Below 10X background
	Silver				
CPP-40	Chromium III	7.20E+01		3.0E+02	Below 10X background
	Fluoride	1.10E+01		2.80E+03[4]	Below 10X background
	Lead	6.00E+01		1.70E+02	Below 10X background
CPP-42	Barium	1.10E+3		3.00E+03	Below 10X background
CPP-44	Cadmium	8.40E+00		2.20E+01	Below 10X background
	Chromium III	1.54E+03		3.30E+02	Retain
	Chromium VI	1.54E+01		NA	Retain
	Decanol	9.00E+03		NA	Retain
	Lead	2.81 E+02		1.70E+02	Retain
	Mercury	5.00E+00		5.00E+01	Retain
	Nickel	3.44E+02		3.50E+02	Below 10X background
CPPk-55	Arsenic	1.34E+01		5.80E+01	Below 10X background
	Chromium III	6.50E+01		3.30E+02	Below 10X background
	Chromium VI	6.50E+01	8.70E+00	NA	Not expected to exist as Chromium
	Lead	320E+01		1.70E+02	VI in the environment
	Mercury	5.20E+00	6.10E+01	5.00E+01	Below 10X background
	Nickel	6.50E+01		3.50E+02	Retain
	Selenium	6.40E+01		2.20E+00	Below 10X background
	Silver	300E+00		3.7E+01	Below 10X background
					Below 10X background
CPP-66	Boron	3.10E+02		230E+02	Retain
	Fluoride	1.65E+02		2.80+02[a]	Below 10X background
	Selenium	1.60E+00		2.20E+00	Below 10X background
	Strontium	6.90E+02		2.20E+03[a]	Below 10X background
CPP-88	Arsenic	7.10E+00		5.80E+01	Below 10X background
	Mercury	1.00E+00	3.00E+01	5.00E+01	95% UCL below 10X background
	Nickel	1.63E+02		3.50E+02	Below 10X background
CPP-90	Antimony	9.50E+00		4.80E+01	Below 10X background
	Arsenic	295E+01		5.80E+01	Below 10X background
	Mercury	1.00E+00	4.50E+01	5.00E+01	95% UCL below 10X background
CPP-93	Aluminum	1.20E+05		1.60E+05	Below 10X background
	Mercury	1.40E+02	6.80E+01	5.00E+01	Retain
Old Storage	Arsenic	5.90E+00		5.80E+01	Below 10X background
	Mercury	5.52E+01	2.20E+01	5.00E+01	95% UCL below 10X background

Table 7-12. (continued).

Site	COC	Maximum Concentration	95% UCL	10X Background	Elimination Rationale
	Nickel	5.51E-01		3.50E-02	Below 10X background
Storage Yard	Arsenic	5.90E-00		5.80E-01	Below 10X background
	Mercury	5.52E-01	3.30E-01	5.00E-01	95% UCL below 10X background
	Nickel	5.51E-01		3.50E-02	Below 10X background
Tank Farm	Mercury	2.30E-01		5.00E-01	Below 10X background
Tank Farm	Arsenic	5.90E-00		5.80E-01	Below 10X background
	Cadmium	3.42E-00		2.20E-01	Below 10X background
	Mercury	1.51E-00	2.60E-01	5.00E-01	95% UCL below 10X background
	Nickel	5.51E-01		3.50E-02	Below 10X background
WCF	Arsenic	7.30E-00		5.80E-01	Below 10X background
	Mercury	7.50E-00	1.50E-00	5.00E-01	Retain
	Nickel	2.80E-02		3.50E-02	Below 10X background

Background from Shacklette and Boerngen (1984).

Table 7-13. Sites and COCs which may present an unacceptable risk to ecological receptors.

Site	Nonradionuclides	Radionuclides	Comments
CPP-13	Mercury	Sr-90	
CPP-14 (Imhoff Tanks)	Mercury		Solely an ecological concern. Approximately 105 m^3 of soil.
Area-1			
CPP-19		Cs-137, Eu-152, Eu-154, Sr-90, Co-60	
CPP-34		Sr-90	
CPP-44	Chromium III, Chromium VI, Lead, mercury		Solely an ecological concern. Approximately 88 m^3 of soil.
CPP-55	Chromium VI		
CPP-66	Boron		Solely an ecological concern. Approximately 325.5 m^3 of soil.
CPP-67	Metals and organics		Solely an ecological concern. Approximately 79,800 m^3 of soil.
CPP-93	Mercury	Am-241, Np-237, Pu-238-239, U-234, and U-238	This site will be remediated based on the HHRA, an assessment beyond the screening level was not deemed necessary.
Old Storage Pool (CPP-01, -04, -05, -08, -09, -10, -11, -88)		Cs-137, Eu-152, Eu-154, Co-60, and Sr-90	
Tank Farm (CPP-20, -25, -26, -28, -31, -32E W, -79, excavated soil)		Am-137, Cs-137, Eu-154, Pu-239, and Sr-90	
Tank Farm South (CPP-15, -27, -33, -58, -88)		Cs-137	
WCF (CPP-35, -36, -85, -88, -91)	Mercury	Am-241, Cs-134, and Cs-137	

grouping including Tank Farm Soils, Soils Under Buildings and Structures. Other Surface Soils, Perched Water, the SRPA, and Buried Gas Cylinder Sites. Individual sites include the SFE-20 Hot Waste Tank System. The response actions elected in this ROD are designed to reduce the potential threats to human health and or the environment to acceptable levels.

8. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) for OU 3-13 were developed in accordance with the NCP and CERCLA RI/ FS guidance. RAOs specify contaminants and media of concern, potential exposure pathways, and remediation goals. Remediation goals establish acceptable exposure levels that are protective of human health and the environment. Factors that are considered in establishing remediation goals are outlined in 40 CFR 300.430(e)(2)(i). RAOs are specific risk criteria that take into consideration the assumed future land uses at the INTEC. The RAOs were defined through discussions between the Agencies (IDHW, EPA, and DOE). The RAOs are primarily based on the results of the baseline risk assessment and applicable or relevant and appropriate requirements (ARARs).

To achieve a reasonable degree of protection at the WAG 3 sites, the Agencies have selected remedy for each group of sites that meet the RAOs. These remedies protect human health and the environment and meet regulatory requirements. The WAG 3 RAOs were developed for specific media (i.e., soils, perched water, or groundwater). The applicable RAOs for a particular site or group of sites depend on the specific media impacted.

RAOS were also developed for ecological receptors, based on a screening-level ERA. For release sites that pose a potential threat to both human health and ecological receptors, it is assumed that remedies selected to protect human health will be designed to address ecological concerns. A specific RAO was developed for sites that solely pose a threat to ecological receptors. For ecological receptors, the remediation goal for protection of the environment at INTEC is to reduce contaminant concentrations to less than 10 times the background COC concentration.

The INTEC land use assumptions used to develop the RAOs include industrial use prior to 2095, and potential residential use after that time. Other assumptions used to develop the RAOs included:

1. The INTEC facility will be used as an industrial facility up to the year 2095. During the period of DOE operations, expected to last to at least 2045, this area is a radiological control area.

2. Only the contaminated groundwater present in the SRPA outside of the current INTEC security fence is addressed in this ROD. The selected remedy is expected to fully address this contamination. However, this action does not address groundwater inside the current INTEC security fence, which will be addressed under OU 3-14.

3. For the time period 2095 and beyond, it is assumed that the SRPA located outside the current INTEC security fence will be used as a drinking water supply.

4. The annual carcinogenic risk at INTEC from natural background radiation due to surface elevation and background soil radiological contamination is 10^{-4} (EPA 1994, NEA 1997, UNEP 1985).

5. Permanent land use restrictions will be placed on those release site source areas and the ICDF complex, which will be closed in place, for as long as land use and access restrictions are required to be protective of human health and the environment.

The human health RAOs developed for soils and groundwater at OU 3-13 include:

1. Groundwater

   a. For INTEC-impacted groundwater (located in the groundwater contaminant plume outside of the current INTEC security fence) restore the aquifer for use by 2095 and beyond, so that the risk will not exceed a cumulative carcinogenic risk of 1×10^{-4} for groundwater ingestion.

   b. For INTEC-impacted groundwater (located in the groundwater contaminant plume outside of the current INTEC security fence) restore the aquifer to drinking water quality (below MCLs) for use by 2095 and beyond.

   c. For INTEC-impacted groundwater (located in the groundwater contaminant plume outside of the current INTEC security fence) restore the aquifer to so that the non-carcinogenic risk will not exceed a total HI of 1 for groundwater ingestion.

   d. For INTEC-impacted groundwater (located in the groundwater contaminant plume outside of the current INTEC security fence), prevent groundwater consumption by the public until Objectives a, b, and c, listed above, are met.

   e. Maintain caps placed over contaminated soil or debris areas that are contained in place and the closed ICDF-complex, to prevent the release of leachate to underlying groundwater which would result in exceeding a cumulative carcinogenic risk of 1×10^{-4}, a total HI of 1; or applicable State of Idaho groundwater quality standards (i.e., MCLs) in the SRPA.

2. Surface Soils

   a. Prevent exposure to contaminated surface soils at each release site such that for all surface exposure pathways, a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1 is not exceeded at each release site. These RAOs also address "No Further Action" Sites where the current radiological contaminant levels will meet residential risk-based concentration on or before year 2095. The RAOs will be achieved as follows:

      (1) DOE Operational Phase, expected until year 2045:

         (a) Implement Institutional Controls to limit access and exposure duration at each source area to achieve a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1.

         (b) Remove contaminated soil at each source area, sufficient to achieve a cumulative carcinogenic risk of 1×10^{-4} and a total H I of 1 to a future residential user; or cap in place contaminated soil or debris areas presenting a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1.

      (2) Government Control Phase: expected between year 2045 and 2095

         (a) Implement Institutional Controls to limit the duration and frequency of exposure to non-capped contaminated soil areas by the public to

achieve a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1.

(b) Maintain caps for contaminated soil areas which are contained in place, to prevent exposure of the public to a cumulative carcinogenic risk of 1×10^{-4} and a total H I of 1.

(c) Maintain the closed and capped ICDF complex to prevent exposure of the public to a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1.

(3) Post-Government Control, Beyond 2095. Continue Institutional Controls at all capped areas to prevent disturbance of capped areas to achieve a cumulative carcinogenic risk of 1×10^{-4} and a total HI of 1.

3. Perched Water

a. Prevent migration of radionuclides from perched water in concentrations that would cause SRPA groundwater outside the current INTEC security fence to exceed a cumulative carcinogenic risk of 1×10^{-4}, a total HI of 1; or applicable State of Idaho groundwater quality standards (i.e., MCLs) in 2095 and beyond.

b. Prevent excavations into and drilling through the contaminated earth materials remaining after the desaturation of the perched water to prevent exposure of the public to a cumulative carcinogenic risk of 1×10^{-4}, a total HI of 1; and protection of the SRPA to meet Objective 3a listed above.

4. Snake River Plain Aquifer (INTEC-derived groundwater contaminant plume outside current INTEC security
fence)

a. Prior to 2095, prevent current on-site workers and general public from ingesting SRPA groundwater that exceeds a cumulative carcinogenic risk of 1×10^{-4}; a total HI of 1; or applicable State of Idaho groundwater quality standards (i.e., MCLs).

b. In 2095 and beyond, ensure that SRPA groundwater does not exceed a cumulative carcinogenic risk of 1×10^{-4}; a total Hl of 1; or applicable State of Idaho groundwater quality standards (i.e., MCLs).

5. Other Areas

a. For other source areas that either pose a safety hazard, a threat of release to groundwater, or an ecological hazard, the RAOs include:

(1) Eliminate the safety hazard posed by buried compressed gas cylinders at sites CPP-84 and CPP-94.

(2) Eliminate the threat of release to the SRPA posed by the SFE-20 Hot Waste Tank System.

(3) Prevent ecological receptor exposure to surface soil COCs with a concentration greater than 10 times background concentrations that may cause adverse effects to resident populations of flora or fauna, as determined by the screening level ERA.

8.1 Remediation Goals

To meet the RAOs, remediation goals are established. These goals generally are quantitative cleanup levels based primarily on risk to human health and the environment. The remediation goals are based on the results of the BRA and evaluation of expected exposures and risks for selected alternatives. If an ARAR is more restrictive, then the ARAR standard is used as the remediation goal. The remediation goals will be used to assess the effectiveness of the selected remedial alternatives in meeting the RAOs.

A 1×10^{-4} cumulative carcinogenic risk or cumulative HI of 1 for noncarcinogenic contaminants, whichever is more restrictive for a given contaminant, is the primary basis for determining remediation goals for the OU 3-13 sites of concern. The higher end of the carcinogenic risk range has been selected because the carcinogenic risk at INTEC from natural background radiation due to surface elevation and background soil radiological contamination is estimated at 10^{-4} (EPA 1994, NEA 1997, UNEP 1985).

Remediation goals for contaminated soils are based on soil concentrations that satisfy the 1×10^{-4} carcinogenic risk goal or non-carcinogenic HI of 1 for current non-workers and future workers and residents. Risk-based soil concentrations corresponding to a 1×10^{-4} risk or a HI of 1 for individual soil COCs are presented in Table 8-1. If more than one COC is present at a particular release site, these activities or concentrations will be modified so that the cumulative risk is 1×10^{-4} or HI is 1. These risk-based remediation goals will be used to verify the effectiveness of the selected remedial action and to determine if additional remedial action (such as additional excavation) is necessary prior to closing the release site.

Table 8-1. Soil risk-based remediation goals.

Contaminant of Concern	Soil Risk-Based Remediation Goal[a] For Single COCs[b] (pCi/g or mg/kg)
Radionuclides	
Am-241	290
Cs-137	23
Eu-152	270
Eu- 154	5200
Pu-238	670
Pu-239 240	250
Pu-241	56.000
Sr-90	223
Nonradionuelides[c]	
Mercury (human health)	23

a source of risk-based soil remediation goals: Table2-1 of the OU 3-13 FS. Risk-based remediation goals developed for residential scenario.

b If multiple contaminants are present, use a*sum of the fractions* to determine the combined COC remediation goal.

c The mercury remediation goal was selected from the EPA Region 3. April 1996, screening guidance for soil ingestion under the residential scenario.

Dose-based soil remediation goals that correspond to the concentration- or activity-based soil remediation goals in Table 8-1 will be developed during RD to facilitate field implementation of the remedial action. It should be noted that for current on-site DOE-workers, the occupational dose limit is specified in 10 CFR 835.202. The annual occupational dose limit is a total effective dose equivalent equal to 5 rem (0.05 Sv). For exposure of the general public prior to the Year 2095, land use is projected as industrial. The above remediation goals combined with institutional controls are considered protective for industrial use of the area by the general public prior to the Year 2095.

Nonradionuclide remediation goals for mercury, lead, and chromium were also estimated for ecological receptors. The ecological receptor remediation goals estimated for these constituents are 0.5 mg/kg for mercury, 170 mg/kg for lead, and 330 mg/kg for chromium. These remediation goals are being used because of the small volume of the sites and the cost effectiveness of taking remedial action versus additional study to refine the estimate. An evaluation of whether additional soil excavation is necessary to protect ecological receptors will be conducted after the WAG 10 plant uptake treatability study is completed.

Remediation goals for INTEC-derived COCs present in the SRPA groundwater outside the current INTEC security fence are based on the applicable State of Idaho groundwater quality standards (IDAPA 16.01.011.200). The SRPA COCs consist of tritium, Sr-90 and daughters, 1-129, Np-237, chromium, and mercury prior to 2095 and Sr-90, 1-129, Np-237, plutonium and uranium isotopes and their daughters, and mercury in 2095 and beyond. The SRPA groundwater remediation goals for these COCs are presented in Table 8-2.

The remediation goal for INTEC-derived alpha-emitting radionuclides (i.e., Np-237, Pu isotopes and their daughters, Am-241, and U isotopes and their daughters) in SRPA groundwater outside the current INTEC security fence corresponds to a cumulative alpha-activity of 15 pCi/L in the year 2095 and beyond. Modeling has shown that alpha-emitting radionuclides are not expected to exceed the 15 pCi/L standard in the SRPA inside the current INTEC security fence until the year 2750, with a peak concentration occurring in the year 3804. Remediation, if necessary, of the Tank Farm inside the current INTEC security fence are expected to mitigate the future alpha-emitting radionuclide impacts in the SRPA outside the current INTEC security fence. Remediation goals for the alpha-emitting radionuclides in the SRPA inside the current INTEC security fence will be established in the final action developed in OU 3-14.

The remediation goal for beta-gamma-emitting radionuclides (tritium, Sr-90 and daughters, and 1-129) in SRPA groundwater outside the current INTEC security fence is restricted to a cumulative dose of 4 mrem/yr in the year 2095 and beyond. The remediation goals for chromium and mercury are 100 ug/L and 2 ug/L, respectively, for individual constituent MCLs.

8.1.1 Tank Farm Soils Interim Action (Group 1)

The principal threats at the Tank Farm Soils release sites are external exposure to radiation and potential leaching and transport of contaminants to the perched water or the SRPA. The remediation goals for the Tank Farm Soils interim action are:

1. Preventing intrusion into soil contaminants by the general public

2. Reduce precipitation infiltration by approximately 80% of the average annual precipitation at the site

3. Maximize run-off and minimize surface water ponding on the Tank Farm

4. Prevent surface water run-on from a 1 in 25 year, 24 hour storm event

5. Minimize infiltration and subsequent contaminant leaching due to external building drainage and run-on.

These remediation goals support groundwater RAOs la through 1d; surface soil RAO 2A(1)(a), perched water RAO 3a, and SRPA RAO 4b.

8.1.2 Soils Under Buildings and Structures (Group 2)

The primary threat posed by Soils Under Buildings and Structures sites is external exposure to radionuclides and possible leaching and transport of soil contaminants to the perched water or SRPA. The selected alternative for Group 2 is a deferred action. It is assumed that the present buildings or structures aid in limiting external exposure and infiltration directly over the contaminated soils.

Remediation goals were developed for the Soils Under Buildings and Structures for the pre-D&D and post-D&D time periods. The remediation goals for the pre-D&D time period are to prevent exposure to current workers and non-workers and to minimize possible leaching and transport of contaminants to underlying SRPA groundwater. The remediation goals for the post-D&D time period are to prevent exposure to future workers and residents and to minimize possible leaching and transport of contaminants to underlying SRPA groundwater.

Table 8-2. SRPA remediation goals.

Contaminant of Concern	SRPA Remediation Goals (Maximum Contaminant Levels) For Single COCs[3]	Decay Type
Beta-gamma emitting radionuclides	Total of beta-gamma emitting radionuclides shall not exceed 4 mrem/yr effective dose equivalent	Beta-Gamma Beta
Sr-90 and daughters	8 pCi/L	Beta
Tritium	20,000 pCi/L	Beta-gamma
1-129	1 pCi/L[b]	Alpha
Alpha-emitting radionuclides	15 pCi/L total alpha emitting radionuclides	Alpha
Uranium and daughters	15 pCi/L	Alpha
Np-237 and daughters	15 pCi/L	Alpha
Plutonium and daughters	15 pCi/L	Alpha
Am-241 and daughters	15 pCi/L	
Nonradionuclides		Not applicable
Chromium	100 Fg/L	Not applicable
Mercury	2 Fg/L	

a. If multiple contaminants are present, use a sum of the fractions to determine the combined COCs remediation goals.

b. Derived concentration if only beta-gamma radionuclide present.

These remediation goals will be accomplished by the following:

1. Pre-D&D

    a. Warning current building or structure users that contaminated soils lie beneath the basement floor. Maintaining the buildings or structures to minimize moisture infiltration and to prevent unacceptable exposure to current industrial users.

    b. Minimizing surface water run-on and precipitation infiltration adjacent to the buildings or structures by modifying drainage patterns around buildings and performing surface modifications as necessary to minimize leaching and transport of soil contaminants to underlying SRPA groundwater.

2. Post-D&D

    a. Implementing the institutional controls described in Table 11-1.

    b. Capping the contaminated areas with an engineered barrier in accordance with the substantive requirements of the hazardous waste landfill closure standards (IDAPA 16.01.05.008 [40 CFR 264.310]).

    c. Excavating the contaminated soils that exceed the soil remediation goals listed in Table 8-1 and subsequent disposal and management in the ICDF.

These remediation goals support groundwater RAOs 1a, through 1e, surface soil RAO 2a, perched water RAO 3a, and SRPA RAO 4b.

8.1.3 Other Surface Soils (Group 3)

The primary threat posed by the Other Surface Soils is external exposure to contaminated soils. The remediation goal for the Other Surface Soils is to prevent external exposure to current workers and non-workers and future workers and residents. This remediation goal will be accomplished by:

1. Implementing the institutional controls described in Table 11-1.

2. Minimizing future residental exposure to surface soils in 2095 and beyond by excavating the contaminated soils exceeding the remediation goals in Table 8-1, to a minimum depth of 3m (10 ft) and subsequent disposal and management of the excavated soils in the ICDF.

3. Capping the contaminated areas that are not excavated with an engineered barrier in accordance with the substantive requirements of the hazardous waste landfill closure standards (IDAPA 16.01.05.008 [40 CFR 264.310]).

The rernediation goal supports surface soil RAO 2a.

8.1.3.1 INEEL CERCLA Disposal Facility (ICDF) Goals and Requirements. Contaminated soils from the Group 3 sites will be disposed and managed in the ICDF. The primary threats posed by soils and debris disposed and managed in the ICDF are external exposure to radiation and the release of leachate to underlying groundwater that could potentially impact the SRPA. The remediation goal for the ICDF is to consolidate contaminated soils at a single location to prevent exposure of human and

ecological receptors. This remediation goal will be accomplished by sitting, designing, operating, and closing the ICDF to prevent exposures or leachate releases to the underlying SRPA groundwater. The design, operation, closure, and post-closure requirements necessary to accomplish these remediation goals include:

Siting Requirements—The ICDF will meet or exceed RCRA Subtitle C location standards specified In IDAPA 16.01.05.008 (40 CFR 264.18).

Design Requirements—The ICDF design will:

1. Meet or exceed RCRA Subtitle C design standards specified in IDAPA 16.01.05.008 (40 CFR 264..301 and 40 CFR 264.302) and the PCB Chemical Waste Landfill design requirements 40 CFR 761.75.

2. Minimize precipitation run-on and maximize precipitation run-off to effectively reduce infiltration through the contaminated soils and debris.

3. Minimize subsidence of the waste and the landfill cap.

4. Ensure that the resulting design is protective of human and ecological receptors.

5. Ensure that the resulting design is protective of the SRPA.

Operational Requirements—The ICDF operation will:

1. Limit disposed wastes to those generated by the INEEL CERCLA program.

2. Limit disposed wastes to those with contaminant concentrations that will not result in MCLs being exceeded in the SRPA.

3. Limit disposed wastes to low level radioactive waste. PCB solids, hazardous, and mixed low, level radioactive waste.

4. Treat waste (soils, debris, and treatment residues) on-Site as necessary to meet Agency-approved Waste Acceptance Criteria developed during the RD.

5. Treat waste (soils, debris, and treatment residues) originating from outside the WAG 3 AOC to comply with the land disposal requirements specified in IDAPA 16.01.05.011 (40 CFR 268 and 40 CFR 268.49) as applicable.

6. Minimize leachate generation. Leachate will be collected and treated using physical chemical treatment (i.e., evaporation in a surface impoundment designed in accordance with the substantive requirements of the hazardous waste surface impoundments (IDAPA 16.01.05.008 [40 CFR 264.221]). Residues from the evaporation process will be managed in the ICDF as necessary during the active life and post-closure period of the ICDF cells.

Closure and Post-Closure Requirements—The ICDF closure and post-closure will:

1. Meet or exceed RCRA Subtitle C closure and post-closure care requirements specified in IDAPA 16.01.05.008 (40 CFR 264.310).

2. Ensure that the final cover is designed to serve as an intrusion barrier for a period of at least 1,000 years.

3. Minimize subsidence of the landfill and its final cover.

4. Place easily located permanent markers at all corner boundaries for each cell of the landfill that identify the potential exposure hazards.

5. Place permanent land use restrictions, zoning restrictions, and deed restrictions on the ICDF and its adjacent buffer zone to permanently preclude industrial or residential development until unacceptable risk no longer remains at the site.

6. Include the disposal records and the surveyed permanent marker locations in the land use restriction documents.

These remediation goals support groundwater RAOs 1a through 1e, surface soil RAOs 2a(l)(a) and 2a(2)(c), and SRPA RAO 4b.

8.1.4 Perched Water (Group 4)

The primary threat posed by perched water is migration of contaminants to the SRPA. The perched water remediation goals are to:

1. Reduce recharge to the perched zones

2. Minimize migration of contaminants to the SRPA, so that SRPA groundwater outside of the current INTEC security fence meets the applicable State of Idaho groundwater standards by 2095.

The remediation goals for the perched water are primarily designed to reduce the moisture content of the perched zone so that the contaminant transport rate in the vadose zone is reduced and radionuclide contaminants present in the perched zone have more time to naturally decay and reduce the concentration of potential contaminants released to the SRPA.

The perched water remediation goals will be accomplished by:

1. Limiting recharge to the perched zone by closing and relocating the existing percolation ponds, and ceasing lawn irrigation, where necessary, at the INTEC so that the moisture content is sufficiently reduced to retard Sr-90 migration by approximately three (3) half-lives (about 90 years).

If the moisture content and contaminant flux is not sufficiently reduced as indicated by moisture content and perched water monitoring and verified by the OU 3-13 vadose zone model, then additional infiltration controls will be implemented to achieve the necessary desaturation, and corresponding

reduction in contaminant transport rate, in the perched zone. The additional infiltration controls that will be implemented (in the listed order) include:

1. Lining the Big Lost River

2. Closing and relocating the existing Sewage Treatment Plant lagoons and infiltration galleries

3. Upgrading the INTEC-wide drainage controls, repairing leaking fire water lines, and eliminating steam condensate discharges.

These remediation goals support groundwater RAOs 1a through 1c, perched water RAOs 3a and 3b, and SRPA RAO 4b.

8.1.5 Snake River Plain Aquifer (Group 5)

The primary threat posed by SRPA is ingestion of contaminated groundwater. The remediation goals for the SRPA outside the current INTEC security fence are to:

1. Preventing current on-site workers and non-workers during the institutional control period from ingesting contaminated drinking water above the applicable State of Idaho groundwater standards or risk-based groundwater concentrations.

2. Achieving the applicable State of Idaho groundwater standards or risk-based groundwater concentrations in the SRPA plume south of the INTEC security fence by the year 2095.

Modeling predicts that the applicable State of Idaho groundwater standards will be naturally achieved by 2095, except for Sr-90, I-129, and plutonium isotopes. Modeling also predicts that removal of the existing percolation ponds (the principal component of the selected Perched Water remedy) will reduce the moisture content so that the individual Sr-90 MCL is achieved by 2095.

Modeling also has shown that plutonium, an alpha-emitting radionuclide, is not expected to exceed the 15 pCi/ L alpha-emitting radionuclide standard in the SRPA inside of the current INTEC security fence until the year 2750, with a peak concentration occurring in the year 3804. Remediation, if necessary, of the SRPA inside the current INTEC security fence will mitigate the future plutonium impacts in the SRPA outside the current INTEC security fence. The remedy for the SRPA inside the current INTEC security fence is being developed under OU 3-14. Therefore, a decision on plutonium remediation goals is deferred to the OU 3-14 ROD.

The SRPA remediation goals will be accomplished by:

1. Maintaining institutional controls over the area of the INTEC-derived SRPA contaminant plume outside of the current INTEC security fence to prevent exposure to contaminated groundwater during the time that groundwater in the aquifer remains above the remediation goals specified in Table 8-2.

2. Determining if groundwater quality outside the current INTEC security fence will be restored by 2095 and beyond. If the modeled action levels for COCS are exceeded, a contingent pumping and treatment action will be implemented to remove sufficient contaminant source to facilitate aquifer restoration by 2095.

These remediation goals support groundwater RAOs 1a through 1e, and SRPA RAOs 4a and 4b.

8.1.6 Buried Gas Cylinders (Group 6)

The principal threat posed by the buried gas cylinders is a safety hazard, including chemical exposure, fire, explosion, and projectile hazards. The remediation goal for the buried gas cylinders is to remedy the safety hazard posed by the disposed cylinders.

The remediation goal will be accomplished by:

1. Excavating, removing, treating, and disposing the cylinders (waste that meets the ICDF WAC will be disposed in the ICDF).

The Agencies may elect to pursue a contingent remedy of capping in place pursuant to the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310) if safety concerns with excavation and removal prevent implementation of the selected remedy.

The remediation goal supports Other Areas RAO 5a.

8.1.7 SFE— 20 Hot Waste Tank System (Group 7)

The principal threats posed by the SFE-20 Tank system is external exposure and the potential for a contaminant release to the environment. The remediation goals for the SFE-20 tank system are as follows:

1. Limit potential external exposures to workers and non-workers.

2. Remove radioactive and hazardous substances remaining in the tank system to prevent potential contaminant releases to the underlying soils or groundwater.

The remediation goals will be accomplished by:

1. Maintaining existing institutional controls to prevent current worker and non-worker exposure.

2. Removing, excavating, treating, and disposing the SFE-20 hot waste tank system waste and components to eliminate the threat of release to the environment (waste that meets the ICDF WAC will be disposed in the ICDF).

3. Remediating contaminated soils present beneath the SFE-20 tank system that may pose an external exposure risk or threat to groundwater (waste that meets the ICDF WAC will be disposed in the ICDF).

These remediation goals support Other Areas RAO 5a and also support groundwater RAOs 1a through 1c.

9 DESCRIPTION OF ALTERNATIVES

A range of cleanup alternatives was developed and evaluated against the nine CERCLA evaluation criteria for each of the seven release site groups. The alternatives were developed from a list of representative remediation technologies for technical and cost evaluation purposes. With the exception of the "No Action" alternative, the selected remedies are protective of ecological concerns. The "No Action" alternative is not protective of human health and the environment beyond the institutional control period. The alternatives evaluated for each group are summarized in the following sections. For more detailed descriptions of the evaluated alternatives refer to the OU 3-13 FS and FSS (DOE-ID 1997a, DOE-ID 1998a). More detailed descriptions of the selected alternatives are found in Section 11. It should be noted that during preparation of the cost estimates for the FS, assumptions were made regarding what activities comprise existing institutional controls (e.g., land use/site access restrictions, monitoring, maintenance). The following alternative descriptions reflect those assumed activities. The original broad assumptions have changed, however, and the current, more specific institutional control scenarios are presented in Section 11.

The alternative descriptions in this section and Section 10 are from the comparisons in the OU 3-13 FS. The selected alternatives have been refined subsequent to the FS. The detailed descriptions in Section 11 reflect these changes.

9.1 Tank Farm Soils Interim Action (Group 1)

After review of the OU 3-13 RI/FS, the Agencies determined that additional information was required to select a final remedy for this group of sites. The Agencies have postponed a final decision on the Tank Farm because of the uncertainty concerning contaminant extent, and site risks. Additional site characterization and risk analysis will be performed at the Tank Farm in a separate RI/FS that is designated as OU 3-14. Remedial alternatives will be developed in the OU 3-14 RI/FS using the existing and newly developed data and will be presented to the public in a separate proposed plan.

An interim action is selected for the Tank Farm in this ROD while the new RI/FS is conducted. The interim action will be performed to minimize contaminant exposures and to limit further impacts to soil and groundwater until a final remedy is implemented. A final remedy decision is anticipated prior to 2008. The interim action is consistent with the expected final remedy. Interim action alternatives were developed and evaluated for the Tank Farm in the FS Supplement. The implemented interim action will be designed to prevent exposure to contaminants present at the site and to minimize moisture that may infiltrate through the Tank Farm soils and leach and transport contaminants to the perched water, and possibly to the SRPA. Interim actions are justified because the facility will be in operation until 2012. Until the facility is closed, surface water controls remain necessary. This action will likely be a component of the final remedy. Three alternatives were developed and evaluated for the Tank Farm Soils Interim Action to meet the current remediation objectives and are discussed in the following sections.

9.1.1 Interim Alternatives Descriptions.

9.1.1.1 Alternative 1 — "No Action" with Monitoring. Alternative 1 consists of the existing institutional controls currently implemented at the site. No active remediation will be performed at the site to alter the existing conditions. The existing institutional controls include site access restrictions, radiation monitoring, and maintenance for a period of 8 years or until a final remedy decision is made by the Agencies and implemented.

9.1.1.2 Alternative 2— Enhanced Institutional Controls. Alternative 2 consists of the existing institutional controls described for Alternative 1 and additional monitoring and institutional controls. This additional monitoring and controls include the installation of new clustered monitoring wells in the perched water and aquifer to enhance the existing groundwater monitoring capabilities during the interim action period and to verify hydraulic parameters and water quality. They also include additional warning signs, surface and subsurface markers, and land use restrictions to prevent exposures to contaminated groundwater.

9.1.1.3 Alternative 3— Enhanced Institutional Controls with Surface Water Control. Alternative 3 includes the existing and additional institutional controls described for Alternative 2 and an interim remedy to control surface water run-on and infiltration at the Tank Farm. The interim remedy includes surface grading and sealing of the Tank Farm soils to divert 80% of the average annual precipitation away from the contaminated areas, and exterior building drainage improvements to direct water away from the contaminated areas so that moisture infiltration is minimized and contaminants are not mobilized. The run-on water will be managed as part of the existing surface water drainage system, and the run-off water will be collected and managed in a lined evaporation pond, to be constructed as part of this alternative.

9.2 Soils Under Buildings or Structures (Group 2)

Contaminant source releases are not well defined for the Soils Under Buildings and Structures sites. Contaminated soil release sites are assumed to be present as a result of accidental past releases during plant operations. The releases occurred under buildings or structures making characterization difficult. The primary threat posed by these sites is external exposure to radionuclide-contaminated soil if the buildings or structures are removed. The soils also pose a minor threat to groundwater. Although these potential releases to the environment are recognized, the release sites are not readily accessible and may remain covered by the facilities, since the buildings or structures may be closed in place as operations cease. The D&D program is determining the fate of individual buildings. Buildings may remain in place upon closure. Evaluations, conducted as part of the CERCLA 5-year review process, will confirm whether the presence of the existing structures over these sites limits soil exposures and moisture infiltration. Three alternatives were evaluated for the Soils Under Buildings or Structures group to minimize the threat of contaminant exposure or mobilization.

9.2.1 Alternatives Descriptions

9.2.1.1 Alternative 1 — "No Action" with Monitoring. Alternative 1 is comprised of existing institutional controls currently implemented at the site. No active remediation will be performed under this alternative to alter the existing site conditions. The existing institutional controls include DOE land use and site access restrictions. These controls will remain in place until 2095.

9.2.1.2 Alternative 2— Containment. Alternative 2 is a deferred action which includes the existing institutional controls described for Alternative 1, additional institutional controls, and soil containment with engineered barriers. The additional institutional controls may include land or regulatory restrictions to prevent inadvertent exposure to contaminants. The proposed engineered barriers will be comprised of natural earthen materials designed to isolate the contaminants until they are no longer a risk. The final cover designs will meet ARARs and are subject to the FFA CO review process. It should be noted that the engineered barriers cannot be constructed until adjacent building or structures have undergone D&D. In the meantime, the presence of the existing buildings or structures is assumed to limit soil exposures and moisture infiltration. The effectiveness of the buildings and structures in limiting exposures and infiltration will be evaluated as part of the CERCLA 5-year review process for OU 3-13.

If the building or structure is entombed in place, the end-state will be subject to review under the FFA/CO to ensure that the RAOs for perched water, surface soils. and the SRPA are met.

9.2.1.3 Alternative 3— Removal and Onsite Disposal. Alternative 3 was developed in the event that contaminated soils present beneath the buildings or structures become exposed following D&D. Alternative 3 includes the existing and additional institutional controls described for Alternative 2, and removal and on-Site disposal of contaminated soils exposed during D&D. The exposed contaminated soils will be excavated and disposed in the ICDF.

9.3 Other Surface Soils (Group 3)

The Other Surface Soils release sites resulted from miscellaneous contaminant spills or past waste disposal activities at the INTEC. The primary threat posed by most of these release sites is external exposure. One site (CPP-93) contains mercury at concentrations potentially hazardous to humans. Three of the sites. CPP-14, -44, and -55, pose solely an ecological risk because of nonradionuclide contaminants, such as mercury, chromium, and lead. These sites are being remediated under the screening action levels because of their small size (i.e., soil volume) and the cost benefit of not pursuing further studies on them. Five alternatives were evaluated for the Other Surface Soils release sites to address a range of potential cleanup actions that are protective of human health and the environment. The alternatives include existing and additional institutional controls, containment using an engineered barrier, removal and onsite disposal, and removal, ex situ treatment, and off-Site disposal.

9.3.1 Alternatives Descriptions

9.3.1.1 Alternative 1— "No Action" with Monitoring. Alternative 1 is comprised of existing institutional controls currently implemented at the site. No active remediation will be performed under this alternative to alter the existing site conditions. The existing institutional controls include site access restrictions, radiation surveys, air monitoring, and maintenance. These controls will remain in place until 2095.

9.3.1.2 Alternative 2— Institutional Controls. Alternative 2 includes the existing institutional controls described for Alternative 1 and additional institutional controls to control exposures to contaminated soils. The additional institutional controls include land use and/or regulatory restrictions to prevent inadvertent exposure to contaminants. For the boxed soils comprising Site CPP-92, the soils will be loaded into SEALAND®-type containers 10 years after ROD signature to provide additional stability and control.

9.3.1.3 Alternative 3— Containment. Alternative 3 includes existing and additional institutional controls described for Alternative 2 and containment using an engineered barrier. The proposed engineered barrier is comprised of natural earth materials and designed to isolate the contaminants, minimize water infiltration, and reduce contaminant leaching and transport for up to 1,000 years. The engineered barrier will be subject to operation and maintenance activities and 5-year reviews under CERCLA as long as an unacceptable risk remains. Some of the operating facilities may interfere with barrier construction so that final containment may not be implemented until facility D&D has concluded several decades in the future.

9.3.1.4 Alternative 4A— Removal and Onsite Disposal. Alternative 4A includes the existing institutional controls described in Alternative 1 and removal and onsite disposal of low level radioactive, hazardous, mixed low level radioactive waste, or PCB contaminated soils at each release site in this group. These excavated soils will be disposed in an ICDF. After removal of soils at individual sites,

institutional controls will be terminated at each site but maintained at the location of the ICDF. The ICDF is planned to be constructed southwest of the INTEC facility and west of the current INTEC percolation ponds.

ICDF—To implement onsite disposal of WAG 3 and other CERCLA-generated wastes at the INEEL, construction and operation of an engineered disposal facility is proposed. The ICDF will be an engineered facility meeting RCRA Subtitle C design and construction requirements, which are the same regulations required for commercial disposal facilities.

The ICDF will be constructed with a disposal capacity of about 400,000 m^3 (510,000 yd^3). The disposal cells, including a buffer zone, will cover approximately 219,000 m^2 (80 acres). Current projections of INEEL-wide CERCLA waste volumes total about 356,283 m^3 (466,000 yd^3). The selected location (Figure 11 -3) lies beyond the area that would be inundated by the Big Lost River 100-year flood event. However, design criteria for the life for the facility's include protection from inadvertent intrusion for up to 1,000 years. Therefore, a 1,000-year flood event, assuming Mackay Dam failure, will be evaluated during the remedial design.

The ICDF will accept only those wastes generated within INEEL boundaries during CERCLA actions. The OU 3-13 wastes lie within the WAG 3 AOC. Other INEEL wastes are not included within the OU 3-13 AOC. Wastes proposed for disposal at the ICDF would include low-level, mixed low-level, hazardous, and limited quantities of Toxic Substances Control Act (TSCA) wastes. Most of the waste will be contaminated soil, but wood and debris from sites CPP-98 and CPP-99 and other INEEL CERCLA sites are expected; specific waste acceptance criteria will be developed during RD. Acceptance criteria will include restrictions on contaminant concentrations based on groundwater modeling results and the goal of preventing potential future risk to the SRPA.

9.3.1.5 Alternative 4B— Removal, Treatment, and Off-Site Disposal. Alternative 4B is identical to Alternative 4A except that disposal is an off-Site facility is contemplated. Soils will be selectively excavated to reduce the soil volume, packaged, and transported by truck or rail to a permitted engineered disposal facility located off-Site. Waste will be treated off-Site at the receiving facility, if necessary, to satisfy land disposal restrictions.

9.4 Perched Water (Group 4)

Although contaminants may be present in the perched water, this water does not pose a threat to human health because it is not available for consumption. However, it does pose a risk to human health and the environment because of its potential to migrate to the SRPA, which is designated as a primary drinking water source. Three alternatives were developed and evaluated to limit exposure to contaminated perched water, and to prevent this water from contaminating the SRPA.

9.4.1 Alternatives Descriptions

9.4.1.1 Alternative 1— "No Action" with Monitoring. Alternative 1 is comprised of existing institutional controls currently implemented at the site. No active remediation will be performed under this alternative to alter the existing site conditions. The existing institutional controls include site access restrictions, radiation surveys, perched water monitoring, and wellhead maintenance. These controls will remain in place until 2095.

9.4.1.2 Alternative 2— Institutional Controls with Aquifer Recharge Control. Alternative 2 proposes existing and additional institutional control and aquifer recharge controls to

prevent exposures to perched water and to reduce moisture content in the perched water. The existing institutional controls are the same as those described for Alternative 1. The additional institutional controls may include land or regulatory restrictions, to prevent inadvertent exposure to contaminated perched water. In addition, perched water-monitoring wells will be installed to provide additional information about the deep perched water. The proposed remedies are actions that control sources supplying water to the perched zone. The aquifer recharge controls, discussed below, are designed to reduce leaching and transport of soil contaminants to perched water, reduce the volume of water in the perched zone, and minimize contaminated perched water releases to the SRPA.

The initial aquifer recharge controls will include removal of the percolation ponds from service and discontinuing lawn irrigation at the INTEC, where necessary. A major contribution to the perched water originates from the existing percolation ponds, which contribute approximately 70% of the water recharging the perched water bodies. Removal of this water source will slow the rate of contaminant transport to the SRPA sufficiently to allow natural radioactive decay to reduce the mass of Sr-90 in the perched zone so that applicable groundwater quality standards will not be exceeded in 2095 or beyond in the SRPA. Discharge to the existing percolation ponds will cease on or before December 31, 2003. See Section 11 for a more detailed description.

If removal of the percolation ponds and ceasing lawn irrigation do not protect the aquifer, additional aquifer recharge controls will be implemented. Additional recharge controls may include lining the Big Lost River (which contributes about 21% of the perched water recharge), repairing leaking fire water lines, curtailing steam condensate discharges to the subsurface, or removing the existing Sewage Treatment Plant lagoons and infiltration galleries. The costs of implementing these additional recharge controls have not been included in the cost estimates in Section 11.

9.4.1.3 Alternative 3— Aquifer Recharge Control and Perched Water Removal, Treatment, and Disposal. Alternative 3 consists of the existing and additional institutional controls and aquifer recharge controls described for Alternative 2 with localized pumping, treatment, and disposal of perched water contaminant hotspots for a period of 25 years. Localized perched water extraction would attempt reduction of contaminant mass and contaminant flux to the SRPA. Five new extraction wells would be installed to perform perched water removal and would be included in the perched water-monitoring program. Contaminated perched water would be removed from the five new wells and nine existing wells using pulsed pumping at low pumping rates to allow for sufficient well recovery. Extracted perched water would be stored in storage tanks, and treated and disposed. Approximately 174 million L (46 million gal) of perched water would be extracted under this alternative.

9.5 Snake River Plain Aquifer Interim Action (Group 5)

Contamination in the SRPA primarily resulted from historic wastewater disposal practices at the former INTEC injection well. The COCs are radionuclides and mercury. The contaminated soils and, perched water also contribute to future contamination in the SRPA. Predictive modeling suggests that if recharge source control actions are not taken, additional contamination mav be leached and transported to the SRPA. In the conceptual model, the currently contaminated perched water is also a significant source of future contamination to the SRPA. Four alternatives were developed to manage the risk posed by contaminants in the SRPA.

9.5.1 Alternatives Descriptions

9.5.1.1 Alternative 1— "No Action" with Monitoring. Alternative 1 is comprised of existing institutional controls presently implemented at the site to minimize potential exposure to contaminated

groundwater. No active remediation be performed under this alternative to alter the existing site conditions. The existing institutional controls include site access restrictions, radiation surveys, groundwater monitoring, and maintenance. These controls will remain in place until 2095. Groundwater monitoring will include sampling and analysis of existing and new groundwater wells until 2095 to determine changes in contaminant concentrations and water quality, and the rate of the contaminant plume migration. Groundwater monitoring will be conducted, as necessary, to verify achievement of the RAOs.

9.5.1.2 Alternative 2A— Institutional Controls, Monitoring, and Source Control.

Alternative 2A proposes the existing institutional controls described for Alternative 1, additional institutional controls, and additional monitoring and perched water infiltration source control to limit exposure to contaminated groundwater. The additional institutional controls include land use or regulatory restrictions to prevent exposure to contaminated groundwater within the INTEC. In addition, six new groundwater-monitoring wells will be installed to supplement the 10 existing wells. Under this alternative, contaminants present in the SRPA will decrease in concentration by radioactive decay and dispersion. Source control measures, included in other alternative remedies (Group 4, Alternatives 2 and 3), significantly decreases future contamination in the SRPA. Predictive modeling demonstrates that if the contaminant contributions from the perched water mobilized by the existing percolation ponds are eliminated by relocation of the percolation ponds, then contaminant concentrations in downgradient wells will still be slightly above acceptable limits at year 2095. Monitoring will be conducted to assess reduction of contaminant levels in the SRPA and to ensure that no down-gradient receptors will be impacted. Monitoring will be maintained until the contaminant concentrations are below the RAOs.

9.5.1.3 Alternative 2B— Institutional Controls with Monitoring and Contingent Remediation.

Alternative 2B includes the existing and additional institutional controls described for Alternative 2A plus active groundwater remediation if sufficient quantities of contaminants of concern are found above the groundwater action level(s).

This action level(s), which is based on modeling results described in Section 5.3.2.3 of the FS Supplement (DOE-ID 1998a), ensures that existing concentrations of I-129 measured in the SRPA will not result in groundwater concentrations in the year 2095 exceeding the derived MCL of 1 pCi/L. If action levels are exceeded, as described in Section 11, treatability studies will commence to determine if pumping from the zones of highest contamination is feasible and to evaluate methods to remove I-129 or other COCs from the groundwater.

The cost estimate for this alternative is based on the assumption that groundwater will be extracted from about 20 wells at an estimated rate of 3.8 L/min (1 gpm) per well. The actual number of wells and extraction rates will be determined during remedial design. Actual treatment technologies will be selected during the proposed treatability studies, For comparison and cost estimating purposes, ion exchange treatment technology is assumed to be part of this alternative. Remedial action will be terminated following the removal of the design-specified volume of groundwater.

9.5.1.4 Alternative 3— Contingent Localized Groundwater Removal, Treatment, and Disposal.

Alternative 3 includes the existing and additional institutional controls described for Alternative 2B, and localized removal, treatment, and disposal of groundwater extracted from SRPA hotspots until 2095, if the I-129 or other COCs action level(s) is exceeded. Groundwater will be extracted from the full vertical extent of the aquifer without targeting any specific layer. Groundwater extraction from within hotspots will locally reduce the contaminant mass in the aquifer. Five new extraction wells and six new injection wells will be installed in areas of high contaminant concentrations in the SRPA to depths, of about 183 m (600 ft) bgs. Actual treatment technologies will be selected during the proposed treatability studies. For comparison and cost estimating purposes, the most likely candidate treatment

technology, ion exchange, is assumed to be part of this alternative. Extracted groundwater will be treated in a newly constructed water treatment plant using ion exchange to concentrate the contaminants. The concentrated waste will be treated and disposed onsite. The remediated water will be reinjected into the aquifer through the six injection wells. Remediation could be challenging and may require treatability studies because current technology is not sufficiently developed to remove I-129 to its derived MCL of 1 pCi/L. The treatability studies will also evaluate the presence of mercury, Sr-90, chromium, Tc-99, and tritium, all of which are known or are predicted to be present in the groundwater plume at significant concentrations. While these contaminants are not long-term risk drivers, they may foul the groundwater treatment system or pose radiological exposure concerns if brought to the surface for treatment. Groundwater extraction and injection will also reduce contaminant transport by hydraulically controlling the contaminant plume in localized areas. A total of approximately 492 billion L (130 billion gal) of water, over the 100-year operating life, would be extracted and treated under this alternative.

9.6 Buried Gas Cylinders (Group 6)

The Buried Gas Cylinders group is comprised of Sites CPP-84 and CPP-94. These sites generally contain buried compressed gas cylinders that contain construction gases at Site CPP-84 and hydrofluoric acid at Site CPP-94. The exact number of cylinders is unknown but is estimated to be between 40 and 100. The principal threat posed by either of these sites is the potential for an injury caused by puncture or explosion of the cylinders. A risk assessment was not performed for these sites during the RI/BRA. Three alternatives were developed and evaluated for the Buried Gas Cylinders to address the safety hazards posed by these sites.

9.6.1 Alternatives Descriptions

9.6.1.1 Alternative 1— "No Action" with Monitoring. Alternative 1 consists of existing institutional controls. Under Alternative 1, no active remediation will be performed at the site. The existing institutional controls will consist of security, access restrictions, and site inspections until 2095.

9.6.1.2 Alternative 2— Removal, Treatment, and Disposal. Alternative 2 consists of the removal, ex situ treatment, and disposal of the gas cylinders at each site. This alternative will also include initial site characterization using geophysical surveys to determine the location and quantity of buried gas cylinders prior to removal. After the cylinders are located, they will be removed using conventional excavation techniques within a containment structure. Gases present in the excavated cylinders will be vented to the atmosphere if they are benign, or treated using a method suitable for the particular gas. A contractor that specializes in gas cylinder removal, treatment, and disposal will perform Alternative 2. The subcontractor performing work at an appropriate offsite facility will dispose of any treatment residuals. The sites will be maintained under existing institutional controls until the cylinders are removed, treated, and disposed.

9.6.1.3 Alternative 3— Containment. Alternative 3 consists of the existing institutional controls described for Alternative 1, additional institutional controls, and containment. Additional institutional controls wil1 include land-use or regulatory restrictions. The principal component of Alternative 3 is containment using an engineered barrier. The barrier will consist of natural earthen materials designed to isolate the buried gas cylinders. A concrete pad will be poured over each of the sites prior to placement of the engineered barrier to minimize the potential for an uncontrolled gas release during barrier construction.

9.7 SFE-20 Hot Waste Tank System (Group 7)

Based on the results of the preliminary investigation conducted at the SFE-20 site in 1984, radiological contamination is present within the tank liquids and sludges, and on the tank, tank vault, and pump pit surfaces. The principal threat posed by the SFE-20 tank system is a release of the radioactive contaminants from the tank due to loss of integrity that could potentially contaminate soils, perched water, or SRPA groundwater beneath the site. In 1976, the tank and its transfer system were replaced. The SFE-20 inlet pipe was disconnected, and the pipe leading to the SFE-20 tanks was capped. At present, there is no exposure to humans or ecological receptors under existing conditions given that the tank vault is 3 m (10 ft) below the ground surface and area access is restricted. However, radiation exposure could occur if the existing access restrictions are not maintained. In addition, the excavation needed to cap the piping to SFE-20 may have been backfilled with radionuclide contaminated soil. Four alternatives were developed and evaluated for the SFE-20 tank system to limit exposure to radiation or to minimize the potential for a release to occur from the tank system.

9.7.1 Alternatives Descriptions

9.7.1.1 Alternative 1— "No Action" with Monitoring. Alternative 1 consists of existing institutional controls. Under Alternative 1, no active remediation will be performed at the site. The existing institutional controls will consist of security, access restrictions, site inspections, environmental monitoring, and general maintenance until 2095.

9.7.1.2 Alternative 2— In Situ Stabilization with Containment. Alternative 2 consists of the existing institutional controls described for Alternative 1, additional institutional controls, in situ treatment, and containment. Characterization of tank liquid, sludge, and surrounding soil is needed for remedial design. Additional institutional controls will include land-use and regulatory restrictions. The principal component of Alternative 2 is containment using an engineered barrier. The barrier will consist of natural earthen materials designed to minimize exposure and moisture infiltration at the site for up to 1,000 years. Prior to placing the barrier, the tank system, including the tank vault, will be filled with concrete grout to stabilize tank liquids and sludge and minimize differential settlement after capping.

9.7.1.3 Alternative 3— Liquid Removal and Treatment with In Situ Stabilization. Alternative 3 consists of existing and additional institutional controls described for Alternative 2, removal and ex situ treatment of the tank liquid, and in situ treatment of the tank sludge, tank, and associated structures. Characterization of tank liquid, sludge, and surrounding soil is needed for remedial design and liquid waste disposal. The tank liquid will be removed and treated at the PEW evaporator. The tank sludge, tank, and associated structures will be filled with concrete or similar grout to solidify and stabilize the contaminants that remain.

9.7.1.4 Alternative 4— Removal, Treatment, and Disposal. Alternative 4 includes the existing institutional controls described for Alternative 1, removal and ex situ treatment of the tank liquid and sludge, and excavation, removal, and onsite disposal of the tank and associated structures. The tank liquid will be removed and treated as described in Alternative 3. The tank sludge will be removed and treated (ex situ) using a suitable grout to solidify and stabilize the contaminants in the sludge. Characterization of tank sludge, liquid, and surrounding, soil is needed for remedial design and waste disposal. The sludge will be drummed and disposed at a suitable engineered disposal facility. The remaining components of the tank system will be excavated, removed, and disposed either in the ICDF or offsite depending on the ICDF waste acceptance criteria. The excavation will be backfilled to grade with clean soils.

10. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives discussed in Section 9 were evaluated against the nine evaluation criteria as specified by CERCLA. These criteria include:

1. **Overall Protection of Human Health and the Environment**—This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with ARARs**—This criterion addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

3. **Long-Term Effectiveness and Permanence**—This criterion refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4. **Reduction of Toxicity, Mobility, or Volume Through Treatment**—This criterion addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the COCs, including how treatment is used to address the principal threats posed by the site.

5. **Short-Term Effectiveness—**This criterion addresses any adverse impacts on human health and the environment that may be posed during the construction and implementation period, and the period of time needed to achieve cleanup goals.

6. **Implementability—**This criterion addresses the technical and administrative feasibility of a remedy including the availability of materials and services needed to implement a particular option.

7. **Cost—**This criterion includes estimated capital and operation costs, expressed as net present-worth costs.

8. **State Acceptance—**This criterion reflects aspects of the preferred alternative and other alternatives that the state favors or objects to and any specific comments regarding state ARARs or the proposed use of waivers.

9. **Community Acceptance—**This criterion summarizes the public's general response to the alternatives described in the Proposed Plan and in the RI/FS, based on public comments received.

A detailed comparative analysis of the alternatives for each release site group is presented in Section 6 of the OU 3-13 FS (DOE-ID 1997a) and the FS supplement (DOE-ID 1998a). A summary of this analysis for the first seven CERCLA criteria is presented by site release group in the following text and in Tables 10-1 through 10-7. A discussion of CERCLA Criteria 8 and 9 is found in Section 10.8.

10.1 Tank Farm Soils Interim Action (Group 1)

10.1.1 Overall Protection of Human Health and the Environment

Alternative 3 provides the most overall protection of human health and the environment, All three alternatives limit human and ecological receptor exposure to contaminants by maintaining the existing institutional controls, which are a common component of all of the alternatives. Alternatives 1 and 2 do not provide any direct action to limit leaching and transport of contaminants from the surface soils to the perched water. Alternative 3 includes remedies involving engineering controls to limit surface water infiltration into contaminated soils and leaching and transport of contaminants to perched water. Implementation of surface water controls to limit future soil contaminant leaching and transport to the perched water will reduce the future risk to the SRPA. All of the alternatives will provide perched water monitoring to determine if additional degradation of perched water is occurring. Table 10-1 summarizes the comparative analysis of the Tank Farm Soils interim action alternatives.

10.1.2 Compliance with ARARs

All of the proposed alternatives comply with the ARARs and to be considered (TBCs) during the interim action period, which ends in 2008. These alternatives would also comply with the ARARs beyond the interim action period as long as the existing institutional controls are maintained. ARARs concerning monitoring well installation and other construction activities will be met using engineering controls, health and safety practices, and radiological control methods.

10.1.3 Long-term Effectiveness and Permanence

None of the proposed alternatives provide long-term effectiveness or permanence. As interim measures, the period of performance is assumed to be about 8 years (until 2008) or until the final remedy is selected and implemented. The proposed alternatives will minimize human and ecological receptor exposure to contaminants during the interim action period. Alternative 3 will limit further perched water degradation during the interim action period. It is presumed that the final Tank Farm remedy developed under OU 3-14 , will provide an effective and permanent long-term solution that mitigates human and environmental exposure risks and limits further perched water degradation.

10.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the alternatives provide a reduction of toxicity, mobility, or volume through treatment since treatment will not be implemented during the interim action period. Some reduction in contaminant mass, and thus volume, is achieved indirectly through natural radioactive decay of short-lived radionuclides, such as Cs-137 and Sr-90; however, the contaminant toxicity will remain the same. Reduction in contaminant mobility will be achieved by implementing the surface water controls in Alternative 3 to limit leaching and transport of soil contaminants to the perched water.

10.1.5 Short-term Effectiveness

All of the alternatives can be implemented without significant additional risk to the community or workers. The primary risk to the workers from implementation of Alternatives 2 and 3 involves fugitive dust and toxic substance emissions, which will be controlled with dust suppressants and engineering controls. Alternatives 2 and 3 also pose a very minor risk to workers from direct exposure to radiation and personal injury during construction activities. Sampling of the monitoring wells proposed in all

Table 10-1. Summary of comparative analyses for the Tank Farm Soils Interim Action, Group 1.

Criterion	Alternative 1	Alternative 2	Alternative 3
Overall Protection	N	N	Y
Compliance with AR.ARS	Y	Y	Y
Long-term Effectiveness	5	5	3
Reduction of Toxicity, Mobility. or Volume	N	N	N
Short-term Effectiveness	3	3	3
Implementability	1	3	3
Net Present Value Cost	$3.4M	$10.0M	$15.1M

5 = least satisfies criterion: 1= best satisfies criterion. Y = yes, criteria will be met; N = no, criteria will not be met

alternatives, poses very minor risks to personnel. Alternative 3 poses similar risks to workers while implementing the surface water controls. Personal injury and radiation exposure will be minimized through radiological engineering controls and safe work practices to maintain exposures ALARA. An alternative will be protective of the community in the short term as the Tank Farm is not located near a population base and access restrictions will remain in place during the interim action period. All three alternatives will be protective at the time of implementation.

10.1.6 Implementability

All of the proposed alternatives are technically and administratively implementable. None of the alternatives require any special materials, equipment, or personnel that are not readily available at the site. Each of the alternatives can be easily implemented using existing controls along with standard sampling, monitoring, and construction methods that are currently used at the site. Alternative 1 is the easiest to implement since it allows for continuation of the existing activities at the Tank Farm and the INTEC. Alternatives 2 and 3 involve additional monitoring well construction and implementation of surface water controls. which are also readily implemented by personnel at the site. Minor implementability concerns are posed by the underground utilities in and around the Tank Farm while implementing subsurface activities. These risks will be minimized through coordination with operating personnel familiar with the Tank Farm and the adjoining facilities.

10.1.7 Cost

Alternative I is the least costly of the proposed Tank Farm interim action alternatives, as it implements current ongoing institutional controls, The cost includes management and oversight. monitoring-, analysis and reporting, maintenance, and inspections. Alternatives 2 and 3 both have increased capital and operating and maintenance(O&M) costs over those of Alternative 1 associated with installing monitoring wells, monitoring perched water, and implementing surface water controls. Alternative 3 is the most expensive alternative evaluated because it includes the largest quantity of capital improvements to implement the remedies (i.e., surface grading and drainage improvements). The increased cost for Alternative 3 is reflective of the fact that it provides the greatest overall protection of the three alternatives. The costs for the interim action alternatives are based on an interim action period that ends In 2008. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a).

10.2 Soils Under Buildings and Structures (Group 2)

10.2.1 Overall Protection of Human Health and the Environment

All of the proposed alternatives provide overall protection of human health and the environment during the institutional control period, which ends in 2095. Beyond 2095, only Alternatives 2 and 3 provide long-term protection and satisfy the applicable RAOs. Current workers will be protected by the existing institutional controls proposed in each alternative. Alternative 2 provides long-term protection of human health and the environment by isolating the contaminants with an engineered barrier designed to last for at least 1,000 years and implementing additional institutional controls. The barrier and the additional institutional controls prevent inadvertent exposures to humans or ecological receptors by limiting contaminant accessibility through engineering controls and land use restrictions. The presence of the existing buildings or structures is assumed to provide the functional equivalent of an engineered barrier and will minimize exposures until D&D is completed. Alternative 3 provides the most overall protection of human health and the environment by removing contaminated soils exposed during D&D and disposing them in the proposed ICDF. Removal of the soils will prevent exposure of humans or ecological receptors to soil contaminants. Table 10-2 summarizes the comparative analysis of the Soils Under Buildings and Structures alternatives.

10.2.2 Compliance with ARARs

All of the alternatives meet the ARARs and TBCs during the institutional control period, which ends in 2095. Beyond 2095, only Alternatives 2 and 3 satisfy ARARs. Alternative 2 meets the ARARs using institutional controls and an engineered barrier designed for 1,000 years of protection. Alternative 3 satisfies ARARs through the use of engineering controls while removing the contaminated soils and disposing of the contaminated materials in an engineered disposal facility designed to provide long-term protection of human health and the environment.

10.2.3 Long-term Effectiveness and Permanence

Alternative 1 does not provide any long-term effectiveness or permanence, because the existing institutional controls will end in 2095. and no exposure controls will remain in place. Alternative 2 provides reliable long-term effectiveness and permanence by reducing human or ecological receptor exposure to contaminants beyond 2095. The proposed engineered barrier is designed to provide long-term isolation of these release sites for up to 1,000 years. during which time the residual risk will decrease by natural radioactive decay. Alternative 3 will provide the most long-term effectiveness by removing the contaminated soils exposed during D&D and disposing of them in the proposed ICDF that will be designed for long-term isolation of radioactive materials. The residual risk posed by soils disposed in this engineered disposal facility will naturally decrease by radioactive decay of the short-lived radionuclides.

10.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the alternatives reduce the toxicity, mobility, or volume of contaminants through treatment, as treatment is not included in any of the alternatives. Contaminants are indirectly reduced over time by natural radioactive decay under each alternative. Contaminant bioavailability to human and ecological receptors is also reduced by the engineered barrier. Removal and disposal of the soil contaminants in the proposed ICDF will also indirectly reduce the contaminant mobility by long-term contaminant isolation.

Table 10-2. Summary of comparative analyses for the Soils Under Buildings and Structures, Group 3.

Criterion	Alternative 1	Alternative 2	Alternative 3
Overall Protection	N	Y	Y
Compliance with ARARs	N	Y	Y
Long-term Effectiveness	5	3	1
Reduction of Toxicity, Mobility, or Volume	N	N	N
Short-term Effectiveness	5	3	5
Implementability	1	1	5
Net Present Value Cost		S6.4M	

a. Cost does not include the pro-rata share for construction and operation of the ICDF.

5 = least satisfies criterion, 1 = best satisfies criterion: Y = yes, criteria will be met; N = no, criteria will not be met.

10.2.5 Short-term Effectiveness

Alternative 1 can be implemented without any additional risks to the community, or workers; however, soil contaminants will continue to be accessible to ecological receptors under this alternative. Alternatives 2 and 3 can be implemented without any additional risks to the community, workers, or the environment. Risks to workers and the environment will be increased slightly during barrier construction, or soil excavation, because of worker exposure to contaminated soils, fugitive dust emissions to the environment, and the potential for personal injury accidents. Engineering controls will be used during barrier construction, or soil excavation, to minimize contaminant exposures or releases. Safe work practices will be used to minimize personal injuries. All three alternatives will meet RAOs for the soil pathway during the institutional control period. Alternatives 2 and 3 will be protective at the time of implementation.

10.2.6 Implementability

Alternatives 1 and 2 are technically and administratively feasible and can be easily implemented. Existing institutional controls proposed in Alternative 1 are currently implemented at the site and are easily continued. The additional institutional controls and engineered barrier provided in Alternative 2 have been used at other Superfund sites with similar contaminants and pose no special legal, engineering, or construction concerns. Engineered barrier construction is similar to other types of earthwork, such as highway construction, and requires no special personnel, equipment, or materials. The only significant implementability issue concerns the timing of barrier construction. The barrier cannot be constructed until adjacent buildings or structures have undergone D&D, which may not occur for several decades in the future. Alternative 3 also is readily implemented. but only if the buildings are completely removed during D&D. The timing for implementation of Alternative 3 is also dependent on D&D activities that are projected to extend over the next several decades. In addition. Alternative 3 also depends on the construction of the proposed ICDF.

10.2.7 Cost

Alternative 1 is the least costly of the alternatives because it implements ongoing institutional controls. However, it is also the least protective and effective of the alternatives. Alternative 3 is less costly than Alternative 2. although the cost does not include costs associated with constructing and

operating the proposed ICDF. Alternative 2 is the most expensive alternative because of the capital costs involved in constructing the engineered barriers. However, it is easily implemented, effective, and protective of human health and the environment, all of which are reflected in the higher cost. Alternative 3 has the least O&M costs because of the elimination of environmental monitoring costs after the soils are excavated. The O&M costs are based on an institutional control period through the year 2095. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a).

10.3 Other Surface Soils (Group 3)

10.3.1 Overall Protection of Human Health and the Environment

Alternatives 3. 4A, and 4B provide the most overall protection of human health and the environment of the alternatives evaluated because the contaminants will either be permanently isolated or removed and disposed in an engineered disposal facility. Alternatives 1 and 2 temporarily reduce human health risks during the institutional control period. which ends in 2095. However, Alternatives 1 and 2 are not protective of the environment because the contaminants will continue to be accessible to ecological receptors. Alternative 3 provides less overall protection than Alternatives 4A and 4B, since the contaminants cannot be covered in place by an engineered barrier during the operating life of the INTEC. Alternatives 4A and 4B will permanently remove the contaminants from the release sites. Table 10-3 summarizes the comparative analysis of the Other Surface Soils group alternatives.

10.3.2 Compliance with ARARs

All of the alternatives will satisfy the ARARs, except for Alternatives 1 and 2, which will only meet the ARARs during the institutional control period. Alternatives 3, 4A, and 4B will satisfy the ARARs using engineering controls to minimize fugitive dust emissions, health, safety, and radiological practices to limit exposures to workers, long-term containment to isolate the contaminated soils, or soil excavation and disposal to eliminate exposures to humans or the environment.

10.3.3 Long-term Effectiveness and Permanence

Alternatives 1 and 2 do not provide reliable long-term effectiveness or permanence because the existing institutional controls will end in 2095. Land use restrictions limiting land and groundwater use in Alternative 2 will provide some measure of long-term protection if maintained beyond 2095, but these controls may not effectively control potential exposure to contaminants. For Alternatives 1 and 2, natural processes, such as precipitation infiltration, erosion, and biointrusion, may cause a contaminant release to the environment. Containment of contaminated soils using an engineered barrier (Alternative 3) will provide long-term effectiveness and permanence, since the proposed barrier will designed to provide isolation for at least 1,000 years, during which time the residual risk will decrease by radioactive decay. Alternatives 4A and 4B will provide the best long-term protection by excavating contaminated soils to a depth of 3 m (10 ft) and disposing in either an on-Site (the proposed ICDF) or off-Site engineered disposal facility designed for long-term protection and contaminant isolation.

10.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 1, 2, 3. and 4A do not reduce the toxicity, mobility, or volume through treatment as no treatment technologies are included in these alternatives. Construction of an engineered barrier under Alternative 3 reduces contaminant mobility by minimizing water that moves through the contaminated soils, reducing leaching and transport of contaminants. Alternatives 4A and 4B limit contaminant mobility at the release site by excavating and disposing of contaminated soils at an engineered disposal site designed to limit contaminant releases to the environment.

Table 10-3. Summary of comparative analyses for the Other Surface Soils. Group 3.

Criterion	Alternative 1	Alternative 2	Alternative 3	Alternative 4A	Alternative 4B
Overall Protection	N	N	Y	Y	Y
Compliance with ARARs	N	N	Y	Y	Y
Long-term Effectiveness	5	3	3	1	1
Reduction of Toxicity, Mobility, or Volume	N	N	N	Y	Y
Short-term Effectiveness	1	1	3	3	5
Implementability	1	2	3	3	5
Net Present Value Cost	$6.8M	$15.0M	$37.5M	$84.9M	$208.4M

5 = least satisfies criterion. 1 = best satisfies criterion Y = yes, criteria will be met. N = no, criteria will not be met.

10.3.5 Short-term Effectiveness

Alternatives 1 and 2 can be implemented without any additional risks to the community, workers or the environment. Implementing Alternative 1 or 2 will not increase environmental risks that presently exist at the sites. Earthmoving activities associated with Alternatives 3, 4A, and 4B may generate fugitive dust emissions or cause personal injury accidents that pose minor risks to workers or the environment. These risks will be minimized using dust suppressants or other engineering controls, and health, safety, and radiological practices. Transportation of contaminated soils off-Site (Alternative 4B) also poses a minor risk to communities; however, potential exposures due to transportation accidents are considered minimal. Surface soil RAOs will be achieved with all alternatives during the institutional control period. However, only alternatives 3, 4A, and 4B will attain RAOs after the institutional control period. These three alternatives will be protective at the time of implementation.

10.3.6 Implementability

All of the proposed alternatives are technically and administratively feasible because they use proven remedial technologies that are readily available. Alternative 1 is readily implemented because the existing institutional controls are currently ongoing at the site and are easily continued. Alternative 2 is also easily implemented as land use restrictions limiting land and groundwater use are used routinely at Superfund sites. Construction of engineered barriers over the Other Surface Soils release sites, Alternative 3, poses several technical difficulties. Heavy equipment would be required for barrier construction and would be required to operate within an operational radioactive material processing and storage facility without damaging existing tanks, buildings, utilities, or other infrastructure. Continued operation of the INTEC would also be affected significantly due to the presence of these construction activities and the subsequent interference to material handling and traffic flow caused by the barriers.

Alternatives 4A and 4B involve excavation of contaminated soils and either on-Site disposal at the proposed ICDF or treatment and off-Site disposal. Both of these alternatives are implementable as they use standard excavation equipment and disposal at an engineered disposal facility which is similar to a common landfill operation. Alternative 4A will require the procurement, design, and construction of an on-Site soil disposal site southwest of the INTEC facility (see Section 9.3.1.4). Alternative 4B is the most difficult alternative to implement because it requires the removal, treatment, and transportation of large

volumes of contaminated soils, great distances off-Site and depends on the availability of off-Site disposal.

10.3.7 Cost

Alternative 1 is the least expensive of the proposed alternatives, but also provides the least long-term effectiveness. Costs increase proportionally for Alternatives 2, 3, 4A, and 4B because of capital cost expenditures, as do the overall protectiveness and effectiveness of each alternative. Alternative 4A, which involves construction design, construction. and operation of an on-Site disposal facility for excavated soils and debris, is designed for INEEL-wide disposal. Alternative 4B, which involves treatment and off-Site disposal, is the most costly alternative. The O&M costs for Alternatives 2, 3, and 4A are based on an institutional control period through the year 2095. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a).

10.4 Perched Water (Group 4)

10.4.1 Overall Protection of Human Health and the Environment

All of the proposed perched water alternatives will provide overall protection of human health and the environment during the institutional control period, which ends in 2095. Alternative 1 will only be protective until 2095. However, excluding Tank Farm contaminant contributions, which are being addressed by OU 3-14. Alternatives 2 and 3 will reduce contaminant flux to the SRPA, resulting in SRPA groundwater MCLs being met. Alternative 2 eliminates exposure to contaminants using land and groundwater use restrictions and minimizing contaminant transport between the surface soils and the SRPA by limiting the available water in the perched zone. The available water will be reduced by closing the existing percolation ponds. Decreased water content in the perched zone will increase the contaminant travel times, allowing for radioactive decay and natural attenuation processes to decrease contaminant concentrations and reduce the residual risk in the perched zone and the SRPA. Alternative 3 only provides minor additional protection of human health and the environment over Alternative 2 by removing contaminant mass and decreasing the water content of the perched zone at an increased rate at contaminant hotspots. Table 10-4 summarizes the comparative analysis of the Perched Water alternatives.

10.4.2 Compliance with ARARs

Alternative 1 does not satisfy the ARARs. Alternatives 2 and 3 meet all of the ARARs if the Tank Farm contaminant contributions are excluded. Plutonium from the Tank Farm soils was predicted to reach the SRPA at concentrations of concern in the future. This predicted migration of plutonium to the aquifer would only occur if current transport assumptions for plutonium isotopes hold true, and no further actions were taken at the Tank Farm (see Section 6 of the RI/BRA for additional information). Remediation of the radionuclide-contaminated soil sources will be addressed in the Tank Farm RI /FS, OU 3-14.

10.4.3 Long-Term Effectiveness and Permanence

Alternative 1 will not provide long-term protection because no active remedial measures will be implemented. The existing institutional controls temporarily, reduce human health and environmental risks. but will only be in effect until 2095. After 2095. Alternative 1 provides no long-term protection. Infiltration controls implemented as part of Alternative 2 to control aquifer recharge will provide long-term effectiveness and permanence, prior to and beyond 2095, through restrictions limiting land and

Table 10-4. Summary of comparative analyses for the Perched Water, Group 4.

Criterion	Alternative 1	Alternative 2	Alternative 3
Overall Protection	N	Y*	Y*
Compliance with ARARs	N	Y*	Y*
Long-Term Effectiveness	5	1	1
Reduction of Toxicity, Mobility, or Volume	N	N	Y
Short-Term Effectiveness	1	3	5
Implementability	1	3	5
Net Present Value Cost	$7.3M	$20.0M	$259.2M

* = excluding Tank Farm contaminant contributions, reduced contaminant flux to the SRPA will satisfy the MCLs.

5 = least satisfies criterion. 1 = best satisfies criterion; Y = yes, criteria will be met; N = no, criteria will not be met.

groundwater use and by reducing the water available for contaminant transport in the perched zone. Alternative 2 will minimize the perched water contaminant transport rate between the surface soils and the SRPA. Increased transport times will allow for radioactive decay of short-lived radionuclides. Alternative 3 also provides long-term protection of human health and the environment because contaminant transport associated with seepage from the percolation ponds is eliminated. Removing contaminant mass in the perched water and decreasing the water available for contaminant transport by extraction and treatment is not considered effective. Alternative 3 does not provide more overall protection than Alternative 2 because, after recharge sources are eliminated, pumping results in very little water yield and contaminant mass removal.

10.4.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 1 or 2 do not reduce the toxicity, mobility, or volume of contaminants through treatment, as treatment is not included in these alternatives. Alternative 3 does reduce contaminant volume through treatment by extracting and treating contaminated perched water. Alternatives 2 and 3 indirectly minimize contaminant mobility by reducing the quantity of water available for contaminant transport in the perched zone.

10.4.5 Short-term Effectiveness

All of the alternatives can be implemented without any additional risks to the community, workers, or the environment. Alternative 1 poses no additional risk to workers. Implementation of the aquifer recharge controls and extraction and treatment may pose a slight risk increase by exposure or personal injury to workers performing the construction and treatment activities, but will be mitigated using health and safety plans, radiological controls, and safety work practices. Alternative 1 is protective of human health during the institutional control period. but is not protective of the environment as it doesn't reduce contaminants in the perched water. Alternatives 2 and 3 are protective at the time of implementation, although Alternative 3 might not provide any additional protection in the short-term due to uncertainties of the effectiveness of extraction.

10.4.6 Implementability

All of the alternatives are technically and administratively implementable. None of the alternatives require any special materials, equipment, or personnel that are not readily available at the site or from the local community. Existing institutional controls proposed in Alternative 1 are currently in place at the site and can be easily continued. Alternative 2 is also readily implemented using standard construction methods and requires no special personnel, equipment, or materials. Alternative 2 may pose some implementability challenges, as this alternative requires replacement of the existing percolation ponds, which are currently used by INTEC operations. Alternative 3 also poses additional implementability concerns because of the surface and underground utilities that occur throughout the plant that could be damaged by activities such as installation of perched water extraction wells or construction of holding tanks and transfer lines.

10.4.7 Cost

Alternative 1 is the least expensive alternative evaluated because it only involves continuation of existing institutional controls and perched water monitoring. Conversely, it provides the least overall protection effectiveness and reduction of toxicity, mobility or volume of all the alternatives. Alternative 2 has higher capital costs than Alternative 1 because of the implementation of aquifer recharge controls. The O&M costs for Alternatives 1 and 2 are similar since perched water monitoring will be conducted under each alternative. Alternative 3 is the most costly alternative because it involves construction and operation of perched water extraction wells and a water treatment facility for 25 years. A detailed cost estimate for each Perched Water alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a).

10.5 Snake River Plain Aquifer Interim Action (Group 5)

10.5.1 Overall Protection of Human Health and the Environment

Each of the proposed alternatives temporarily eliminates human health and environmental risks using existing institutional controls. Alternative 1 will not provide human health protection beyond the institutional control period, which ends in 2095. Alternatives 2A, 2B and 3, provide long-term protection through implementation of additional institutional controls such as land use restrictions until groundwater cleanup goals are achieved. These controls would limit land and groundwater use as long as they remain in place. According to conservative groundwater modeling, predictions Alternative 2A may not satisfy MCLs by 2095 (see Figure 10-1). Groundwater monitoring is required to verify that RAOs are achieved. Alternatives 2B and 3 contain contingent active remediation of the SRPA to meet MCLs by 2095, If the COC action level(s) are exceeded. Table 10-5 summarizes the comparative analysis of the SRPA alternatives.

10.5.2 Compliance with ARARs

Alternatives 1 and 2A do not comply with ARARs beyond the institutional control period. Alternatives 2B and 3 are predicted to achieve ARARs before 2095.

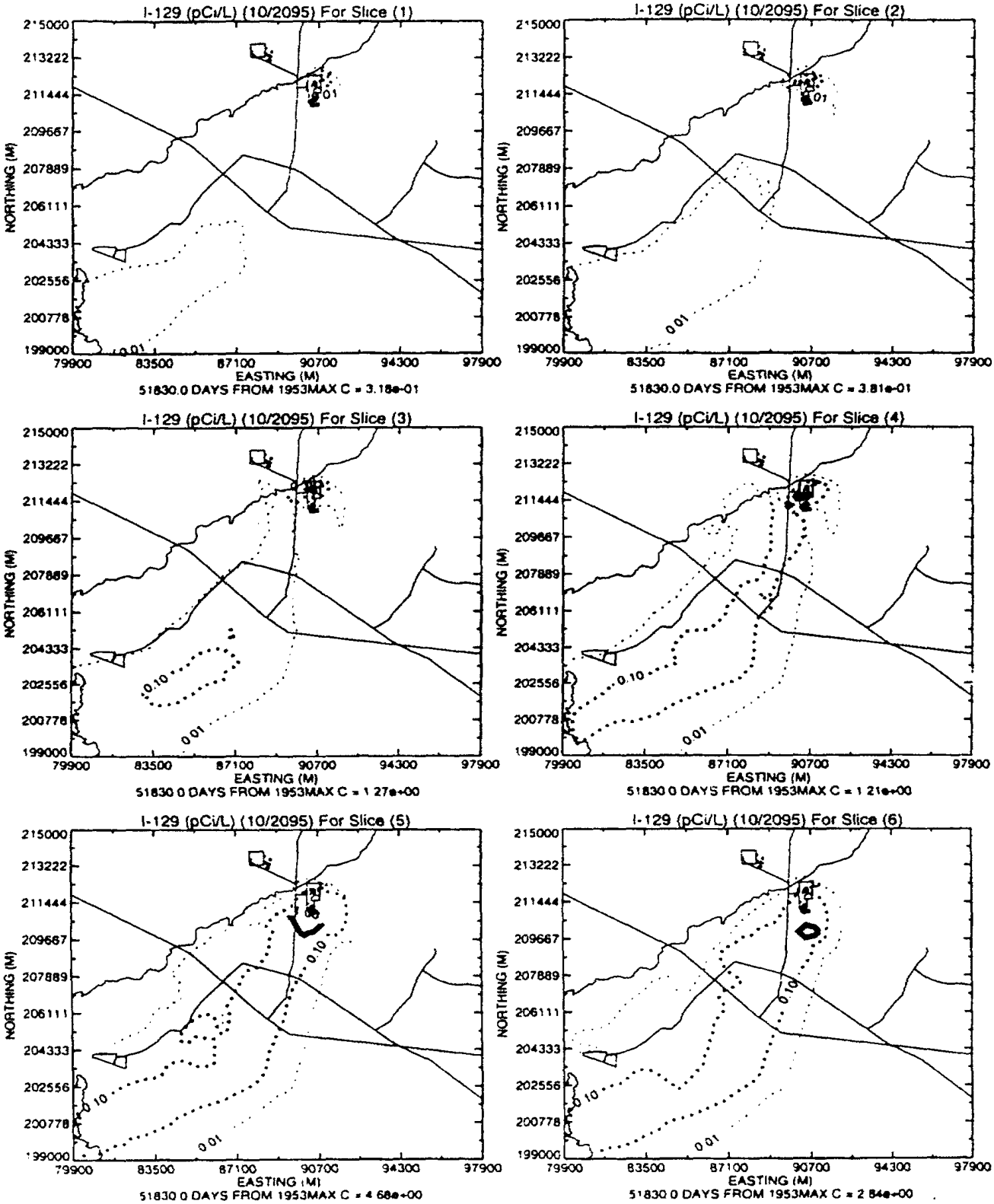


Figure 10-1. Predicted 1-129 concentrations for slices 1-10 in 2095.

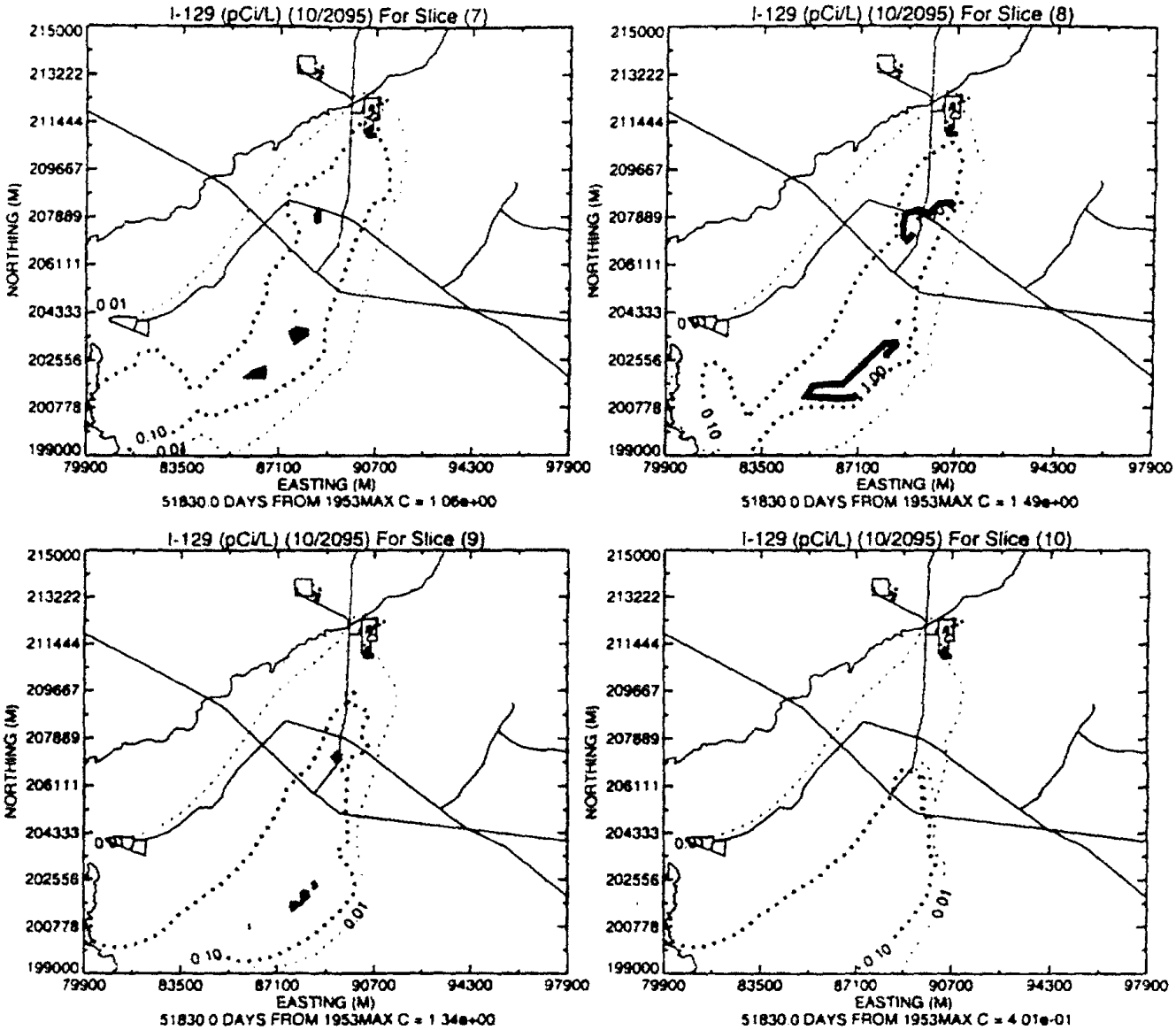


Figure 10-1. (Continued).

Table 10-5. Summary of comparative analyses for the Snake River Plain Aquifer Interim Action, Group 5

Criterion	Alternative 1	Alternative 2A	Alternative 2B	Alternative 3
Overall Protection	N	Y	Y	Y
Compliance with ARARS	N	Y	Y	Y
Long-term Effectiveness	5	3	3	3
Reduction of Toxicity, Mobility, or Volume	N	N	Y	Y
Short-term Effectiveness	1	1	3	3
Implementability	1	1	5	4
Net Present Value Cost	$13.9M	$14.8M	$39.8M	$787.9M

5 = least satisfies criterion; 1 = best satisfies criterion; Y = yes, criteria will be met; N = no, criteria will not be met.

10.5.3 Long-term Effectiveness and Permanence

Alternative 1 does not provide any measure of long-term protection because no remedial actions will be performed, other than existing institutional controls, which end in 2095. Restrictions limiting land and groundwater use proposed in Alternative 2A will provide long-term protection beyond 2095 as long as the restrictions remain in place. Alternative 2A will provide long-term effectiveness by removal of recharge sources under Group 4. Active remediation in Alternatives 2B and 3 will provide long-term effectiveness by removal of COCs from the groundwater. The risk reduction achieved using Alternative 3 does not provide additional long-term benefit compared to Alternative 2A or 2B. Since Alternative 2B achieves the same level of risk reduction at a lower cost, it is considered superior to Alternative 3.

10.5.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 1 and 2A do not reduce toxicity, mobility, or volume through treatment, as treatment is not included in these alternatives. Alternative 2B reduces both volume and toxicity of contaminants in the SRPA. Alternatives 2B and 3 will reduce contaminant mobility using hydraulic controls and contaminant volume using extraction and treatment.

10.5.5 Short-term Effectiveness

All of the alternatives can be implemented without any additional risks to the community or the environment. Alternatives 2B and 3 pose a minor short-term risk from personal injury to workers during extraction and injection well installation and construction of the treatment facilities. The potential for injury risks will be minimized using health and safety plans and safe work practices. All alternatives provide short-term effectiveness. Alternatives 2B and 3 will be protective by 2095.

10.5.6 Implementability

Alternatives 1 and 2A are technically and administratively implementable. The existing institutional controls are currently implemented at the site and are easily continued. Most of the additional institutional controls proposed under Alternative 2A and 2B have been used at numerous Superfund sites and pose no special implementability concerns. Groundwater extraction, treatment, and injection technologies proposed under Alternatives 2B and 3 pose implementabilty concerns regarding

handling of excessive volumes of extracted water and available groundwater treatment technologies for I-129 and other COCs removal. Groundwater extraction at depths of 183 m (600 ft) can be implemented without any special personnel, equipment, or materials. Alternatives 2B and 3 will also require handling and treatment of millions to billions of gallons of contaminated groundwater. Bench-scale treatability testing may be required to determine the most appropriate treatment and extraction technology for the low concentration contaminants present in the SRPA groundwater. In addition, extraction of contaminated groundwater from the low permeability H-I layer is more technically challenging than aquifer extraction contemplated in Alternative 3.

10.5.7 Cost

Alternative 1 is the least costly of the alternatives evaluated but provides the least overall protection and long-term effectiveness. Alternative 2A is more costly because of additional monitoring costs. Alternatives 2B and 3 cost the most because they include extraction and treatment costs. Alternative 3 extraction and treatment capacity is much larger than 2A, yielding higher costs. Overall protection, long-term effectiveness, and reduction in toxicity, and mobility and volume increase with increased costs. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a).

10.6 Buried Gas Cylinders (Group 6)

10.6.1 Overall Protection of Human Health and the Environment

Alternatives 2 and 3 provide overall protection of human health and the environment. Alternative 1 does not provide overall protection because no effective access controls are in force at these sites. Alternatives 2 and 3 fully satisfy the RAOs for the buried gas cylinder sites. Alternative 3 achieves the RAOs through containment and will be protective for at least 1,000 years, Alternative 3 may be protective beyond 1,000 years, but it was only evaluated for the minimum design life of the barrier. Alternative 2 provides the most overall protection at the buried gas cylinder sites because the hazardous reactive and ignitable gasses will be removed, treated, and disposed in an engineered disposal facility. Table 10-6 summarizes the comparative analysis of the Buried Gas Cylinders alternatives.

10.6.2 Compliance with ARARs

Alternative 1 does not comply with ARARs during the institutional control period. Alternative 2 satisfies all of the ARARs using engineering controls and proper disposal procedures. Alternative 3 complies with all of the ARARs during the barrier's 1,000-year functional design life. Beyond 1,000 years, it is assumed that the waste and the large soil mass comprising the barrier will continue to minimize risks.

10.6.3 Long-term Effectiveness and Permanence

Alternative 1 does not provide any measure of long-term effectiveness or permanence. Alternative 2 will provide the highest degree of long-term effectiveness and permanence. The buried gas cylinders will be removed and treated. The remaining cylinder casings and treatment residue will be disposed in an approved treatment, storage, and disposal facility. Alternative 3 provides a high degree of long-term effectivness and permanence by containing the waste. The use of the containment barrier would reduce the current risk to human, and ecological receptors for the design life of the barrier.

Table 10-6. Summary of comparative analyses for the Buried Gas Cylinders, Group 6.

Criterion	Alternative 1	Alternative 2A	Alternative 3
Overall Protection	N	Y	Y
Compliance with ARARS	N	Y	Y
Long-term Effectiveness	5	1	3
Reduction of Toxicity, Mobility, or Volume	N	Y	N
Short-term Effectiveness	1	5	3
Implementability	1	3	3
Net Present Value Cost	$6.4M	$1.8M	$8.2M

5 = least satisfies criterion; 1 = best satisfies criterion; Y = yes, criteria will be met; N = no, criteria will not be met.

10.6.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 does not reduce the toxicity, mobility, or volume of waste through treatment since treatment is not included in this alternative. Alternative 2 includes treatment to reduce the toxicity, mobility, and volume of the hazardous components in the buried gas cylinders. Alternative 3 does not reduce contaminant toxicity or volume through treatment. Contaminant mobility is reduced through installation of an engineered barrier over the buried gas cylinders, which will minimize contaminant mobility in the event of a release by isolating the cylinders beneath a large mass of earth materials.

10.6.5 Short-term Effectiveness

All of the alternatives can be implemented without any significant additional risk to the community or the environment. The primary risk to the community and the environment from these alternatives involves fugitive dust or toxic air emissions, which will be controlled with dust suppressants and engineering controls. Additional risk may occur to workers while implementing alternatives during characterization, removal, and treatment of the buried gas cylinders. Hazardous gas exposure and occupational injuries will be minimized through the use of personnel trained in industrial hygiene, safe work practices, and health and safety. Alternative 1 provides the greatest degree of short-term effectiveness because remediation will not be conducted to change the current site conditions. Alternative 2 has the least short-term effectiveness because of the possibility for explosion or chemical exposure of workers implementing these alternatives. Alternative 3 poses a minor risk to workers from exposure to hazardous gases and explosive cylinders during placement of the stabilization pad and construction of the engineered barrier. Alternative 1 will not be protective as RAOs will not be achieved. Alternatives 2 and 3 will be protective at the time of implementation.

10.6.6 Implementability

Each of the alternatives retained for detailed analysis is technically and administratively implementable. The necessary personnel, services, and materials are readily available. Alternative 1 only requires a continuation of the existing institutional controls already implemented at the site. Alternative 2 requires specialized construction equipment and materials. Buried compressed gas cylinder retrieval and treatment is an available commercial technology that can be used on the identified contaminants and is readily implemented by a specialty contractor. Alternative 3 is technically and administratively implementable. Alternative 3 requires no specialized construction personnel, equipment, or materials.

Existing institutional controls are currently implemented at the site and are easily continued. Construction of an engineered barrier is similar to other types of earthwork. such as highway construction, and can be readily implemented.

10.6.7 Cost

Alternative 2 is the least costly of the alternatives evaluated, and provides the most overall, long-term protection. Alternatives 1 and 3 are similar in cost and are much more costly than Alternative 2 because these alternatives include 100 years of environmental monitoring, whereas, Alternative 2 does not include environmental monitoring after the buried gas cylinders are removed. Alternative 3 is the most expensive alternative because it includes increased capital costs for constructing an engineered barrier. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID 1998a)

10.7 SFE-20 Hot Waste Tank System (Group 7)

10.7.1 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health and the environment because no active remedial measures will be implemented to limit the threat of contaminant release to the environment. Alternatives 2, 3, and 4 are the only alternatives that fully satisfy the SFE-20 tank system RAOs. Alternative 2 achieves the RAOs through in situ treatment and containment and will be protective for at least 1,000 years. Alternative 2 probably may be protective beyond 1,000 years, but it was only evaluated for the minimum design life of the barrier. Alternatives 3 and 4 provide the greater protection of the SFE-20 tank system alternatives because the radioactive liquids and/or sludges will be removed, treated, and disposed in an engineered disposal facility. Alternative 4 provides the most overall protection of human health and the environment. Table 10-7 summarizes the comparative analysis of the SFE-20 tank system alternatives.

10.7.2 Compliance with ARARs

Alternative 1 does not comply with the ARARs either during the 100-year institutional control period or beyond. Alternative 2 complies with all of the ARARs and TBCs during the barrier's 1,000-year functional design life. Beyond 1,000 years, it is assumed that the solidified waste and the large soil mass comprising the barrier will continue to minimize exposure risks from alpha-emitting radionuclides and satisfy all of the ARARs and TBCs. Alternatives 3 and 4 will satisfy all of the ARARs.

10.7.3 Long-term Effectiveness and Permanence

Alternative 1 does not provide any measure of long-term effectiveness or permanence beyond the institutional control period, which ends in 2095. Alternative 2 provides a high degree of long-term effectiveness and permanence by solidifying and containing the waste. Alternative 3 will provide a high degree of long-term effectiveness and permanence because the tank liquid will be removed, treated, and disposed, the tank sludge solidified using grout, and the tank and associated structures filled with grout to prevent future exposures. Alternative 4 will provide the highest degree of long-term effectiveness and permanence because the tank liquid and sludge will be removed, treated, and disposed, and the remaining components of the tank system will be excavated and disposed at the proposed ICDF.

Table 10-7. Summary of comparative analyses for the SFE-20 Tank System Group 7.

Criterion	Alternative 1	Alternative 2A	Alternative 3	Alternative 4
Overall Protection	N	Y	Y	Y
Compliance with ARARS	N	Y	Y	Y
Long-term Effectiveness	5	3	3	1
Reduction of Toxicity, Mobility, or Volume	N	Y	Y	Y
Short-term Effectiveness	1	3	5	5
Implementability	1	3	5	5
NPV Cost	$6.4M	$8.7M	$8.5M	$4.6M

5 = least satisfies criterion; 1 = best satisfies criterion; Y = yes, criteria will be met; N = no, criteria will not be met.

10.7.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 does not reduce the toxicity, mobility, or volume of waste through treatment since treatment is not included in this alternative. Alternatives 2, 3, and 4 include treatment to reduce the mobility or volume of the radioactive liquid and sludge. The toxicity of the radionuclides is not directly reduced by any of these alternatives.

10.7.5 Short-term Effectiveness

All of the alternatives can be implemented without any significant additional risk to the community or the environment. The primary risk to the community and the environment from these alternatives involves fugitive dust or toxic air emissions, which will be controlled with dust suppressants and engineering controls. Additional risk may occur to workers while implementing the alternative because of radiation exposure during characterization, removal, and treatment of the tank liquids and sludges.

External radiation exposure and occupational injuries will be minimized through the use of personnel trained in radiological controls, safe work practices, and health and safety plans to maintain exposures ALARA. Alternative 1 provides the greatest degree of short-term effectiveness because remediation is not required and will prevent worker-exposure. Alternative 2 poses a minor risk to workers from direct exposure to radiation during grouting of the tank system and construction of the barrier. Alternative 3 and 4 have the least short-term effectiveness because of the higher possibility for external radiation exposure of workers implementing these alternatives. Alternative 1 will be protective during the institutional control period only. Alternatives 2, 3, and 4 will be protective at the time they are implemented.

10.7.6 Implementability

Each of the alternatives retained for detailed analysis is technically and administratively implementable and the necessary personnel, services, and materials are locally available. Alternative 1 is readily implemented, as it requires no change in the existing operations and conditions at the site. Alternative 2 requires no specialized construction equipment or materials. Grouting is a common technology that is routinely used to isolate wastes and is readily implemented. An engineered barrier is also a demonstrated remediation technology that uses standard earth moving methods for construction.

Barriers are routinely used to control exposures and leaching and transport of contaminants. Barriers have been used at numerous Superfund sites. Alternatives 3 and 4 are more difficult to implement than Alternatives 1 and 2 because of the potential for construction workers to be exposed to radiation or occupational injury during the characterization, removal, handling, treatment, or disposal of the tank liquids, sludges, and other components. Engineering controls, health and safety plans, radiation controls, and safe work practices will be used to minimize radiation exposure and reduce personal injury. Treatment of similar tank liquids at the PEW evaporator is routinely conducted and would be reliable for these alternatives. Solidification of the tank system is readily implemented, as grouting is a demonstrated technology that has been used at numerous Superfund sites.

10.7.7 Cost

Alternative 4 is the least costly of the alternatives evaluated for the SFE-20 tank system, and it provides the most long-term effectiveness of the alternatives. Alternatives 1, 2, and 3 are similar in total costs but vary slightly in capital costs. Alternative 4 is much less expensive than the other alternatives because Alternative 4 does not include long-term environmental monitoring for the 100-year institutional control period. Alternatives 2 and 3 cost essentially the same because of higher capital costs. Alternative 2 is the most expensive alternative because it includes capital costs for grouting the tank system and constructing an engineered barrier. A detailed cost estimate for each alternative is presented in Appendix A of the FS supplement (DOE-ID) 1998a).

10.8 Modifying Criteria

The modifying criteria, state and community acceptance, are used in the final evaluation of remedial alternatives. For both of these criteria, the factors include the elements of the alternatives that are supported, the factors of the alternatives that are not supported, and the elements of the alternatives that have strong opposition.

10.8.1 State Acceptance

The IDHW has been involved in the development and review of the OU 3-13 RI/FS report, the Proposed Plan (DOE- ID 1998b), and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs with the selected remedial alternatives for the sites contained in this ROD and is signatory to the ROD with DOE and EPA.

10.8.2 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews includes participation in the public meetings held November 16 through 19, 1998. Community acceptance is summarized in the Responsiveness Summary presented as Appendix A of this document. The Responsiveness Summary includes comments received either verbally or in writing from the public, and the Agencies’responses to these comments. A total of about 55 people not associated with the project attended the Proposed Plan public meetings. The community was generally supportive of the proposed remedial action. All comments received on the Proposed Plan were considered during the development of this ROD.

11. SELECTED REMEDY

Based on consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, the Agencies have selected the following alternatives for the OU 3-13 release site groups described in this ROD.

11.1 Descriptions of the Selected Remedies

The Agencies have selected a remedy for each release site group based on the alternative analyses presented in the FS (DOE-ID 1997a) and FS supplement (DOE-ID 1998a). For two of the groups, the Tank Farm Soils release sites (Group 1), and the Snake River Plain Aquifer (Group 5), the remedy selected is an interim action. Insufficient data currently exist to fully determine the impact of the Tank Farm contaminated soils to the SRPA and to determine the most cost effective remedial action alternatives. Although the action selected for the SRPA is complete for groundwater outside the current INTEC security fence, further investigation is required to evaluate the appropriate remedial alternatives for contaminated SRPA groundwater directly beneath the INTEC facility. Therefore, the Group 5 Remedial Action is considered interim.

Each of the selected remedies relies, in part, on Institutional Controls. Table 11-1, lists the type of controls that will be implemented for each Group and release site where contamination remains at levels that result in use or access restrictions to prevent an imminent and substantial endangerment to public health or the environment. In general, institutional controls will be designed to limit site access to an annual duration such that exposure to radionuclides and other Contaminants of Concern do not result in an imminent and substantial endangerment to public health or the environment. For each source area, calculations will be performed as part of Remedial Design to determine acceptable dose-based action levels that correspond to the risk-based concentrations identified in Section 8. This information will, at a minimum be noticed to all affected federal, state and local governmental agencies.

For those source areas representing a moderate exposure risk, controls in addition to administrative actions are required. Warning signs will be installed and maintained to warn intruders of the risks of remaining in an area longer than the posted duration. In those cases where only a brief exposure would result in an unacceptable risk and a high risk of exposure exists and active controls like fencing are required in addition to warning signs and administrative controls. The potential exposure threats would be to unauthorized trespassers if current DOE radiological site controls were no longer applied.

The evaluation of exposure duration necessary to represent an unacceptable risk is consistent with the approach used for the Baseline Risk Assessment. The identification of low, moderate and high potential exposure risk will be made in the Remedial Design, consistent with the current and future land use assumptions identified in the Baseline Risk Assessment and in this ROD. For example, if less than a day exposure would represent an unacceptable risk to a trespasser (high-risk potential) the requirement for fencing, warning signs, and administrative controls would be necessary. Conversely, the "No Further Action" Sites would require years of exposure to result in a potential unacceptable hazard and hence, only administrative controls are necessary to be protective.

The effectiveness of the Institutional Controls will be periodically evaluated during 5-year reviews and modified as necessary to meet RAOs. The INEEL Land Use Plan will serve as the tracking mechanism to identity, at a minimum, all CERCLA land areas at INEEL under restriction or control. This planning document may itself become a part of an INEEL Stewardship Plan or equivalent, but any modifications to the INEEL Land Use Plan will be consistent with the requirements of this ROD.

Table 11-1. Institutional controls for OU 3-13 ROD.

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in place
1 Tank Farm Soils Interim Action	Current DOE operations until final action implemented	Industrial radiologically controlled area.	Radionuclides and metals Moderate exposure threat	Prevent intrusion into underlying contaminated soils, except for, approved activities pursuant to the FFA/CO. Limit access to only authorized personnel and/or DOE certified radiation workers.	Visible access restrictions (warning signs, provide copies of surveyed maps). Control of activities (drilling or excavating). Publish surveyed boundaries and description of controls in INEEL Land Use Plan.	FFA/CO, 10 CFR 835, "Radiological Worker Protection," DOE Order 5400.5, "Radiation Protection of the Public," ALARA 40 CFR Part 300.	Periodic inspections by DOE and IDHW/EPA reviews. Frequency to be determined in the remedial action work plan. *Note: The Interim Action is expected to last for less than 10 years and be replaced by the final action, OU 3-14*
2a Soils Under Buildings and Structures (cap-in-place)	Current DOE operations prior to D&D of building	Industrial radiologically controlled area.	Radionuclides and metal Low exposure threat	Limit access to only authorized personnel and/or DOE certified radiation workers.	Visible access restrictions (warning signs, provide copies of surveyed maps). Control of activities (drilling or excavating). Publish surveyed boundaries and description of controls in INEEL Land Use Plan.	FFA/CO, 10 CFR 835, "Radiological Worker Protection," DOE Order 5400.5, "Radiation Protection of the Public," ALARA 40 CFR Part 300.	Require state/EPA notice prior to start of building D&D. Periodic inspections by DOE and IDHW/EPA reviews. Frequency to be determined in the remedial action work plan. *Note: Building demolition will be performed outside scope of ROD*

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Current DOE operations after building D&D-contamination left in place	Industrial landfill no unauthorized intrusion into capped area. FFA/CO approved O&M activities authorized.	Radionuclides and metal Low exposure threat	Limit direct exposure to underlying radiologically contaminated soil areas by public to < 1E-4 risk through shielding provided by building. Limit water recharge activities adjacent to Group 2 buildings. Maintain integrity of cap.	Visible access restrictions (warning signs, provide copies of surveyed maps). Control of activities (drilling or excavating). Publish surveyed boundaries and description of controls in INEEL Land Use Plan. Notice to affected stakeholders (e.g., BLM, F&W, ShoBan Tribal Council, local county governments; State and EPA), including notice of any change in land use designation, restriction, land users or activities.	FFA/CO, 10 CFR 835, "Worker Protection," DOE Order 5400.5, "Radiation Protection of the Public," ALARA 40 CFR Part 300 CERCLA 120(h).	Periodic inspections and reviews. Frequency to be determined in the Remedial Action Work Plan.
	DOE control post operations	Landfill no unauthorized intrusion into capped area. FFA/CO approved O&M activities authorized.		Maintain integrity of cap.	Visible access restrictions (warning signs). Control of activities (drilling or excavating) Notice to affected stakeholders (e.g., BLM, F&W, ShoBan Tribal Council, local county governments; State and EPA), including notice of any change in land use designation, restriction, land users or activities. Property lease requirements including requirements for control of land-use consistent with the ROD.	FFA/CO, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act,[2] DOE order 5400.5, "Property Release Restrictions."	5-year review until determined to not be needed.

Table 11-1. (continued)

Category of Source Area	Time Frame	Land Restriction	COCs and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Post DOE control	Landfill – no unauthorized intrusion into capped area. FFA/CO approved O&M activities authorized.		Maintain integrity of cap	Notice to affected stakeholders (e.g., BLM, F&W, Sho-Ban Tribal Council, local county governments, State and EPA), including notice of any change in land use designation, restriction, land users or activities Property transfer requirements including Finding of suitability to transfer and requirements for control of land-use consistent with the ROD	FFA/CO, CERCLA Section 120(h)(3),[3] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[5] CERCLA Section 120(h)(1)-(3),[6] CERCLA Section 120(h)(4),[7] 43 CFR 2372.1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2, 7,[10] DOE order 5400.5 property release restrictions	5-year review until determined to not be needed
2b – Soils Under Buildings and Structures (remaining after removal to and disposal in IC DU)	Current DOE operations	Industrial	Contaminants removed to 10 ft	Ensure land-use is appropriate if contamination left in-place >10 ft	Review and control of activities as applicable	OU3-13 ROD, FFA/CO, 10 CFR 1021 NEPA Review of Activities	5-year review until determined to not be needed including review of land use assumptions (OSWER Directive 9355.7-02A) (Supplemental Five-year Review Guidance)
	DOE control post operations	Industrial	Contaminants removed to 10 ft	Ensure land-use is appropriate if contamination left in-place >10 ft.	Property lease requirements including requirements for control of land-use consistent with the ROD	OU3-13 ROD, FFA/CO, 10 CFR 1021 NEPA Review of Activities, CERCLA Section 120(h)(5),[3] Hall Amendment Section 3154 of the National Defense Authorization Act[2] DOE Order 5400.5, "Property Release Restrictions"	5-year review until determined to not be needed including review of land use assumptions.

Table 11-1. (continued)

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Post DOE control	Industrial to 2095. residential after 2095.	Contaminants removed to 10 ft.	Ensure land-use is appropriate if contamination left in-place >10 ft.	Property transfer requirements including Finding of suitability to transfer and requirements for control of land-use consistent with the ROD.	OU 3-13 ROD, FFA/CO, CERCLA Section 120(h)(3), [3] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[5] CERCLA Section 120(h)(l)-(3),[6] CERCLA Section 120(h)(4),[7] 43 CFR 2372.1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2,-7,[10] DOE Order 5400.5, "Property Release Restrictions."	5-year review until determined to not be needed including review of land use assumptions
3a ICDE	Same as 2a						
3b Other Soil Site (contamination remaining at depth >10 ft after removal to and disposal in ICDE)	Same as 2b						
4 Perched Water	Current DOE operations	Industrial.		Prevent consumption and use of >MCL &/or >1E-04 risk drinking water.	Control of activities (drilling of wells for drinking).	DOE-ID directive limiting access to prevent groundwater use while INTEC operations continue, and to restrict future goundwater use (through noticing this restriction to local country governments, ShoBan Tribal council, GSA, BLM, etc.) including site access restrictions, and drilling restrictions	5-year review until determined to not be needed

Table 11-1. (continued)

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	DOE control post operations	Industrial		Prevent consumption and use of >MCL &/or >1E-04 risk drinking water.	Control of activities (drilling of wells for drinking). Property lease requirements including finding of suitability to transfer and requirements for controls of activities.	OU3-13 ROD, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act.[2] DOE-ID directive limiting access to prevent groundwater use while INTEC operations continue, and to restrict future groundwater use (through noticing this restriction to local county governments. ShoBan Tribal council, GSA, BLM, etc.) including site access restrictions, and drilling restrictions.	5-year review until determined to not be needed.

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Post DOE control (>2095)	Residential		Prevent drilling through contaminated interbeds and dragging contamination downhole to the SRPA.	Property transfer requirements including finding of suitability to transfer and requirements for control of activities consistent with ROD.	FFA/CO, CERCLA Section 120(h)(3),[3] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[5] CERCLA Section 120(h)(I)-(3),[6] CERCLA Section 120(h)(4),[7] 43 CFR 2372 1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2,-7.[10] DOE-ID directive limiting access to prevent groundwater use while INTEC operations continue, and to restrict future groundwater use (through noticing this restriction to local county governments, ShoBan Tribal council, GSA, BLM, etc.) including site access restrictions, and drilling restrictions	5-year review until determined to not be needed including review of land use assumptions
5. Snake River Plan Aquifer-outside INTEC 1999 fence line	Current DOE Operations	Industrial		Prevent consumption and use of >MCL &/or >1E-04 risk drinking water.	Control of activities (drilling of wells for drinking).	FFA/CO	5-year review until determined to not be needed

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure controls in-place
	DOE control post operations apples up to 2095	Industrial		Prevent consumption and use of >MCL &/or >1E-04 risk drinking water.	Control of activities (drilling of wells for drinking). Property lease requirements including finding of suitability to transfer.	OU3-13 ROD, FFA/CO, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act.[2] DOE-ID directive limiting access to prevent groundwater use while INTEC operations continue, and to restrict future groundwater use (through noticing this restriction to local county governments, ShoBan Tribal council, GSA, BLM, etc.) including site access restrictions, and drilling restrictions.	5-year review until determined to not be needed.

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Post DOE control - applies up to 2095	Industrial (residential after 2095).		Prevent consumption and use of >MCL &/or >1E-04 risk drinking water (NA after 100 years).	Property transfer requirements including finding of suitability to transfer (NA after 100 years).	OU3-13 ROD, FFA/CO, CERCLA Section 120(h)(3),[5] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[5] CERCLA Section 120(h)(I)-(3),[6] CERCLA Section 120(h)(4),[7] 43 CFR 2372.1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2,-7.[10] DOE-ID directive limiting access to prevent groundwater use while INTEC operations continue, and to restrict future groundwater use (through noticing this restriction to local county governments, ShoBan Tribal council, GSA, BLM, etc.) including site access restrictions, and drilling restrictions.	5-year review until determined to not be needed.
6a Buried Cylinders[11] (removeal)	Current DOE operations Post-remediation	Industrial. Unrestricted.		Prevent access to sites except by authorized workers. NA-to be remediated.	Visible access restrictions (warning signs, provide copies of surveyed maps)	FFA/CO, 10 CFR 835 “Worker Protection”	Periodic inspection until remediation is complete.

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restrictions	COCs and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	Current DOE operations after cap construction contamination left in place	Industrial landfill no unauthorized intrusion into capped area. FFA/CO approved O&M activities authorized.		Limit water recharge activities adjacent to Group 2 buildings. Maintain integrity of cap.	Visible access restrictions (warning signs, provide copies of surveyed maps). Control of activities (drilling or excavating). Publish surveyed boundaries and descriptions of controls in INEEL Land Use Plan. Notice to affected stakeholders (e.g.,BLM, F&W, ShoBan Tribal Council, local county governments ; State and EPA), including notice of any change in land use designation, restriction, land users or activities	FFA/CO, 10 CFR 835, "Worker Protection"	Periodic inspections and reviews. Frequency to be determined in the Remedial Action Work Plan.
	DOE control post operations	Landfill no unauthorized intrusion into capped area FFA/CO approved O& M activities authorized		Maintain integrity of cap.	Visible access restrictions (warming signs). Control of activities (drilling or excavating) Notice to affected stakeholders (e.g., BLM, F&W, ShoBan Tribal Council, local county governments, State and EPA), including notice of any changingland use designation, restriction, land users or activities. Property lease requirements including requirements for control of land-use consistent with the ROD.	FFA/CO, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act,[2] DOE order 5400.5, "Property Release Restrictions."	5-year review until determined to not be needed.

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs and Exposure Area	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
	DOE control post operations	Landfill no unauthorized intrusion into capped area FFA/CO aprpoved O&M activities authorized.		Maintain integrity of cap.	Visible access restrictions (warning signs). Control of activities (drilling or excavating). Notice to affected stakeholders (e.g. BLM, F&W, ShoBan Tribal Council, local county governments; State and EPA), including notice of any change in land use designation, restriction, land users or activities. Property lease requirements including requirements for contol of land-use consistent with the ROD..	FFA/CO, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act,[2] DOE order 5400.5, "Property Release Restrictions."	5-year review until determined to not be needed.
	Post DOE control	Landfill no unauthorized intrusion into capped area FFA/CO approved O&M activities authorized.		Maintain integrity of cap.	Notice to affected stakeholders (e.g. BLM, F&W, ShoBan Tribal Council, local county governments; State and EPA), including notice of any change in land use designation, restriction, land users or activities. Property transfer requirements including Finding of suitability to transfer and requirements for control of land-use consistent with the ROD.	FFA/CO, CERCLA Section 120(h)(3),[3] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[5] CERCLA Section120 (h)(I)-(3),[6] CERCLA Section 120 (h)(4),[7] 43 CFR 2372.1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2,-7,[10] DOE order 5400.5 property release restrictions	5-year review until determined to not be needed.
7 Hot Waste Tank System Prior to Excavation[11]	Current DOE operations.	Industrial		Same 1.			

Table 11-1. (continued).

Group or Source Area	Time Frame	Land Restriction	COCs/and Exposure Threat	Objective	Controls	Regulatory Basis/Authority	Surveillance to Assure Controls in-place
"No Further Action" NFA Sites	DOE control post operations	Industrial radiological controlled		Control land use as protective and consistent with NFA determination.	Property lease requirements including requirements for control of land-use consistent with the ROD.	FFA/CO, CERCLA Section 120(h)(5),[1] Hall Amendment Section 3154 of the National Defense Authorization Act,[2] DOE; Order 5400.5, "Property Release Restrictions."	5-year review until determined to not be needed.
	Post DOE control	Industrial to 2095, residential following 2095		Control land use as protective and consistent with NFA determination.	Property transfer requirements including Finding of suitability to transfer and requirements for control of land-use consistent with the ROD.	FFA/CO CERCLA Section 120(h)(3),[3] CERCLA Section 120(h)(3)(C)(ii),[4] CERCLA Section 120(h)(3)(A)(iii),[8] CERCLA Section 120(h)(I)-(3),[6] CERCLA Section 120(h)(4),[7] 43 CFR 2372.1,[8] 43 CFR 2374.2,[9] 41 CFR 101-47.202-1,-2,-7,[10] DOE Order 5400.5, "Property Release Restrictions."	5 year review until determined to not be needed.

1. Notification to states of leases involving contamination.
2. Request concurrent of EPA on leases of NPF sites.
3. Statement in deed that remedial action is complete.
4. If remedial action is not complete, restrictions, response, guarantee, and schedule, budget assurances to be included in deed.
5. Clause allowing U.S. access to property to be included in deed.
6. Notice of information on hazardous substance to be included in deed.
7. Identify uncontaminated parcels of land.
8. Notice of intent to relinquish to DOE with contamination information and protection needs.
9. Transfer to DOE should indicate contamination of DOE responsibility.
10. Report in contamination information and allowed land-use
11. Use is unrestricted after remediation activities, and institutional controls do not apply.

Periodic institutional control monitoring reports will be prepared as part of the RD/RA submissions, in compliance with the EPA Region 10 policy on the use of Institutional Controls at Federal Facilities. The first monitoring report will be submitted within 6 months of ROD signature. The monitoring reports will be submitted annually thereafter. A brief synopsis of the required institutional controls is also provided in the Group-specific selected remedy descriptions below.

Legacy waste that was generated as a result of previous sampling activities under WAG 3 RI/FS [i.e., investigation derived waste (IDW)] and removal actions will be disposed in the ICDF. Wastes from OU 3-13 RD/RA activities and IDW will be temporarily managed within the WAG 3 AOC under the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 Temporary Units and 40 CFR 264.554 Remediation Waste Staging Piles). By managing the wastes in the AOC, placement will not be triggered. The wastes will be managed in temporary units and remediation waste staging plies until the ICDF is available to receive then. Wastes treated in temporary units may be subject to LDRs. The final disposition of these wastes will be in the ICDF. The anticipated wastes include: soil cuttings, well purge water, personnel protective equipment, decontamination wastes, and bulk soils and debris.

This ROD also recognizes that contaminated soil sites addressed under this ROD may be disturbed through maintenance or upgrade activities associated with INTEC operations during the period before the CERCLA remedies are fully implemented. These contaminated soils will be considered CERCLA remediation waste, as the removal and subsequent storage or disposal of any contaminated soil represents progress toward cleanup.

For the purpose of selecting final surface soil remedial actions, the WAG 3 AOC (consisting of an area extending across all contaminated soils at WAG 3, as shown in Figure 1-10) will be considered a CERCLA AOC. The AOC allows for the flexibility in moving and staging noncontiguous soils while implementing selected remedial alternatives.

11.1.1 Tank Farm Soils Interim Action (Group 1)

A final remedial action selection decision concerning the Tank Farm Soils release sites has been postponed and will be developed following additional site characterization, risk analysis, and remedial alternative evaluation, which will be presented in a separate OU 3-14 RI/FS. An interim action is selected at the Tank Farm until a final decision is made by the Agencies. The remedy selected for the Tank Farm Soils Interim Action is Alternative 3–Institutional Controls with Surface Water Control. This alternative will assure that public exposure to the contaminated soils will be prohibited and will install engineering controls to reduce water infiltrating into the contaminated Tank Farm soils. Institutional controls include: warning signs administrative controls to restrict access; inspection and maintenance for the duration of the interim action, projected to last 8 years or until a final risk management decision is made and implemented by the Agencies.

The interim remedy for controlling surface water infiltration includes: surface water run-on diversion channels sized to accommodate a 1 in 25 year, 24 hour storm event; grading and surface sealing the Tank Farm soils or covering the Tank Farm sufficient to divert 80% of the precipitation falling atop the Tank Farm soils area; and exterior building drainage improvements to direct water away from the contaminated areas so that moisture infiltration is minimized and contaminants are not mobilized. The diverted run-on water will be managed as part of the existing surtace water drainage management system. Run-off water from the scaled Tank Farm soils will be collected and managed in a lined evaporation pond with leak detection. Tile evaporation pond will be constructed and used as a best management practice to reduce infiltration In the INTEC area, It will also contain the Tank, Farm run-off in the event of an unplanned spill or release.

The goal of this action is to significantly reduce surface water infiltration into Tank Farm soils. Reducing surface water infiltration into these contaminated soils is expected to limit leaching and transport of soil contaminants to the perched water and reduce available water in the perched zone. INTEC-wide monitoring will be performed during the interim action period to evaluate potential changes in water content and quality in the perched water and SRPA, if they occur.

The selected remedy provides an interim solution that reduces the potential for further soil contaminant leaching and transport to the perched water, reduces the available water in the perched zone beneath the Tank Farm, and potentially minimizes further water quality impacts. The Agencies believe this interim action will be protective of human health and the environment while the OU 3-14 Tank Farm RI/FS is being performed. Further, this action will comply with ARARs, be cost effective, and be consistent with the final Tank Farm remedy and the Idaho High Level Waste and Facility Disposition Environmental Impact Statement (HLW & FD EIS) currently being conducted.

11.1.2 Soils Under Buildings and Structures (Group 2)

The selected remedy for the Soil Under Buildings and Structures is Alternative 2-Institutional Controls with Containment. Alternative 2 is a deferred action and consists of implementing institutional controls and soil excavation or capping. The institutional controls include: warning signs and administrative controls to restrict access to the contaminated soils. For those areas capped in place, additional institutional controls will be instituted to prevent future disturbance of the caps. This action assumes that the contaminated soils are currently contained in place due to the presence of the existing buildings and structures. The operation and subsequent demolition of these buildings and structures are outside the scope of this action. However, upon completion of D&D, an evaluation will be performed by the Agencies to determine if the soils, to a minimum depth of 10 ft bgs, contain contaminants exceeding the action levels specified in Table 8-1 of this ROD. If these action levels are exceeded, then the Agencies will either cap these soils in place in compliance with the substantive requirements of the hazardous waste landfill closure requirements or excavate and manage the soils as a Group 3 soil, as described below. If the buildings are demolished and closed in-place as a landfill under the D&D program, an assessment will be performed by the CERCLA program to evaluate the effectiveness of D&D containment to meet the Group 2 RAOs and remediation goals, specified in Section 8. The D&D containment structure would be augmented, as necessary, to meet these goals.

Prior to D&D, and in addition to the institutional controls described above, a process will be established as part of the Group 2 Remedial Design Work Plan to review the effectiveness of the building(s) as aids in limiting infiltration through the underlying contaminated soils. This evaluation will consist of the following periodic steps being taken:

1. Review Operations maintenance of each building to be sure the buildings are kept in a protective configuration.

2. Examine roof drains/surface drainage system to determine if water is percolating into the contaminated soils or is being diverted somewhere else.

3. Monitor building or structure perimeter to determine if (based on drainage patterns) there is enough moisture to exceed the field capacity of the soils. Determine how much seepage the soil poses a problem.

4. If there is a seepage problem upgrade drainage patterns and perform surface modifications as necessary.

The final building or structure and release site configuration will be assessed under the group 2 CERCLA program to determine if the building or structure will perform as an equivalent engineered barrier. Criteria for this evaluation will be developed during RD RA.

Alternative 2 is selected because it best meets the balancing criteria of Implementability and short-term effectiveness, given that Alternative 3 is dependent upon the removal of the buildings and structures to be cost-effective. The Agencies believe the selected alternative is protective of human health and the environment. complies with ARARs, uses a permanent solution, and is cost effective.

11.1.3 Other Surface Soils (Group 3)

The selected remedy for Group 3. Other Surface Soils is Alternative 4A — Removal and On-Site Disposal. Alternative 4A consists of excavating contaminated surface soils and backfilling with sufficient clean soils to reduce the risk from external exposure to $< 1 \times 10^{4}$. Sites will be backfilled and graded for erosion control. Depending on the extent of soil removal at individual release sites, institutional controls will be terminated at each site.

The excavated material will be disposed on-Site or off-Site. On-Site disposal will be an on-Site engineered landfill, the ICDF. The ICDF will be constructed under this alternative. Off-Site disposal will be in accordance with the Off-Site Rule (40 CFR 300.440). Prior to excavation, the life cycle cost effectiveness of on- or off-.site disposal and compliance with DOE policy will be evaluated to determine where to dispose the excavated soils.

Based on currently available cost information, all Group 3 soils will be disposed in the ICDF. This approximately 80 acre area (including a buffer zone) will be engineered to be TSCA/RCRA-compliant for the purpose of final placement of WAG 3 CERCLA soils. The ICDF will also be designed to function as an INEEL-wide disposal facility to accommodate disposal of CERCLA soils and debris from other WAGs. A Staging, Storage, Sizing, and Treatment, Facility (SSST) will also be constructed and operated to prepare CERCLA wastes (i.e., soils, debris, and aqueous wastes, such as purge and decontamination waters), as necessary. For disposal in the ICDF. It is anticipated that this facility will consist of a storage/ staging building an evaporation pond or equivalent surface impoundment, a waste shredder, solidification/stabilization treatment tanks, and associated systems. The evaporation pond will be designated as a Corrective Action Management Unit (CAMU). The evaporation pond will be designed and constructed to treat ICDF leachate and other aqueous wastes generated during operations. .

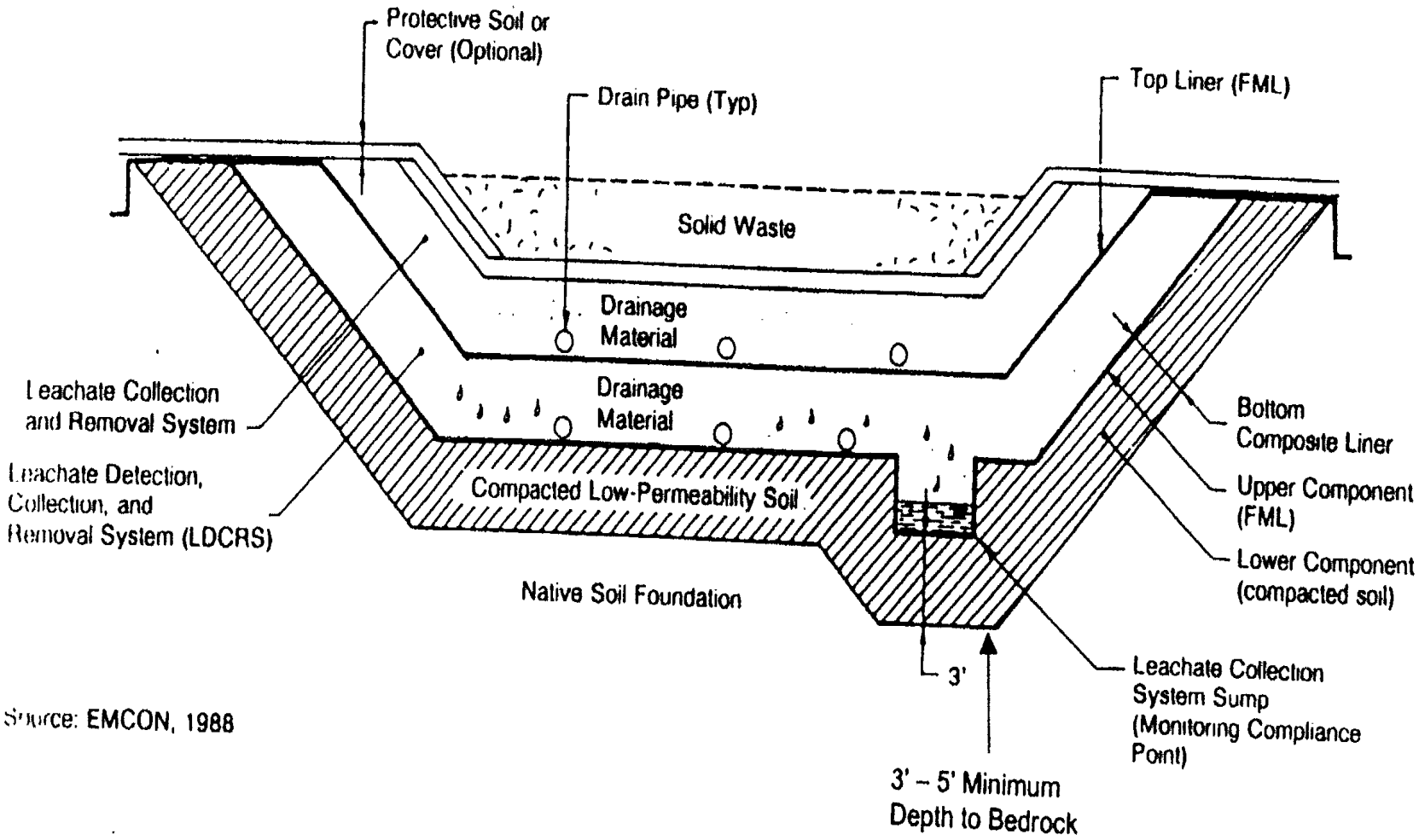
The ICDF will be a modular design, containing up to six cells, with a total capacity of 466,000 m^3 (510, 000 $yd^{3)}$. Cells will be constructed as needed. Contaminated soils will be permanently contained in this engineered facility designed for long-term protection of human health and the environment. Institutional controls will be maintained at the ICDF as long as necessary to ensure long-term protection.

The ICDF will reduce the overall areal extent of soil contamination at INTEC and the INEEL, and will achieve cost savings relative to off-INEEL disposal, or on-site management, because the soils will be managed in a central facility. Selection of this alternative implements design and construction of the initial cells of the ICDF sufficient to contain the Group 3 soils.

- Figure 11-1 provides a schematic cross-section of the ICDF facility. A conceptual cross section of an engineered barrier. with an expected 1,000-year design life (i.e., Hanford Barrier), that may be used to cap the ICDF at Closure is presented in Figure 11-2. ICDF design., construction, operation, and closure objectives include: Construct the ICDF complex which will Include an engineered facility meeting, Idaho Hazardous Waste Management Act (HWMA) RCRA Subtitle C. and polychlorinated biphenyl (PCB) landfill design and

Double Liners and Leachate Collection System

Components



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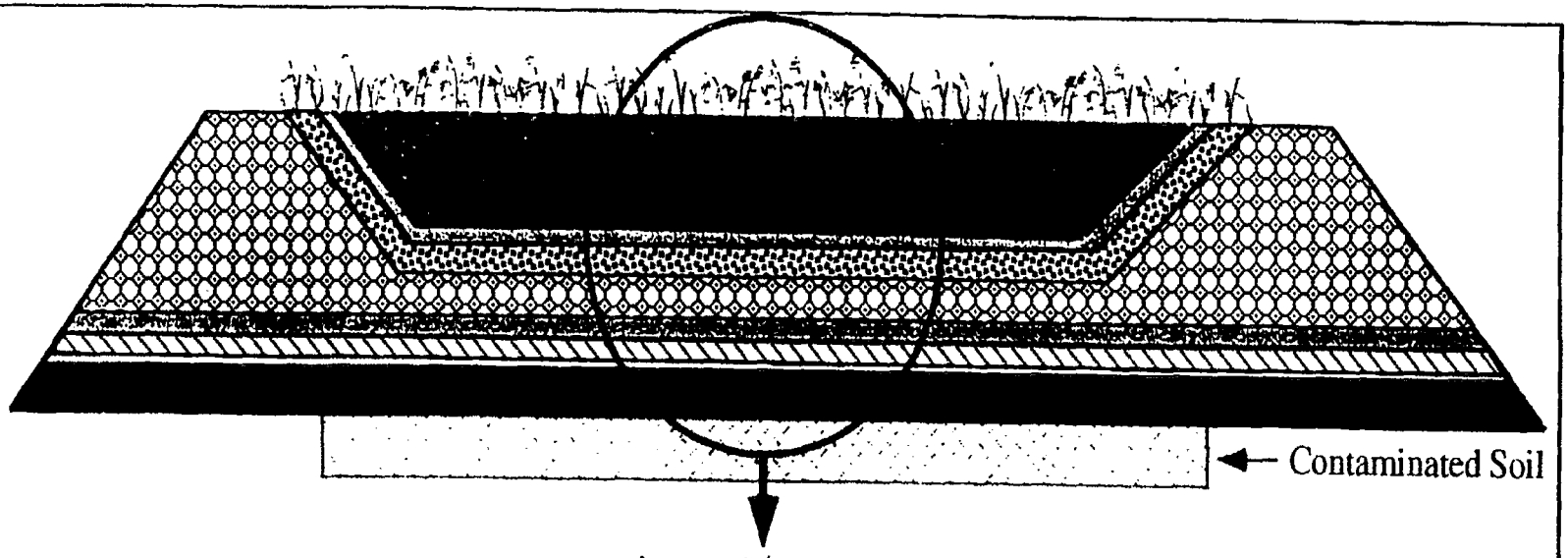
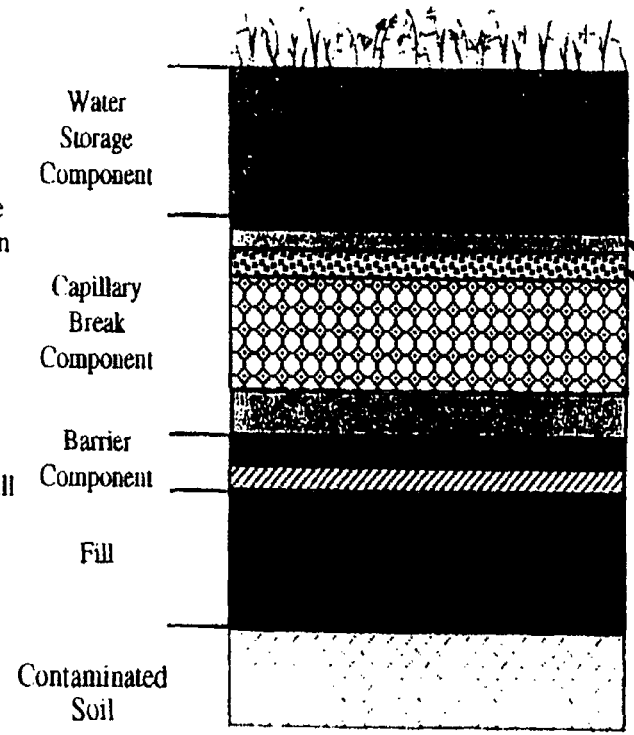


Notes:

1. The ICDF will be closed with a final cap that will meet or exceed the performance of the RCRA Subtitle C MTG design and will meet all ARARs, RAOs, and RGs designed for the ICDF.

2. This design is presented for discussion purposes. The actual barrier implemented will be developed during remedial design (RD).



Cover Vegetation: Mixed perennial grasses.

Layer 1: Silt loam topsoil with pea gravel admixture.

Layer 2: Silt loam topsoil without pea gravel.

Layer 3: Geotextile filter fabric.

Layer 4: Sand filter layer.

Layer 5: Gravel filter layer.

Layer 6: Coarse, fractured basalt.

Layer 7: Lateral drainage layer.

Layer 8: Low-permeability asphalt.

Layer 9: Asphalt base course.

Layer 10: Grading fill.

construction requirements. The ICDF will be located within the WAG 3 area of contamination (AOC) Design. Construction, operational, and closure requirements for the ICDF include:

- Designed to have a total capacity of approximately 466,000 m^3 (510,000 yd^3)

- Engineered to meet IDAPA 16.01.05.008 (40 CFR § 264.301) hazardous waste, 40 CFR § 761.75 PCB, and DOE Order 435.1 radioactive waste landfill design and operating substantive requirements

- Double leachate collection/detection liner system

- Minimum of 3 feet of compacted clay soils and flexible membrane liner (FML) will serve as the bottom liner

- The cap will be designed to minimize infiltration and run-on and maximize run-off

- Cover designed to protect against inadvertent intrusion for >1,000 years

- Void spaces will be filled to minimize future subsidence.

• Only INEEL on-Site CERCLA wastes meeting the agency-approved ICDF Waste Acceptance Criteria (WAC), to be developed during the remedial design, will be disposed in the ICDF. Wastes will be limited to low level radioactive, PCB solids, hazardous, and mixed tow level waste. An important objective of the WAC will be to assure that hazardous substances disposed in the ICDF will not result in exceeding groundwater quality standards in the underlying groundwater aquifer, even if the ICDF leachate collection system were to fail after closure.

• Located in an area meeting hazardous waste, PCB waste and low-level waste (LLW) landfill siting requirements. Through a preliminary evaluation of all relevant decision criteria, the Agencies have determined the Study Area for siting the ICDF to be the CPP-67 Percolation Ponds and adjacent areas to the west. However, the specific ICDF cell locations will be determined through the completion of a comprehensive geotechnical evaluation of the entire Study Area. Which shall be reviewed and approved by the Agencies. Siting criteria for the location of the ICDF included:

- Outside the 100-year flood plain

- Outside of wetland areas

- Not in active seismic zones

- Not in high surface erosion areas

- Not in an area of high historic groundwater table.

• The construction and operation of an ICDF supporting complex Including a facility waste storage, sizing staging, and treatment (SSST) facility in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subparts I, J, and DD). Operations at the facility will include chemical/physical treatment to prepare ICDF wastes to meet applicable Waste Acceptance Criteria and RCRA land disposal restrictions.

• One or more remedial waste staging and storage areas will be utilized to stage and handle remediation waste. The storage area be operated in accordance with the substantive requirements of IDAPA 16.01 05.006.01 and 16.01.05.006.02 (40 CFR 262.34[a][I]

- Monitoring well construction and sampling waste generated prior to construction of the ICDF and SSST facility (i.e., purge water and drill cuttings may be managed and treated using remediation waste staging piles and temporary treatment units in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554).

- Treatment will be accomplished using mobile tankage and physical/chemical treatment and will comply with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subpart J. BB. and CC).

- An evaporation pond will be constructed and designated as a corrective action management unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.552 and 40 CFR 264 Subpart K and CC) for purpose of managing ICDF leachate and other aqueous wastes generated as a result of operating the ICDF complex.

- Operate, close, and post-close the ICDF Complex in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subparts G, F, and N) Maintain site access restrictions and institutional controls throughout the post-closure period.

Closure requirements will include:

- Access restrictions to prevent intrusions into the closed area, including the creation of a buffer zone surrounding the capped ICDF and supporting structures

- Access controls, monitoring and maintenance will remain in place for as long as the contents of the landfill remain a threat to human health or the environment if uncontrolled.

The best location to site the ICDF was evaluated using the analytic hierarchy process (AHP) decision analysis technique. Figure 11-3 shows the AHP decision evaluation criteria used in the preliminary ICDF siting evaluation. Based on this evaluation, it was determined that locating the facility within the AOC was the most cost effective and ARAR-compliant location for siting the ICDF. The Agencies have determined the Study Area for siting the ICDF to be the CPP-67 Percolation Ponds and adjacent areas to the west as depicted in Figure 11-4 based on the preliminary geotechnical information. However. the specific ICDF cell locations will be determined through the completion of a comprehensive geotechnical evaluation of the entire Study Area, which shall be reviewed and approved by the Agencies.

The preliminary siting evaluation criteria included:

- Public health and safety (e.g., effects on surface water, effects on groundwater, floodplain)

- Natural environment (e.g.,effects on the habitat of rare, threatened or endangered species)

- Technical (e.g., depth to bedrock, underlying soil properties, perched aquifer protection)

- Social Economic environment (e.g., effects on future land use)

- Cultural Environment (e., effects on archaeological or heritage sites)

- Community acceptance (e.g., public comments, Citizens Advisory Board comments)

- Cost.

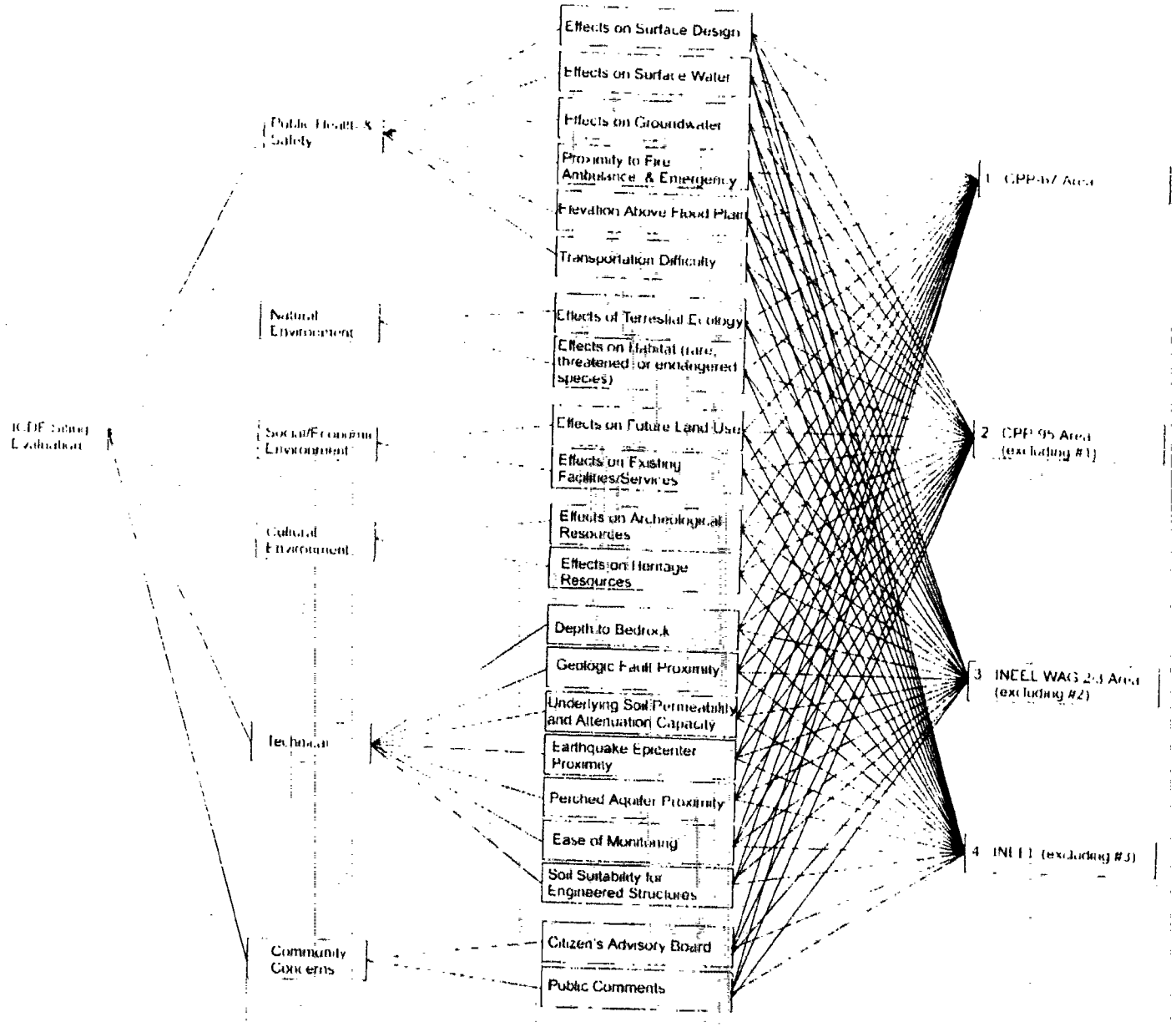


Figure 11-3. Summary of the AHP decision evaluation criteria for the preliminary ICDF siting evaluation.

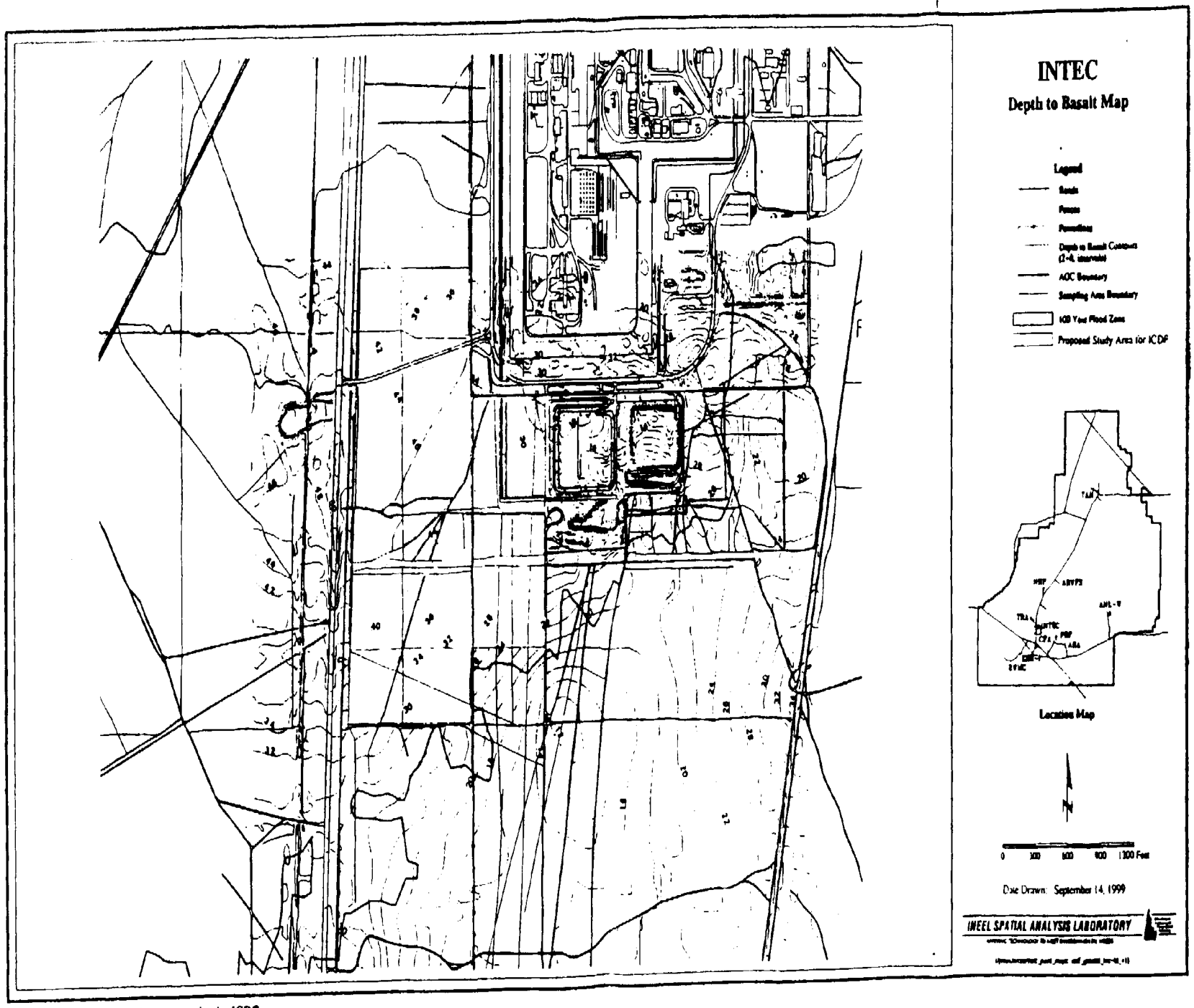


Figure 11-4. Proposed Study Area for the ICDF.

Figure 11-4 shows the proposed Study Area that the ICDF is to be sited in.

In special circumstances (e.g.. Site CPP-37b). where a source area is located so as to become part of a D&D or closure cover. the Agencies may elect not to excavate the soil but cap in place in accordance with RCRA Hazardous Waste Hazardous Waste Management Act (HWMA) closure standards. The same groundwater protection standard applicable to the ICDF will be met.

Although more costly than Alternative 3, which requires capping each Group 3 site in place. the selected Alternative 4A, reduces the footprint of the WAG 3 restricted area allowing for future development and is expandable to address INEEL -wide CERCLA contaminated media and debris. Further. the consolidation in an engineered landfill with leachate collection will further safeguard the underlying SRPA. The Agencies believe that this alternative ensures long-term protection of human health and the environment. complies with ARARs. is a permanent solution, and is cost-effective.

11.1.4 Perched Water (Group 4)

The selected remedy for the Perched Water is Alternative 2— Institutional Controls with Aquifer Recharge Control. Alternative 2 is comprised of institutional controls in the form of administrative actions to restrict future use of perched water and implementation of remedies to control water infiltration and minimize perched water releases to the SRPA. The institutional controls include:

- Site access restrictions
- Warning signs on wells screened in the perched water
- Locked and labeled wells screened in the perched water
- Well drilling/water usage restrictions
- Radiation surveys
- Environmental monitoring
- General maintenance and upkeep

The DOE will periodically inspect and repair the warning signs, conduct environmental monitoring, and perform routine maintenance and upkeep, as necessary. Land use controls will remain in place indefinitely to prevent unauthorized drilling through the contaminated perched zone.

Perched water monitoring will include sampling and analysis of existing and new perched water wells to determine changes in the areal extent of perched water (water levels and hydraulic head) and perched water quality. Moisture content and contaminant of concern (COC) concentration(s) will be measured in the perched water zones to determine if water contents and contaminant fluxes are decreasing as predicted. These data will also be used to verify the OU 3-13 vadose zone model and to determine potential impacts to the SRPA. The specific monitoring to determine perched water drain-out will be described In the OU 3-13 Group 4 Post -ROD Monitoring Plan. The monitoring will be perfomed for a minimum of 20 year after the percolation ponds are removed from service. The perched water zone related to the existing percolation ponds are calculated to drain out in approximately 14 years from the time the ponds are removed from service(OU 3-13 RI FS. Appendix F). New perched water-monitoring wells will be installed to provide additional perched water monitoring locations. If after 5 years. the

perched water zones are not draining out as predicted by the RI FS model then additional recharge controls will be implemented.

Additional controls may include:

- Lining, or an equivalent, the Big Lost River to minimize river recharge to perched water. A trade study will be performed to determine the most cost-effective method to achieve the recharge reduction objective.

- Curtailing steam condensate discharges to the subsurface

- Removing the existing STP lagoons and infiltration galleries. Substitute facilities that do not discharge to contaminated perched water (e.g., new sewage treatment pond lagoons) would need to be sited and constructed prior to implementing, this control.

The additional recharge controls are actions that control sources supplying water to the perched zone. These actions are designed to reduce leaching, and transport of soil contaminants to perched water, reduce the water content of the perched zone, and minimize contaminated perched water releases to the SRPA. Computer simulations indicate that removal of the existing percolation ponds from service is the most beneficial method to prevent the COCs in the vadose zone (particularly Sr-90) from reaching the SRPA. Removal of the existing percolation ponds from service addresses approximately 70% of the water recharging the perched water bodies and sufficiently slows the rate of contaminant transport to the aquifer to allow natural radioactive decay to reduce the Sr-90 mass in the vadose zone. This action is expected to prevent perched water contaminant releases to the SRPA, which would cause the MCLs to be exceeded in the SRPA beyond 2095 (FS Supplement, Section 5.3.2 [DOE-ID 1998a]).

The replacement percolation ponds will be constructed at a sufficient distance (approximately 10,200 ft) away from the INTEC Facility so as to no longer remain a recharge source to the contaminated perched water beneath INTEC. The locations of' the new percolation ponds were based on the measured presence of perched water at the current percolation ponds and groundwater modeling. The amount of "spread" of water from new percolation ponds in the uppermost perched layer was modeled using the interbed parameters from the OU 3-13 vadose zone modeling (OU 3-13 FS, Appendix F). The next pond are located so that perched water from them does not spread to the contaminated perched water beneath INTEC. Figure 11-5 shows the proposed location of the replacement percolation ponds. Other factors evaluated in selecting a new location for the percolation ponds include: locating the ponds outside of any rare, threatened, or endangered habitat, and locating the ponds in areas that have been surveyed cultural and historic artifacts.

The replacement percolation ponds, limited to 80 acres in size, will be subject to applicable permitting, requirements. The Agencies believe that sufficient time is provided prior to the removal date to assure
that this contingency operation under CERCLA will not be necessary. However, due to the necessity and importance of stopping the recharge to the perched water on or before December 31, 2003. the new percolation ponds will be constructed under this ROD and may operate, as a necessary contingency. pursuant to this ROD during the interim period that applicable permits are sought.

The Group 4 remedy will include:

- Removing the existing percolation ponds from service

- Discontinuing lawn irrigation at the INTEC where necessary.

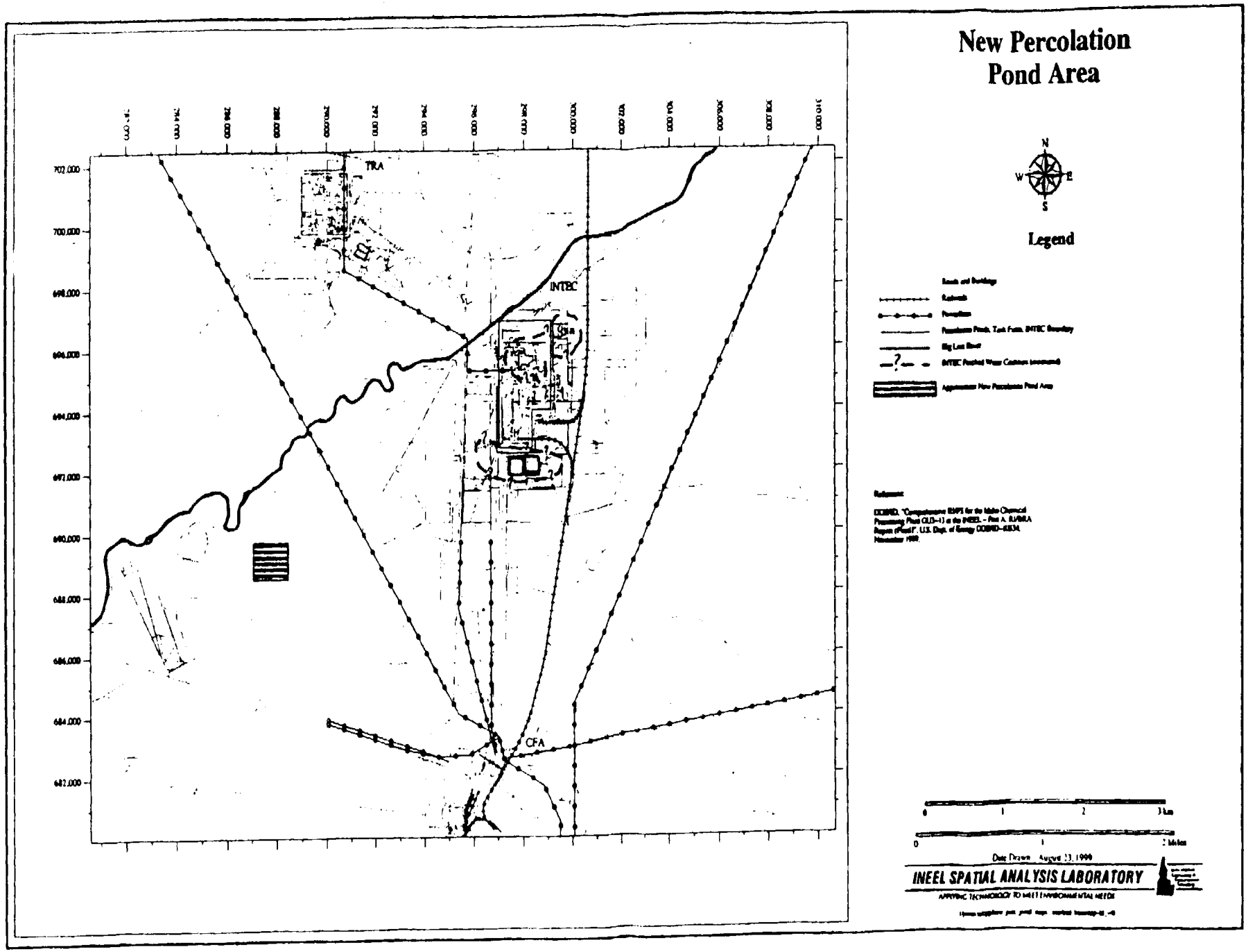


Figure 11-5. Location of replacement percolation ponds.

Additional infiltration controls may include lining or diverting the Big Lost River, repairing leaking fire water lines at the INTEC, curtailing steam condensate discharges to the subsurface, or removing the existing STP lagoons and infiltration galleries. Substitute facilities that do not discharge to the zone of contaminated perched water would need to be sited and constructed prior to implementing this phase.

Five-year reviews of the efficiency of this remedy will be conducted until the Agencies determine that there is no longer a risk posed by vadose zone contaminants leaching to the SRPA. Institutional controls will remain to restrict drilling through the contaminated zone or access to perched water.

Alternative 2 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment. The Agencies believe the selected alternative is protective of human health and the environment, compliant with ARARs, uses permanent solutions, and is cost effective.

11.1.5 Snake River Plain Aquifer Interim Action (Group 5)

The selected SRPA interim action is Alternative 2B-Institutional Controls with Monitoring and Contingent Remediation. This interim action alternative consists of three components:

- Maintaining existing and additional institutional controls over the area of the SRPA contaminant plume to prevent exposure to contaminated groundwater during the time the aquifer is expected to remain above MCLs

- Groundwater monitoring to determine if SRPA groundwater COC concentrations exceed their action levels and if the impacted portion of the aquifer is capable of producing more than 0.5 gpm, which is considered the minimum drinking water yield necessary for the aquifer to serve as a drinking water supply.

- Contingent active pump and treat remediation if the action levels are exceeded and production is greater than 0.5 gpm such that the modeled aquifer water quality will exceed the MCLs after 2095 In the SRPA outside the current INTEC security fence.

Since contaminants from INTEC operations will remain in the SRPA, a five-year review is required by the NCP (40 CFR 300.430[f][4][ii]). Five-year reviews will be conducted until the Agencies determine they are no longer necessary. The five year reviews will evaluate the effectiveness of the alternative and the need for its continuation or to consider a different alternative.

11.1.5.1 Existing and Additional Institutional Controls. Existing institutional controls will prevent the groundwater ingestion exposure route from being completed by preventing direct access to the contaminated SRPA until the year 2095. Institutional controls will remain in place until 2095 and include:

- Area access restrictions

- Land use restrictions to prevent the installation of water supply wells in the SRPA prior to 2095

- A Notice of Agreement with affected federal and local government stakeholders

- Warning signs on wells screened in the SRPA contaminant plume

- Locked and labeled wells screened in the SRPA contaminant plume.

In addition to institutional controls, environmental monitoring and general maintenance and upkeep of monitoring wells will be conducted for as long as it is determined that monitoring is required.

11.1.5.2 Groundwater Monitoring. Groundwater monitoring activities will be conducted throughout the institutional control period to evaluate the concentration and extent of contaminants in the SRPA. Monitoring will cease if the regulators determine there is no unacceptable risk in the aquifer. Monitoring will include sampling of the SRPA using new and existing wells to determine the SRPA aquifer intervals with the highest concentrations of groundwater COCs. The specific groundwater monitoring actions will be described in the OU 3-13 Post-ROD Monitoring Plan that will be developed during RD/RA. A general summary of the groundwater monitoring actions that would trigger subsequent treatability studies and contingent remediation is shown on the decision flow chart in Figure 11-6. Groundwater modeling presented in Appendix B of the FS Supplement (DOE-ID 1998a) suggests that the highest I- 129 concentrations occur in the H-I interbed of the SRPA. The modeling accounts for attenuation and dispersion. The H-I interbed is a sedimentary interbed that is located approximately 38 m (125 ft) below the top of the SRPA water table. The water table at INTEC occurs at an approximate depth of 140 m (460 ft) beneath the INTEC. The H-I interbed is about 7.6 m (25 ft) thick and has a low permeability (4 mDarcy). The model also assumed that potential releases of contaminated perched water to the SRPA will be controlled by removing the existing percolation ponds from service.

Additional groundwater modeling and sampling will be conducted to determine the location of COC hotspot (Step 1 in Figure 11-6). Monitoring wells will be installed at the predicted hot spots along the centerline of the predicted plume. Packer tests will be used to determine the zone(s) of highest contamination. These results will be compared to the action levels (Table 8-2). Groundwater quality data will be obtained from the SRPA intervals containing the highest COC concentrations to determine if these concentrations exceed the action level(s) (Step 2 in Figure 11-6). The action levels are based on the modeled maximum concentration of the COCs measured in calendar year 2000 that are expected to yield individual contaminant concentrations above the MCLs in the SRPA outside the current INTEC securitv fence in 2095. Contaminant transport studies, and refinements to the contaminant transport model will continue during the institutional control and monitoring period. The action levels will be reviewed at each 5-year review and adjusted as necessary to insure that RAOs are being met.

If the action levels are exceeded (Step 3 in Figure 11-6), isopleth maps will be developed using the groundwater quality data. The isopleth maps will be developed (Step 4 in Figure 11 -6) to determine if the hot spot(s) is(are) of sufficient volume to provide an unacceptable risk to a hypothetical groundwater user for more than one year (Step 5 in Figure 11-6). The isopleth maps will be prepared to determine if the plurne will move past a future receptor such that the exposure duration would be too short to present an unacceptable risk. If the hot spot is small, or if it moves too quickly to present an unacceptable risk, then no further active measure would be pursued. but monitoring would continue and the data and modeling would be reviewed at the 5-year review period.

- If the contaminated aquifer interval exceeds the COC action level(s) and is of sufficient volume to potentially expose a hypothetical groundwater user to an unacceptable risk, representative wells will be selected to determine if the affected portion of the SRPA is capable of producing a sustainable yield (for at least 24 hours continuous pumping) of more than 0.5gym (Step 6 in Figure 11 -6). The 0.5 opm pumping rate is based on the minimum amount of drinking water necessary. to sustain an average household. The wells that are selected to determine these limits will be screened over the aquifer interval exhibiting the

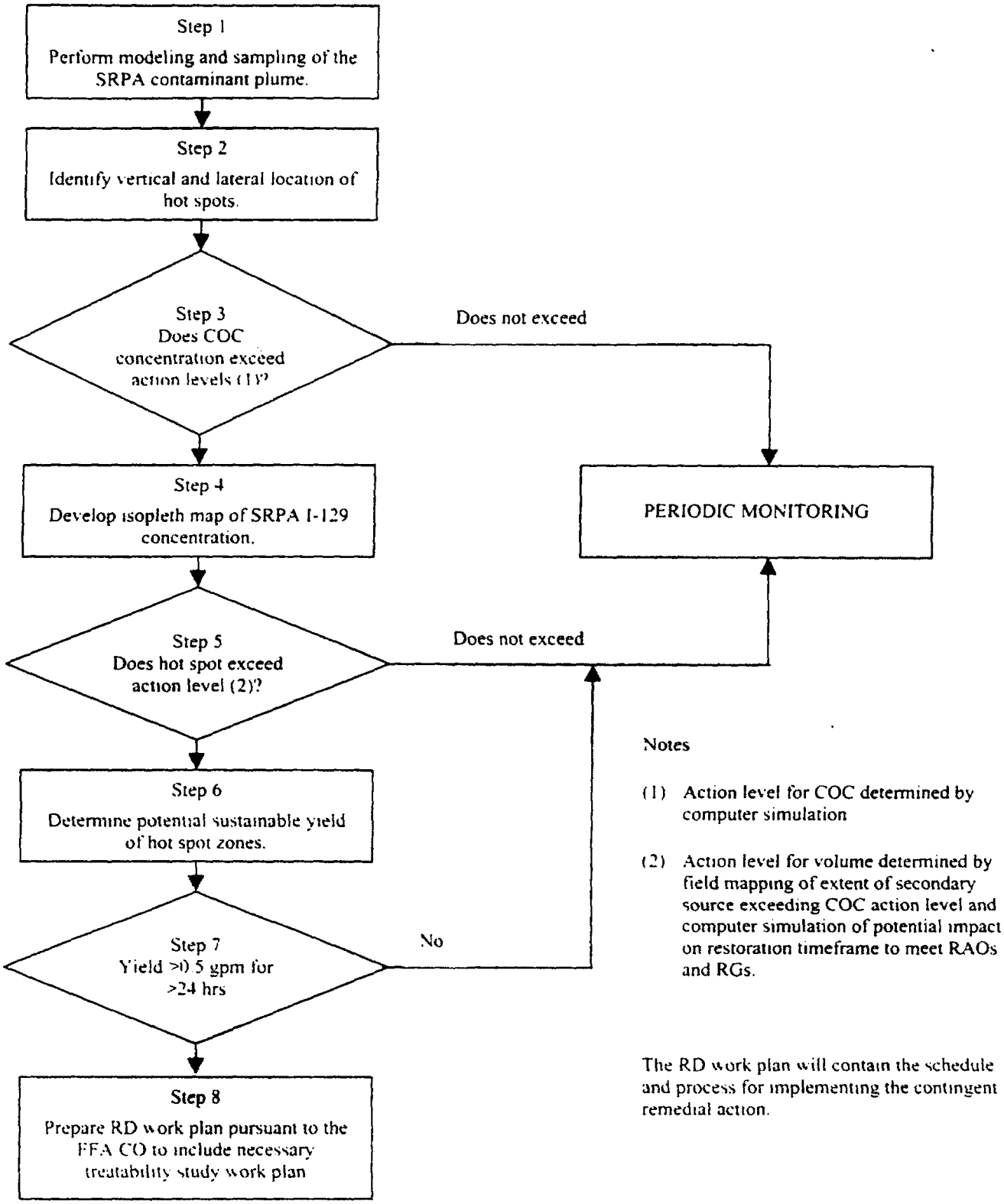


Figure 11-6. SRPA contingent remediation decision flow chart.

highest concentrations of COCs. If the water yield is greater than 0.5 gpm on a sustained basis, and the action level(s) is exceeded (Step 7 in Figure 11-6), then active remedial action will be pursued. If monitoring does not support the need for remedial action, periodic groundwater monitoring will be continued and the data reviewed during each 5-year reviews until restoration is achieved.

- **Treatability Studies and Contingent Remediation**. If all of the above described criteria (Steps 1 through 7 in Figure 11-6) are met for a well screened in the SRPA, treatability studies will be pertormed (Step 8 in Figure 11-6). The treatability studies may include analytical calculations and/or numerical modeling, pumping tests, and bench- or pilot-scale treatment testing. The treatability studies will determine if long-term pumping from the affected interbed is feasible and whether the COCs exceeding the action level(s) can be cost-effectively removed from groundwater. In addition to I-129 and other COCS the treatability studies will also evaluate the presence of mercury, Sr-90, chromium. Tc-99, and tritium, all of which are known or are predicted to be present in the groundwater plume at significant concentrations. While these contaminants are not long-term risk drivers, they may foul the groundwater treatment system or pose radiological exposure concerns if brought to the surface for treatment. Further monitoring will be performed to define the optimum path forward. The treatability study will be developed during RD if needed. If the treatability studies determine that selectively pumping and treating contaminated groundwater from the affected portions of the SRPA will meet the MCL(s) in 2095, and treatment and recharge or evaporation of treated groundwater is implementable and cost-effective, then Remedial Design and active remediation will be implemented.

Prior to installing a pump and treat system, the COC action limits will be verified or reestablished by additional modeling using the data obtained from the new monitoring wells, the packer tests, and pump/yield/concentration data. The duration of pumping and treatment will also be estimated using the model. If treatability studies determine that pumping the affected SRPA interbed is not technically feasible, then a technical impracticability waiver will be sought through a ROD Amendment.

Active remediation would consist of:

- Contingent pump and treat remedial action will be implemented if groundwater monitoring determines that combined COCs in groundwater exceed their respective action levels in the year 2000 or during subsequent monitoring. The action levels are based on modeling that predicts that individual or combined contaminants will exceed MCLs in the year 2095 for portions of the aquifer that is capable of sustaining a production of rate 0.5 gpm.Components of the pump and treat action include:

  - Installation of extraction wells to remove the zone of maximum contamination or hot spot

  - Above ground, on-site physical chemical treatment of the extracted water in compliance with ARARs

  - On-site recharge to the SRPA or evaporation of the treated effluent in compliance W ith A RARs.

The treatabilitystudies will consider the presence of all contaminants. Mercury, Sr-90, chromium. Tc-99, H-3, are known or are predicted to be present in the SRPA at significant concentrations. Although these additional contaminants are not necessarily long-term risk-drivers, they become problematic once brought to thesurface for treatment because they may foul the treatment system or may pose radiological

exposure concerns, as in the case of Tc-99. In addition, all contaminants must be removed to below MCLs if the treated groundwater is injected into the aquifer.

Although Alternative 2A is less costly than the selected alternative 2B, it does not provide any reduction in toxicity, mobility or volume through treatment and may not meet the Remedial Action Objective of restoring the aquifer to drinking water quality by the year 2095. Therefore, the contingency remedy, Alternative 2B best addresses groundwater modeling concerns regarding aquifer restoration. The Agencies believe the selected alternative is protective of human health and the environment, complies with ARARs. uses a permanent solution, and is cost effective.

11.1.6 Buried Gas Cylinders (Group 6)

The selected remedy for the Buried Gas Cylinders is Alternative 2— Removal, Treatment, and Disposal. The basis of this remedy is the removal and management of buried cylinders from each burial site. Abandonment of the cylinders presents a safety hazard should the cylinders burst from over-pressurization. Alternative 2 consists of:

- Institutional controls (i.e., warning signs) until completion of the buried cylinders removal
- Site characterization using geophysical surveys
- Removing the gas cylinders
- Treating the contents, if necessary
- Recycling or disposing of the gas cylinder containers.

The remedy will consist of two phases. Phase 1 includes initial geophysical surveys of each burial site to determine the extent of the buried cylinders and initial surface soil sampling of burial site CPP-94. The primary threat at the site is safety.

Phase 2 of the remedy consists of excavation, removal, and management of the cylinders at each site. Excavation will be conducted within a containment structure to ensure that accidental contaminant releases to the environment do not occur. Evaluation and management of the cylinders during Phase 2 will consist of the following:

- Removal and disposal or recycling of empty cylinders
- Removal and verification of cylinders with "known" contents
- Removal and sampling of cylinders with unknown contents
- Re-valving or re-containerization of cylinders with inoperable valves followed by sampling of the gases
- Venting of cylinders containing environmentally benign gases (i.e., compressed air, argon, carbon dioxide, helium, nitrogen, and oxygen)
- Treatment of cylinders containing acetylene or hydrofluoric acid having operable valves followed by disposal or recycling of the cylinder

- Treatment of cylinders containing acetylene or hydrofluoric acid having inoperable valves following valve replacement or recontainerization and subsequent disposal or recycling of the cylinder.

A contractor specializing in gas cylinder removal, treatment, and disposal will perform the activities associated with this alterriative.

After removal of the cylinders from the burial sites, a post remediation survey of each burial site will be performed to determine earthwork requirements for the final grading. The burial sites will be graded to blend with the surrounding topography. Clean Fills for the final grading will be obtained from an onsite borrow source if necessary.

The Agencies may elect to pursue a contingent remedy of capping in place pursuant to the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310) if safety concerns with excavation and removal prevent implementation of the selected remedy.

Alternative 2 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment. The Agencies believe the selected alternative is protective of human health and the environment, complies with ARARs. uses a permanent solution, and is cost effective.

11.1.7 SFE-20 Hot Waste Tank System (Group 7)

The selected remedy for the SFE-20 Hot Waste Tank System is Alternative 4— Removal, Treatment, and Disposal. Alternative 4 consists of:

- Institutional controls (i.e.. waming signs) until the removal of the tank liquid and sludge
- Sampling the tank contents
- Removal and ex situ treatment of the tank liquid and sludge
- Excavation and removal of the tank, tank vault, pump pit enclosures and other associated structures
- On-site disposal of the tank and associated structures.

Following characterization, the tank liquid will be removed and treated at the PEW evaporator if it meets the specified waste criteria. The tank sludge w ill be removed and treated (ex situ) using a suitable grout to solidify and stabilize the contaminants in the sludge. The stabilized sludge will then bedrummed and disposed either on-Site or off-site at a suitable engineered disposal facility. Depending on waste characteristics, the remaining component of the tank system will be excavated, removed, and disposed in the ICDF or off-site, depending on whether they meet the ICDF waste acceptance criteria. The excavation will be backfilled to grade with clean soils.

It is assumed that the liquid within the SFE-20 tank will meet the PEW WAC. The liquid contents of the tank are consistent with previous INTEC waste processed through the tank system and discharged to the PEW. However, if the PEW is unable to accept the liquid waste or is unavailable at the time the response action is conducted, a small portable evaporator unit would be utilized on-Site: or the waste would be disposed off-,site in accordance with the Off-site Rule (40 CFR 300,440).

Alternative 4 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment and compliance with ARARs. The Agencies believe the selected alternative is protective of human health and the environment, complies with ARARs, uses a permanent solution, and is cost effective.

11.1.8 Future Site Closures Under RCRA and D&D

In addition to the 101 CERCLA sites addressed in this ROD, approximately 79 INTEC facilities will be undergoing closure under RCRA, HWMA and D&D in the future, after this ROD becomes final.

To minimize duplication of resources and in keeping with the RCRA/CERCLA Parity Policy, a periodic review will be conducted to evaluate facility closures outside the scope of this ROD to determine what additional sources have been identified, and what impact of these sources may have on the residual risk at OU 3-13. Plans for upcoming RCR-A;HWMA and D&D closures will also be evaluated to determine that the closure plans include an approach that ensures the following:

- Both RCRA/HWMA and D&D closures of INTEC facilities will satisfy RAOs, and will not add significantly to human health or environmental risks.

- Risks to human health and the environment resulting from any residual contamination discovered will be evaluated and minimized in order to be consistent with the RAOs identified previously.

11.1.9 Five-Year Reviews

The CERCLA 5-year review process will be implemented to ensure protection of human health and the environment at sites where contaminants remain in place at levels that do not allow unlimited or unrestricted current or future use as required under 40 CFR 300.430 and CERCLA Section 121. The schedule for 5-year reviews will be included in the RD/RA Work Plan. Five year reviews will continue to be conducted as long as site access or use restrictions are necessary to remain protective of human health and the environment.

Five-year reviews will also assess the effectiveness of Institutional Controls for sites for which “No Further Action” was recommended and ensure that these sites are not adversely impacted by continued INTEC operations. Any new information acquired regarding the nature and extent of contamination at these sites will be considered during each review

11.1.10 Post-Closure Care and Monitoring

Post-clQsure care and monitoring are included as elements of remedial alternatives for sites where COCs remain in place above risk-based levels. Monitoring and maintenance reports will be considered in 5-year reviews to determine the continued effectiveness of remedies.

11.2 Estimated Costs of Selected Remedies

Tables 11 -2 through 11-8 prov ides the estimated capital and operation costs for each group. The costs presented in these tables are - 30 to -50 percent estimates according to EPA guidance. A 100 year operation and maintenance period vas costed for all ofthe final actions. Operation and maintenance costs for the interim actions \k ere cal'culated for the interim action period. A discount rate of 5 percent was used to calculate the NPV.

11.3 Expected Outcome of Selected Remedy

For all groups. except the Tank Farm and SRPA interim actions. the expected outcome of the selected remedies is that the cumulative risk, for all pathways at these sites will be reduced to less than I x 10"' and other risks will be reduced to a HI less than 1).

The use of industrial health and safety controls and the implementation of DOE radiolo-gical control procedures will control worker risk during remedy implementation.

Following the operational control period, the Group 2 Soils Under Buildings and Structures will either be covered by the equivalent of a cap with a 1000 year design life. or by the overlying buildings. If exposed during D&D activities, contaminated soils will be removed to a minimum of 3 m (10 ft) below grade (if necessary), backfilled with clean Fill, and revegetated where appropriate. Where a cap is in place, the area up to the edge ofthe cap will be available for industrial use. Where soils have been removed, the former soil site wIII be available for industrial use.

Group 3, Other Surface Soils, will have been excavated and disposed in the lCDF, or suitable off-site facility-, and the former release sites will be filled with clean back fill. revegetated where appropriate, and available for industrial use.

The ICDF wit] remain in place and closed. The supporting facilities will be completely removed and disposed within the ICDF. The ICDF will contain contaminated surface soils from INTEC, and potentially will contain CERCLA wastes from other parts of the INEEL. The cap of the facility will be designed to last 1.000 years, against intrusion from both humans and biota, and minimize infiltration of precipitation through the waste layer. The cap will rise slightly above the surrounding area, and will have a low grade to promote runoff. A 100 m (328 ft) buffer zone will be maintained as part of the exclusion area around the capped area. Institutional Controls will be maintained to prevent unauthorized access to the disposal facility.

Group 4, Perched Water, will have been greatly reduced in areas of saturation, if not completely eliminated. High levels of contamination will remain in place in the subsurface, but these contaminants will be unavailable for either surface exposure or transport to the SRPA. The majority of the contamination is Sr-90. which will decay in place due to Its short half-life of approximately 30 years.

Group 5, the SRPA, will meet MCLs outside of the current INTEC security fence by 2095. Institutional controls will be implemented to prevent the use of groundwater inside the current INTEC security fence.

Group 6, Buried Gas Cylinders. will have been removed. and these areas will be available for industrial use.

Group 7. the SFE-20 Hot Waste Tank System. w ill have been removed. and this area will be available for industrial use.

Table 11-2. Estimated Capital and Operations Costs (6 years) for Tank Farm Soils Interim Action Selected Alternative 3. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/C0 Management and Oversight[a]	1,574,000
Remedial Design[b]	135,000
Remedial Action Construction[c]	10,286,000
Total Capital Cost in FY97 dollars	12,096,000
Operation Costs	
Remedial Action Operations[d]	491,000
D & D of Facilities	NA
Surveillance and Monitoring	3,679,000
Total Operation Cost in FY97 dollars	4,170,000
TOTAL PROJECT COST IN FY97 S's	**16,266,000**
Total Capital Cost in NPV	11,428,000
Total Operation Cost in NPV	3,725,000
TOTAL PROJECT COST IN NPV	**15,153,000**

a. Includes Program Management, RA documentation preparation, RD, RA SOW, RA Work Plan, Packaging, Shipping, Transportation documentation. RA Report. WAG-wide R_-k 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan. and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization. construction subcontract. and project construction management.

d. Includes Program Management. continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-3. Estimated Capital and Operations Costs (100 years) for Soils Under Buildings and Structures Selected Alterative 2. Costs are in 1997dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/ CO Management and Oversight[a]	6,748,000
Remedial Design[b]	910,000
Remedial Action Construction[c]	524,000
Total Capital Cost in FY97 dollars	8,182,00
Operation Costs	
Remedial Action Operations[d]	9,032, 000
D & D of Facilities	NA
Surveillance and Monitoring	676,000
Total Operation Cost in FY97 dollars	9,708,000
TOTAL PROJECT COST IN FY'97 S's	**17,890,000**
Total Capital Cost in NPV	5,103,000
Total Operation Cost in NPV	4,076,000
TOTAL PROJECT COST IN NPV	**9,179,000**

a. Includes Program Management. RA documentation preparation. RD RA SOW. RA Workplan. Packaging, Shipping, Transportation documentation. RA Report. WAG-wide RA 5yr review, RD documentation preparation. Safety Analysis documentation. Sampling and Analysis Plan. and Pre-Final Inspection Report.

b. Includes, added institutional controls and title design construction document package

c. Include site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-4. Estimated Capital and Operations Costs (100 years) for Other Surface Soils Selected Alternative 4A. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/CO Management and Oversight[a]	5,199,000
Remedial Design[b]	1,699,000
Remedial Action Construction[c]	85,056,000
Total Capital Cost in FY97 dollars	91,955,000
Operation Costs	
Remedial Action Operations[d]	11,514,000
D & D of Facilities	NA
Surveillance and Monitoring	8,213,000
Total Operation Cost in FY97 dollars	19,727,000
TOTAL PROJECT COST IN FY97 $'s	**111,682,000**
Total Capital Cost in NPV	76,626,000
Total Operation Cost in NPV	8,283,000
TOTAL PROJECT COST IN NPV	**84,909,000**

a. Includes Program Management, RA documentation preparation, RD.RA SOW, RA Workplan, Packaging, Shipping, Transportation documentation, RA Report, WAG-wide RA 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan, and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-5. Estimated Capital and Operations Costs (100 years) for Other Surface Soils Selected Alternative 2. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/CO Management and Oversight[a]	5,036,000
Remedial Design[b]	3,774,000
Remedial Action Construction[c]	9,445,000
Total Capital Cost in FY97 dollars	18,256,000
Operation Costs	
Remedial Action Operations[d]	8,171,000
D & D of Facilities	NA
Surveillance and Monitoring	2,892,000
Total Operation Cost in FY97 dollars	11,063,000
TOTAL PROJECT COST IN FY97 $s	**29,319,000**
Total Capital Cost in NPV	15,320,000
Total Operation Cost in NPV	4,645,000
TOTAL PROJECT COST IN NPV	**19,965,000**

a. Includes Program Management, RA documentation preparation, RD.RA SOW, RA Workplan, Packaging, Shipping, Transportation documentation, RA Report, WAG-wide RA 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan, and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-6. Estimated Capital and Operations Costs (100 years) for Snake River Aquifer Interim Action Selected Alternative 2B. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/CO Management and Oversight[a]	5,300,000
Remedial Design[b]	4,302,000
Remedial Action Construction[c]	14,855,000
Total Capital Cost in FY97 dollars	24,457,000
Operation Costs	
Remedial Action Operations[d]	16,141,000
D & D of Facilities	1,647,000
Surveillance and Monitoring	16,911,000
Total Operation Cost in FY97 dollars	34,699,000
TOTAL PROJECT COST IN FY97 $'s	**59,156,000**
Total Capital Cost in NPV	20,701,000,
Total Operation Cost in NPV	19,149,000
TOTAL PROJECT COST IN NPV	**3,985,000**

a. Includes Program Management, RA documentation preparation, RD.RA SOW, RA Workplan, Packaging, Shipping, Transportation documentation, RA Report, WAG-wide RA 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan, and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-7. Estimated Capital and Operations Costs (100 years) for Buried Gas Cylinder Sites Selected Alternative 2. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/CO Management and Oversight[a]	992,000
Remedial Design[b]	48,000
Remedial Action Construction[c]	956,000
Total Capital Cost in FY97 dollars	1,926,000
Operation Costs	
Remedial Action Operations[d]	NA
D & D of Facilities	NA
Surveillance and Monitoring	NA
Total Operation Cost in FY97 dollars	NA
TOTAL PROJECT COST IN FY97 $'s	**1,926,000**
Total Capital Cost in NPV	1,834,000
Total Operation Cost in NPV	NA
TOTAL PROJECT COST IN NPV	**1,834,000**

a. Includes Program Management, RA documentation preparation, RD RA SOW, RA Workplan, Packaging, Shipping, Transportation documentation, RA Report, WAG-wide RA 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan, and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

Table 11-8. Estimated Capital and Operations Costs (100 years) for SFE-20 Hot Waste Tank System Selected Alternative 4. Costs are in 1997 dollars except as noted.

Cost Elements	Estimated Costs in $
Capital Costs	
FFA/CO Management and Oversight[a]	862,000
Remedial Design[b]	893,000
Remedial Action Construction[c]	3,008,000
Total Capital Cost in FY97 dollars	4,763,000
Operation Costs	
Remedial Action Operations[d]	NA
D & D of Facilities	NA
Surveillance and Monitoring	NA
Total Operation Cost in FY97 dollars	NA
TOTAL PROJECT COST IN FY97 $'s	**4,763,000**
Total Capital Cost in NPV	4,639,000
Total Operation Cost in NPV	NA
TOTAL PROJECT COST IN NPV	**4,639,000**

a. Includes Program Management, RA documentation preparation, RD RA SOW, RA Workplan, Packaging, Shipping, Transportation documentation, RA Report, WAG-wide RA 5-yr review, RD documentation preparation, Safety Analysis documentation, Sampling and Analysis Plan, and Pre-Final Inspection Report.

b. Includes added institutional controls and title design construction document package.

c. Includes site characterization, construction subcontract, and project construction management.

d. Includes Program Management, continued and new construction caretaker maintenance, operations, maintenance, materials, and disposal.

12. STATUTORY DETERMINATION

The selected remedy for each site including the "No Action" and "No Further Action" sites, meets the statutory requirements of CERCLA Section 121. the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. Regulatory compliance for each selected remedy for each group is summarized in the following sections. All remedies meet the threshold criteria established in the NCP (i.e., protection of human health and the environment and compliance with ARARs). CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action must be cost -effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. For many of the sites contaminated with radionuclides, effective treatment technologies are currently unavailable, and therefore, the preference for permanent solutions cannot be met except through natural radioactive decay processes over time.

12.1.1 Protection of Human Health and the Environment

As described in Section 11, the selected remedy for each site satisfies the criterion of overall protection of human health and the environment. The selected remedies for each site and the means by which each type of alternative meets this criterion are further described in Section 12.1.1 through 12.1.9.

12.1.1 "No Action" Sites

The Agencies have determined that "No Action" be taken under CERCLA at 34 sites. Ten sites were classified as "No Action" sites with the signing of the FFA/CO. An additional 24 sites were determined to be "No Action" sites through Track 1 or 2 investigations or RI/BRA analysis. "No Action" sites are those sites that have no contaminant source or have a contaminant source with an acceptable risk level (less than 1×10^{4}) as determined in the BRA (DOE-ID 1997b). Table 4-1 lists the "No Action" sites in OU 3-13.

As a result of the "No Action" decision for these sites, the Agencies have determined that these sites pose no short- or long-term risks to human health or the environment. Therefore, the "No Action" decision provides for overall protection of human health and the environment.

12.1.2 "No Further Action" Sites

The Agencies have determined that "No Further Action" be taken under CERCLA at six sites. Table 4-1 lists the "No Further Action" sites. A "No Further Action" site is a site that has a contaminant source or a potential contaminant source present that does not have an exposure route resulting in risks greater than 1×10^{-4} for the risk scenario evaluated under the assumed site controls. These sites were determined to be "No Further Action" sites through Track 1 or 2 investigations and RI/ BRA analysis. The "No Further Action" sites are sites where remedial action is being taken. However, the only remedial action is Institutional Controls.

Short- and long-term protection will be provided for the "No Further Action" sites using institutional control. The institutional controls will be maintained at these sites until the Agencies determine that access or land use restrictions are no longer needed to prevent potential exposures or the perceived risk is considered acceptable. The institutional controls during the period of DOE operations will include property lease requirements, including control of land use consistent with this ROD. Institutional controls after DOE operations cease will include property transfer, restrictions, including a

finding of suitability to transfer and requirements for control of land use consistent with this ROD. The institutional controls will be tracked using the INEEL Land Use Plan. The "No Further Action" sites will be reviewed during the CERCLA 5-year review process to verify the effectiveness of the “No Further Action” decisions.

The Agencies believe that these controls will provide overall protection of human health and the environment for the "No Further Action" sites. The institutional controls will be maintained at these sites until an unacceptable risk to human health or the environment no longer exists .

12.1.3 Tank Farm Soils Interim Action Selected Remedy: Alternative 3 Institutional Controls with Surface Water Controls

An interim action was selected for the Tank Farm Soils release sites. A final remedial action will be developed under OU 3-14 following additional site characterization, risk analysis, and remedial alternative evaluation. The interim action will be performed to minimize contaminant exposures to the public and to limit further impacts to soil and groundwater until a final remedy is implemented under OU 3-14. A final remedy decision is anticipated prior to 2008. Based on currently available information. the interim action is not inconsistent with the expected final remedy for the Tank Farm Soils. The selected interim action is designed to prevent short-term exposure to contaminants present at the site and to minimize moisture infiltration that may occur and leach and transport contaminants to the perched water or SRPA.

The selected interim action will provide short-term protection of human health and the environment while the final remedy is developed and selected. Short-term protection will be provided by this alternative through existing and additional institutional controls, including radiological engineering controls and health and safety procedures, which will limit current worker and non-worker access or exposure to contaminated soils. Engineering controls will be used to minimize fugitive dust or toxic emissions during construction activities and provide short-term protection during implementation of the interim action. Additional short-term protection will be provided by surface water controls which will facilitate management of an unplanned spill or release and significant1v reduce surface water infiltration into the Tank Farm soils. Some measure of long-term protection is provided by the reduction of surface water infiltration into the Tank Farm soils which will limit expected leaching and transport of contaminants to the perched water and minimally reduce available water in the perched zone. These actions will pro- vide overall protection of human health and the environment by minimizing the potential for environmental releases and future groundwater quality impacts to the SRPA.

The Agencies believe that this interim action best satisfies the 5 balancing criteria and will be protective of human health and the environment while the OU 3-14 Tank Farm RI/FS is performed. Further. this action will satisfy RAOs and will not be inconsistent with the expected final Tank Farm remedy and the HLW & FD EIS currently being conducted.

12.1.4 Soils Under Buildings or Structures Selected Remedy: Alternative 2 Existing and Additional Institutional Controls and Containment

The selected alternative for the Soils Under Buildings and Structures is a deferred action that consists of existing and additional institutional controls and soil capping or excavation. The selected remedy will provide short-term protection of human health and the environment through the implementation of existing and additional institutional controls that reduce the potential for current worker, non-worker, or community access or exposure to contaminated soils. Implementing the remedy will not pose unacceptable short-term risks to the community, workers, or the environment. Engineering controls, radiological engineering controls, and health and safety procedures will be used to minimize any

short-term risks to current workers, non-workers, or the community during barrier construction or soil excavation, if necessary. Safe work practices will be used to minimize personnel injury during construction activities.

Long-term protection of human health and the environment will be achieved by containing the contaminated soils beneath the existing buildings, or structures, or capping with an engineered barrier or excavating the contaminated soils should the building or structure be removed and the soils exposed. If the building or structure is removed such that the contaminated soils are exposed, capping or excavation will be implemented to provide long-term protection. The engineered barrier will be designed to limit exposure to contaminated soils and to minimize infiltration of precipitation into the contaminated soils which could potentially leach and transport contaminants to the SRPA for at least 1,000 years. Soils that are excavated will be handled as Group 3 soils. Removal and disposal of the contaminated soils at the ICDF would also provide long-term protection, since the ICDF will be designed to provide isolation for at least 1,000 years.

Closure and D&D plans for the Group 2 buildings and structures will be reviewed by the Agencies, under CERCLA, to ensure that the building or structure end-state satisfies soil and groundwater RAOs and meets ARARs. Decontamination and closure will be completed in a manner that will assure adequate short- and long-term protection of human health and the environment. This will prevent future exposure to contaminated soils and minimize any potential adverse impacts to SRPA groundwater quality above allowable levels for up to 1,000 years, if necessary. Natural radioactive decay will reduce contaminant concentrations to levels that are not a risk to human health or the environment.

Alternative 2 is selected because it best meets the balancing criteria of Implementability and short-term effectiveness, given that Alternative 3 is dependent upon the removal of the buildings and structures to be cost-effective. The Agencies believe that the selected remedy will provide overall protection of human health and the environment and satisfy the RAOs by reducing the potential exposures to less than 1×10^{-4} or a HI less than 1 by eliminating human and environmental exposure pathways.

12.1.5 Other Surface Soils Selected Remedy: Alternative 4A— Excavation and Onsite Disposal in the ICDF

The selected remedy for the Other Surface Soils is excavation and onsite disposal in the ICDF. This remedy will reduce potential exposures to contaminated soils by excavating and disposing the soils in the ICDF. The selected remedy will provide short-term protection of human health and the environment through the implementation of administrative and engineering controls that will limit current worker, non-worker, or community exposures to acceptable levels during soil excavation, transport, and disposal at the ICDF. Short-term protection will be provided during soil excavation using engineering controls to minimize fugitive emissions and radiological engineering controls, health and safety procedures, and safe work practices to prevent exposures or injury. These controls will minimize any short-term risks to workers, non-workers, or the community.

Long-term protection of human health and the environment will be achieved by removing all soils at each release site that exceed the remediation goals to a depth of at least 10 feet below ground and disposing them in the ICDF. The ICDF will be designed for long-term protection and contaminant isolation for at least 1,000 years. Soil excavation and disposal at the ICDF will eliminate the existing surface exposure pathways at the release sites.

The excavated soils will be disposed in the ICDF. an engineered disposal facility, designed for long-term protection and containment. The ICDF will be sited in Site CPP-95 (Figure 11-4). The ICDF

footprint will cover no more than 80 acres. Short-term protection of human health and the environment will be provided through the implementation of institutional and engineering controls, radiological controls, health and safety procedures, and safe work practices during construction, operation, and closure of the ICDF to protect workers, non-workers, and tile community from exposure to the disposed contaminated soils. Long-term protection of human health and the environment will be provided by the ICDF which will be designed, constructed, operated. and closed to inhibit intrusion by humans and biota, to provide sufficient shielding to minimize external exposure to radionuclide-contaminated soils, and to limit surface water and precipitation infiltration through the contaminated soils to reduce the potential for leaching and transport of soil contaminants to the perched water or SRPA. The final cover on the ICDF will be designed to provide human and biotic intrusion protection for at least 1,000 years.

Construction of the ICDF will disturb the environment. Environmental disturbances will be minimized by performing the construction activities in compliance with ARARs, the INEEL Storm Water Pollution Prevention Plan, and performing a cultural resource evaluation. All soil disturbance activities will be performed in compliance with the INEEL Storm Water Pollution Prevention Plan, including revegetation activities.

A preliminary cultural resource evaluation has been conducted for the areas that might be disturbed by the ICDF. If during soil disturbance activities, unusual materials such as arrowheads, obsidian, or bones are discovered, all work will cease and the INEEL Cultural Resources Office will be contacted for assistance. The land that will be disturbed during ICDF construction has been evaluated for biological resources. There are no known wetlands, unique habitats, or areas occupied by Threatened or Endangered species. As such, consultation with the Fish and Wildlife Service will not be necessary.

Although more costly than Alternative 3, which requires capping each Group 3 site in place, the selected Alternative 4A, reduces the footprint of the WAG 3 restricted area allowing for future development and is expandable to address INEEL-wide CERCLA contaminated media and debris. Further, the consolidation in an engineered landfill with leachate collection will safeguard the underlying SRPA. The Agencies believe that the selected remedy will provide overall protection of human health and the environment because the soils will be permanently excavated to a depth of at least 10 feet and disposed in the ICDF which will be designed to provide protection for at least 1,000 years. This remedy will reduce potential exposures to less than 1×10^4 or a HI less than 1.

12.1.6 Perched Water Selected Remedy: Alternative 2— Existing and Additional Institutional Controls with Aquifer Recharge Control

The selected remedy for Perched Water is existing and additional institutional controls with aquifer recharge control. Implementation of the selected remedy will pose no additional risks to workers, non-workers, the community, or the environment. Short-term protection during implementation of the selected remedy will be provided by the Implementation of institutional and engineering controls, radiological engineering controls, health and safety procedures, and safe work practices. These actions will limit current worker and non-worker exposures to perched water during drilling, well installation, and monitoring.

Long-term protection of human health and the environment will be achieved by institutional controls. including land and ground water use restrictions, to eliminate future use of perched water as long as an unacceptable risk remains. The estimated yield of wells completed in the perched water further precludes domestic use and provides a measure of long-term protection. Additional long-term protection is provided by the implementation of aquifer recharge controls, to reduce leaching and transport of soil contaminants to the perched zone, to limit the available water content in the perched zone, and reduce the

potential for future perched water releases to the SRPA. The remedies will be implemented as necessary to provide long-term protection of SRPA groundwater quality. Perched water does not pose either short-or long-term risks to environmental receptors as it is not accessible to biota.

The selected Perched Water alternative requires removing the existing percolation ponds from service, and constructing alternative service wastewater disposal facilities that will not impact SRPA water quality. The replacement percolation ponds will be constructed approximately 3.109 m (10.200 ft) from the existing percolation ponds so as to no longer recharge the contaminated perched zone beneath the INTEC. Replacement percolation pond construction will involve the usual short-term risks involved with similar earth work projects. These short-term risks, if necessary, will be minimized using engineering and radiological controls, health and safety plans, and safe work practices. If removing the existing percolation ponds does not achieve the necessary moisture reduction in the perched zone, lining the Big Lost River to prevent river recharge to the perched zone will also be considered. Neither current workers nor non-workers will be exposed to contaminants during the construction of the replacement percolation ponds or lining the Big Lost River that would result in excess cancer risks or health effects.

Construction of the replacement percolation ponds will disturb the environment. Environmental disturbances will be minimized by performing the construction activities In compliance with ARARs and the INEEL Storm Water Pollution Prevention Plan, and performing a cultural resource evaluation. All soil disturbance activities will be performed in compliance with the INEEL Storm Water Pollution Prevention Plan, including re-vegetation activities.

A preliminary cultural resource evaluation has been conducted for the areas that might be disturbed by the replacement percolation ponds. If during soil disturbance activities, unusual materials such as arrowheads, obsidian, or bones are discovered, all work will cease and the INEEL Cultural Resources Office will be contacted for assistance. The land that will be disturbed as part of the replacement percolation pond construction activities has been evaluated for biological resources. There are no known wetlands, unique habitats, or areas occupied by Threatened or Endangered species. As such, consultation with the Fish and Wildlife Service will not be necessary.

Alternative 2 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment. The Agencies believe that the selected remedy will provide overall protection of human health and the environment and satisfy RAOs by restricting potential perched water use and reducing water infiltration to minimize future contaminant releases to the SRPA. This remedy will reduce potential risks to human health to less than 1×10^{-4} or a HI less than 1.

12.1.7 Snake River Plain Aquifer Interim Action Selected Remedy: Alternative 2B—Institutional Controls with Monitoring and Contingent Remediation

The selected SRPA remedy is an interim action with existing and additional institutional controls, groundwater monitoring, and contingent remediation. This interim action is a final action for the portion of the SRPA outside the current INTEC security fence. A Final action for the portion of the SRPA inside the current INTEC security fence will be developed under OU 3-14. Implementation of the selected remedy poses no additional risks to workers, non-workers, the community, or the environment. Short-term protection will be provided by implementation of institutional and engineering controls, radiological engineering controls, health and safety plans, and safe work practices to limit current worker and non-worker exposures or injuries during SRPA drilling, well installation, and groundwater, monitoring. These controls will also protect current workers and non-workers from short-term risks if contingent remediation is implemented. Current workers, non-workers, and the community will also be prevented

from ingesting SRPA groundwater using institutional and engineering controls, such as locked wells or groundwater use restrictions.

Long-term protection of human health and the environment will be achieved by maintaining existing and additional institutional controls, such as land and groundwater use restrictions, over the area of the contaminant plume. These restrictions will prevent exposure to contaminated groundwater during the time that the aquifer is expected to remain above the applicable State of Idaho groundwater quality standards. Long-term protection will also be provided by groundwater monitoring to determine if the SRPA COCs exceed their action levels and if the impacted portion of the aquifer is capable of providing sufficient yield to serve as a water source. If these two conditions are met, contingent pump and treat remediation will be implemented to reduce the contaminant concentrations in the impacted portion of the SRPA so that the unacceptable risk is reduced by meeting the applicable State of Idaho groundwater quality standards and federal MCLs.

SRPA groundwater does not pose either short- or long-term risks to environmental receptors as it is not accessible to biota.

Although Alternative 2A is less costly than the selected alternative 2B, it does not provide any reduction in toxicity, mobility or volume through treatment and may not meet the Remedial Action Objective of restoring the aquifer to drinking water quality by the Year 2095. Therefore, the contingency remedy, Alternative 2B best addresses groundwater modeling concerns regarding aquifer restoration. The Agencies believe that the selected remedy will provide overall protection of human health and the environment and satisfy RAOs by restricting potential SRPA groundwater use outside the current INTEC security fence and implementing contingent pump and treat remediation if contaminant action levels are exceeded and the aquifer is capable of producing a sustainable yield. This remedy will reduce potential risks to human health to less than 1×10^4 or an HI less than 1.

12.1.8 Buried Gas Cylinders Selected Remedy: Alternative 2-Removal, Treatment and Disposal

The selected alternative for the Buried Gas Cylinders is removal, treatment, and disposal. Implementation of this remedy does not pose any additional significant risk to the community or the environment. Short-term risks to the workers implementing the remedy will be minimized using institutional and engineering controls, health and safety plans, and safe work practices. These actions will reduce physical hazards and exposures to workers to allowable levels during cylinder removal, transportation. treatment and disposal.

Long-term protection of human health and the environment will be achieved by removing all of the cylinders, treating the cylinder contents as necessary, venting non-hazardous contents directly to the atmosphere, and disposing the empty cylinders.

The Agencies may elect to pursue a contingent remedy of capping in place pursuant to the substantive requirement of IDAPA 16.01.05.008 (40 CFR 264.310) if safety concerns with excavation and removal of the cylinders prevent implementation of the selected remedy.

Alternative 2 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment. The Agencies believe that the selected remedy will provide overall protection of human health and the environment and satisfy RAOs because the reactive, ignitable, and potentially hazardous gases will be removed. treated (if necessary), and disposed. This remedy will eliminate the safety hazard posed by the cylinders.

12.1.9 SFE-20 Hot Waste Tank System Selected Remedy: Alternative 4— Existing Institutional Controls, Removing and Treating Tank Liquid and Sludge Contents, and Removing the Tank and Associated Structures

The selected alternative for the SFE-20 Hot Waste Tank System includes existing institutional controls, and removal, treatment, and disposal of the tank liquids and sludges, tank, and associated piping and structures. This remedy can be implemented without any additional short-term risks to the community or the environment. Short-term risks to the workers implementing the remedy will be minimized using institutional and engineering controls, health and safety plans, and safe work practices. These actions will reduce physical hazards and exposures to workers to allowable levels during tank liquid and sludge removal and treatment, and removal, decontamination, and disposal of the tank, piping, and associated structures.

Long-term protection of human health and the environment will be achieved by permanently removing, treating, and disposing of the SFE-20 tank liquids and sludges, tank, piping, and associated structure. Any contaminated soils that may exist beneath the structure at concentrations exceeding the RGs will be excavated and disposed in the ICDF to eliminate future leaching and transport of the soil contaminants to the perched water or SRPA.

Alternative 4 is selected because it best meets the five balancing criteria while providing overall protection of human health and the environment and compliance with ARARs. The Agencies believe that the selected remedy will provide overall protection of human health and the environment and satisfy RAOs because the SFE-20 tank system will be permanently removed, treated, and disposed. This remedy will reduce potential risks to, human health to less than 1×10^{4} or a HI less than 1.

12.1.10 Sites Under Other Regulatory Authority

The Agencies have determined that the following six sites are most appropriately dispositioned under other WAGs or INEEL regulatory programs other than CERCLA. These sites, which were investigated and evaluated during the RI/FS include: CPP-38 (asbestos on nine INTEC buildings), CPP-65 (Sewage Treatment Plant lagoons), CPP-66 (Steam Plant fly ash pits), CPP-61 (area within CPP-718 transformer yard), CPP-81 (abandoned pipe line from Calciner Pilot Plant), and CPP-82 (wastewater spills from ruptured pipelines). Sites CPP-61, -81, and -82 will be transferred to OU 3-14 for further evaluation. These sites will be included under the CERCLA 5-year review process to ensure that the necessary actions by the other OUs, WAGs or regulatory programs are performed.

Site CPP-38 consists of transite asbestos on nine buildings at INTEC. A Track 1 decision document was written and demonstrated that the asbestos is a nonfriable form and represents a low risk. Therefore, the Agencies decided that this site would be more appropriately administered and remediated (if necessary) under the INEEL Asbestos Abatement Program. INEEL asbestos management is implemented in accordance with NESHAPs.

Site CPP-65 is the INTEC Sewage Treatment Plant lagoons which treat sanitary waste from 31 INTEC facilities. The Sewage Treatment Plant began operation in 1984 and is currently used. The lagoons include four infiltration. percolation trenches that are used to dispose of treated sanitary wastewater. The lagoons were investigated in the RI BRA (DOE-ID 1997a, Section 9.3) where it was determined that site CPP-65 is not a significant source of contamination to the groundwater. However; the lagoons appear to contribute water to the perched zone and eventually the SRPA. The water discharged to the lagoons was included as a water-source term in the vadose zone modeling conducted for the RI BRA. The agencies have decided that final closure of the Sewage Treatment Plant lagoons would

be most appropriately handled under the Idaho Wastewater Land Application Permit Rules (IDAPA 16.01.07). This decision was based on the low concentration of contaminants in the plant effluent and the continued use of the lagoons. However, if additional perched water actions are deemed necessary by the Agencies to further reduce recharge to the perched zone, then the closure and relocation of the Sewage Treatment Plant lagoons will be managed under CERCLA.

Site CPP-66 is the coal-tired steam generation facility fly ash pit located southeast of the INTEC. The pit has been used for the disposal of fly ash produced by the INTEC steam generation facility since 1984. The ash in the pit contains natural radionuclides and metals derived from coal and limestone. Site CPP-66 was evaluated using the Track 1 process in 1993 and recommended for "No Further Action" based on a human health risk evaluation. Subsequently, an ecological risk screening was performed during the OU 3-13 RI/BRA, which suggested that a risk to environmental receptors may exist from the metals present in the ash. The Agencies have determined that the site will be transferred to OU 10-04 for further evaluation and remediation, if necessary.

Site CPP-61 is an area within the CPP-718 transformer yard where a PCB oil spill occurred in the early 1980's. Approximately 1.510 L (400 gal) of PCB oil was spilled. The PCB concentration in the oil was 179 ppm. Most of the spill was contained, however, some spilled oil contaminated the surrounding soil. In 1985, the spill area was cleaned up; approximately 40 drums of soil and debris were removed. A new transformer and concrete pad have been installed over the site. Three soil borings were drilled and soil samples analyzed for radionuclides. The radionuclides found were below risk-based soil concentrations. The Agencies have determined that Site CPP-61 will be transferred to OU 3-14 for further evaluation. This decision is based upon the uncertain amount of PCB contamination that may remain under the concrete pad (WINCO 1992a),

Site CPP-81 is an abandoned line from the 30-cm (12-in.) Calciner Pilot Plant. The line, located approximately 0.6- to 0.9-m (2- to 3-ft) b1s, contained simulated calcine that became plugged in the line following a test run. During the fall of 1993, the line was cleaned as part of a time-critical removal action. The line was flushed with hot acid to remove the simulated calcine. No leaks were observed during the removal action indicating that no previous release to the environment had occurred. The final water rinse was analyzed and found to not contain contaminants above toxicity characteristic leaching procedure (TCLP) limits. The Agencies have determined that Site CPP-81 will be transferred to OU 3-14 for further evaluation.

Site CPP-82 is the location of three waste water spills (designated Sites A, B, and C) caused by rupturing of previously abandoned underground lines. The lines were ruptured during excavation activities. In the spill associated with Site A, an estimated 9.4 L (2.5 gal) of low-level radioactive waste escaped, the abandoned line and contaminated soil associated with the leak were removed and disposed. Sites B and C are associated with spills of nonradioactive, nonhazardous waste water; these spills occurred during the repair activities associated with Site A. The Agencies have determined that Site CPP-81 will be transferred to OU 3-14 for further evaluation.

12.1.11 Five-Year Reviews

The remedial actions taken under this ROD will be reviewed under the CERCLA 5-year review process to ensure their protectiveness. Five-year reviews will also ensure that any changes in the physical configuration of any INTEC facility or site (such as D&D) where there is suspicion of a release of hazardous or radioactive substances will be managed to achieve remediation goals established in the ROD. The 5-year reviews will continue as long as contaminants exist at levels which result in restricted or limited site usage.

12.2 Compliance with ARARs

Compliance with action-. chemical-, and location-specific ARARs is described in Sections 12.2.1 through 12.2.7 for the selected remedy for each group. Chemical-specific ARARs are generally health- or risk-based requirements that establish numerical limits on the amounts or concentrations of a particular radionuclide, compound or material that may be discharged to or present in the environment. Location-specific ARARs restrict specific activities occurring in particular locations. Action-specific ARARs restrict specific types of remedy activities or technologies.

The most significant uncertainty at OU 3-13 sites is whether or not RCRA-hazardous materials are present at Soils Under Buildings sites. Other Surface Soils sites, the Buried Gas cylinders, and in the SFE-20 Hot Waste Tank contents and system; as well as in residuals produced while treating SRPA water and the SFE-20 tank contents. Media and materials from these sites will be characterized to facilitate material handling and disposal options. RCRA and IDAPA ARARs that will apply if these materials are determined to be hazardous are cited in the ARARs tables for the selected remedy for each group, with qualifying statements, and are discussed in the following sections.

Investigation derived waste (IDW) from OU 3-13 RD/RA activities and OU 3-14 investigations, including soil cuttings, well purge water, personnel protective equipment, decontamination water, and similar wastes generated during sampling and inspection/maintenance activities wilt be temporarily managed (not to exceed 1 year) in a staging area under the substantive portions of IDAPA 16.01.05.008 40 CFR 264.544 Remediation Waste Staging Piles). By managing the wastes in this area, placement will not be triggered. If these wastes are treated in temporary units under IDAPA 16.01.05.008 (40 CFR 264.553), they may be subject to LDRs. The final disposition of these wastes will be in the ICDF.

This ROD recognizes that INTEC is an operating facility, it is possible that changes in physical configuration of INTEC may uncover new sites or change the residual risk posed by those sites addressed under this ROD. Any planned disturbance at a site for which action is required under this ROD (including the "No Further Action" sites with institutional controls) will be preceded by appropriate planning documents to be submitted to and concurred on by the Agencies prior to implementation. Newly discovered sites will be subject to remedial action pursuant to the terms and conditions of the FFA/CO.

12.2.1 Tank Farm Soils Interim Action: Alternative 3-Institutional Controls with Surface Water Control.

Compliance with action-, chemical-, and location-specific ARARs for the selected remedy for the Tank Farm Soils Interim Action, Alternative 3, is summarized in Table 12- 1. A discussion of the ARARs and TBCs is provided below.

12.2.1.1 Action-Specific ARARs. Site security, inspections, and personnel training will be required during the interim action period. These requirements will be met by institutional and engineering controls, radiological safety measures, and health and safety plans implemented or planned for the site.

State of Idaho Fugitive Dust Emission Rules will apply to any activities that generate fugitive dust. These rules require that reasonable precautions be taken to prevent the generation of fugitive dust from unprotected surfaces, as well as during active operations. Engineering controls will be implemented to meet these rules.

Table 12-1. Compliance with ARARs for Group 1- Tank Farm Soils Interim Action Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A). or TBC	Comments
Group 1-Tank Farm Soils Interim Action: Alternative 3— Institutional Controls with Surface Water Control			
Action-specific			
IDAPA 16.01.05 008 (40 CFR 264.14)	Site security	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.05 008 (40 CFR 264.15)	General inspection requirements	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.05 008 (40 CFR 264.16)	Personnel Security	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.01.650, 16.01 651	Idaho fugitive dust emissions	Applicable	Applies during construction of remedies and observation wells; will be met through engineering controls.
40 CFR 122.26	Storm water discharges during construction	Applicable	Applies during construction of remedies ; will be met through engineering controls.
40 CFR 61.92 40 CFR 61.93	NESHAPS for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Applies during construction of remedies; will be met through engineering controls.
IDAPA 16.01.01.586, 16.01.01.586	Rules for Control of Air Pollution in Idaho	Applicable	Applies during construction of remedies; will be met through engineering controls.
IDAPA 16.01.05 008 [40 CFR 264.310(b)(5)]	Run-on and run-off controls	Applicable	Run-on to and run-off from RCRA hazardous soils, if present, will be controlled during the interim action period.
IDAPA 16.01.05 008 (40 CFR 264.553)	Temporary units	Applicable	Applies to the soil stockpiles derived from grading and sealing the Tank Farm or from construction of the diversion channels.
IDAPA 16.01.05 008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Applies to the soil stockpiles derived from grading and sealing the Tank Farm or from construction of the diversion channels.

Chemical -specific
None identified
Location-specific
None identified

Table 12-1. (Continued)

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
TBCS			
DOE Order 43.5 1	Radioactive waste management performance objectives to protect workers.	TBC	Substantive design and construction requirements will be met to protect workers
DOE Order 5400 5	Exposures to public will be ALARA	TBC	Substantive design and construction requirements will be met to keep public exposures ALARA.

Storm Water Discharges during Construction Rules require control of contamination that discharges into waters of the United States. These rules will be met by administrative and engineering controls on construction activities.

NESHAPs for radionuclide emissions from DOE facilities applies to construction or other activities that may suspend radionuclides in fugitive dust. The radiation dose to the public produced by these activities will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards, then the need for additional measures will be evaluated and implemented as appropriate.

IDAPA Rules for Control of Air Pollution in Idaho apply because they also address releases or emissions of toxic and/or carcinogenic constituents to the atmosphere, which may occur during construction activities. Engineering and administrative controls would be used to maintain fugitive emissions below allowable levels.

IDAPA RCRA rules for controlling run-on and run-off will be met through engineering and administrative controls, if Tank Farm soils are determined to be RCRA hazardous. Ground surfaces will be graded to reduce the potential for flooding during precipitation or snowmelt events. Building roof drains will be improved to divert potential run-on away from areas of suspected contamination.

If any hazardous waste contaminated soils or water are generated as part of the interim action there will be temporarily managed according to the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 [Temporary Units] and 40 CFR 264.554 [Remediation Waste Staging Piles]). Wastes treated in the Temporary Units my be subject to LDRs.

Tank Farm soils that may be contaminated while grading and sealing the Tank Farm soils and constructing the surface water diversion system will be managed in temporary storage units or remediation waste staging plies and disposed in the ICDF as necessary. These soils will be required to meet the substantive requirements of IDAPA HWMA rules.

12.2.1.2 Chemical-Specific. No chemical-specific ARARs were identified for this alternative.

12.2.1.3 Location-Specific. No location-specific ARARs were identified for this alternative.

12.2.1.4 TBCs. DOE Orders 435.1 and 5400.5 provide guidance on radiological human health and environmental protection on cleanup and management of residual radioactive material and the release of property. Radiation exposures to the public, workers, and the environment will be kept as low as reasonably achievable (ALARA) as required by these orders.

12.2.2 Soils Under Buildings and Structures Selected Remedy: Alternative 2—Institutional Controls with Containment

Compliance with action-, chemical-, and location-specific ARARs for the selected remedy, for the Soils under Buildings or Structures. Alternative 2, is summarized in Table 12-2. A discussion of the ARARs, and TBCs is provided below.

Action-Specific, Site security, inspections, and personnel training will be required during the institutional control period if' the soils are capped in place. These requirement, will be met by the institutional controls, radiological safety measures, and health and safety plans implemented or planned for the site. Idaho Fugitive Dust Rules for Control Air Pollution.

Table 12-1. Compliance with ARARs for Group 1 - Tank Farm Soils Interim Action Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 1 - Tank Farm Soils Interim Action: Alternative 3—Institutional Controls with Surface Water Control			
Action-specific			
IDAPA 16.01.05.008 (40 CFR 264.14)	Site security	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.05.008 (40 CFR 264.15)	General inspection requirements	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.05.008 (40 CFR 264.16)	Personnel security	Applicable	Applies only if RCRA units are created as part of interim action.
IDAPA 16.01.01.650, 16.01.01.651	Idaho fugitive dust emissions	Applicable	Applies during construction of remedies and observation wells; will be met through engineering controls
40 CFR 122.26	Storm water discharges during construction	Applicable	Applies during construction of remedies; will be met though engineering controls.
40 CFR 61.92 40 CFR 61.93	NESHAPS for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Applies during construction of remedies; will be met though engineering controls.
IDAPA 16.01.01.585, 16.01.01.586	Rules for Control of Air Pollution in Idaho	Applicable	Applies during construction of remedies; will be met though engineering controls.
IDAPA 16.01.05.008 [40 CFR 264.310(b)(5)]	Run-on and run-off controls	Applicable	Run-on to and run-off from RCRA hazardous soils, if present, will be controlled during the interim action period.
IDAPA 16.01.05.008 (40 CFR 264.553)	Temporary units	Applicable	Applies to the soil stockpiles derived from grading and sealing the Tank Farm or from construction of the diversion channels
IDAPA 16.01.05.008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Applies to the soil stockpiles derived from grading and sealing the Tank Farm or from construction of the diversion channels
Chemical-specific			
None identified			
Location-specific			
None identified			

Table 12-2. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
IDAPA 16.01.05.008 [40 CFR 264.310(a)(1-5)]	Landfill closure requirements	Applicable	Applies if the soils are capped with an engineered barrier; substantive requirements will be met
IDAPA 16.01.05.008 [40 CFR 264.310(b)(1)(4)(5)(6)]	Landfill post-closure requirements	Applicable	Applies if the soils are capped with an engineered barrier; substantive requirements will be met. 40 CFR 264.97 will be used to meet the requirements of 40 CFR 264.310(b)(4)
Chemical-specific			
IDAPA 16.01.05.006 (40 CFR 262.11)	Hazardous waste determination	Applicable	Applies to soils that are excavated and that may require pretreatment to meet ICDF waste acceptance criteria; applies to soils where a hazardous waste determination has not been made
IDAPA 16.01.05.005 (40 CFR 261.20 through 24)	Hazardous waste characteristics identification	Applicable	Applies for hazardous waste contaminated soils that are excavated and disposed off-site
Location-specific			
None identified			
TBCs			
DOE Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive design and construction requirements will be met to keep radiation exposures ALARA
DOE Order 5400.5	Exposures to the public will be kept ALARA	TBC	Substantive design and construction requirements will be met to keep public exposure ALARA.

NESHAPs, storm water discharges during construction, and DOE Orders 435.1 and 5400.5 apply as previously described for Group 1.

If the building or structure is removed so that contaminated soils are exposed, they will either be capped with an engineered barrier or will be excavated as Group 3 soils and disposed in the ICDF. If the soils are capped with an engineered barrier, the substantive requirements of the hazardous waste landfill closure and post-closure regulations, including surveying and recordkeeping and DOE Orders 435.1 and 5400.5 will apply. These requirements will be met by designing, constructing, and maintaining the cap so monitoring will be required for soils that remain in place to determine if soil contaminants are leached and transported to the perched water or the SRPA.

If the exposed soils are excavated and disposed in the ICDF, the action-specific ARARs for the Other Surface Soils will apply. These ARARs will be met as described for the Other Surface Soils in Section 12.2.3.

Excavated soils may be temporarily (not to exceed 1 year) managed within the AOC under the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554). Soils or liquids treated in the Temporary Units may be subject to LDRs.

12.2.2.1 Chemical-Specific. RCRA hazardous waste characteristics identification is required to facilitate handling and management of newly generated hazardous waste contaminated soils that will be shipped and disposed off-site. Soils that are only being consolidated within the WAG 3 AOC are not subject to RCRA hazardous waste characterization, but will be subject to Waste Acceptance Criteria evaluation if disposed in the ICDF.

12.2.2.2 Location-Specific. No location-specific ARARs were identified for this alternative.

12.2.2.3 TBCs. Exposure to the public will be kept ALARA as required by DOE Orders 435.1 and 540.5. Engineering and administrative controls used under DOE's ALARA program will reduce public exposures to allowable levels during barrier construction or soil excavation. The final site configuration will be designed, constructed, maintained, and monitored in the post-closure period to meet DOE Orders 435.1 and 5400.5 performance objectives.

12.2.3 Other Surface Soils Selected Remedy: Alternative 4A— Removal and On-Site Disposal

Compliance with action-, chemical-, and locations-specific ARARs for the selected remedy for Other Surface Soils, Alternative 4A, is summarized in Table 12-3. A discussion of the ARARs and TBCs is provided below. ARARs discussed for this alternative relate both to excavation and disposal of the Other Surface Soils, and to the design, construction, operation, closure and post-closure of the ICDF, which is implemented under this alternative. The Group 3 soils consist of release sites with low-level radioactive and mixed waste soils. Sites CPP-92, -98, and -99 are boxed mixed waste soils. Site CPP-97 is a stockpile of mixed waste soils.

12.2.3.1 Action-Specific. Action-specific ARARs for this alternative relate both to excavation and transportation of Other Surface Soils to the ICDF: and to the design, construction, operation, closure and post-closure of the ICDF. Site security, inspections, and personnel training will be required at the ICDF or for soils that are capped in place. These requirements will be met by institutional and engineering controls, radiological safety measures, and health and safety plans implemented or planned for the site.

Table 12-3. Compliance with ARARs for Group 3 Other Surface Soils Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 3 Other Surface Soils: Alternative 4A—Removal and Onsite Disposal			
• *Action-specific*			
IDAPA 16.01.01.650, 16.01.01.651	Idaho fugitive dust emissions	Applicable	Will be met during construction through administrative and engineering controls.
IDAPA 16.01.01.585	Rules for the control of air pollution in Idaho	Applicable	Will be met using administrative and engineering controls
IDAPA 16.01.01.586			
40 CFR 61.92	NESHAPs for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Will be met using administrative and engineering controls
40 CFR 61.93			
40 CFR 122.26	Storm water discharges during construction	Applicable	Will be met during excavation and disposal through engineering controls.
IDAPA 16.01.05.006 (40 CFR 262.11)	Hazardous waste determination	applicable	Applies if the soils disposed outside of the WAG 3 AOC; applies to soils where a hazardous waste determination has not been made
IDAPA 16.01.05.008 (40 CFR 264.553)	Temporary units	Applicable	Applies to temporary (< 1 year) storage or treatment units
IDAPA 16.01.05.008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Excavated soils can be temporarily staged prior to disposal in the ICDF without triggering LDRs or MTRs
IDAPA 16.01.05.011 (40 CFR 268)	Land disposal restrictions	Applicable	Applies only to soils from sites CPP-92, CPP-97, CPP-98, and CPP-99 or soils that have triggered placement
IDAPA 16.01.05.011 (40 CFR 268.49)	Alternative LDR treatment standards for contaminated soils	Applicable	Applies only to soils from sites CPP-92, CPP-97, CPP-98, and CPP-99 or soils that have triggered placement.
Chemical-specific			
IDAPA 16.01.05.005 (40 CFR 261.20 through 24)	Hazardous waste characteristics identification	Applicable	Applies if the soils are excavated and consolidated to facilitate their management and for soils that are treated or placed in a long-term storage unit
40 CFR 761.50(a)(5)	PCB disposal requirements	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761.50(b)(3)	PCB remediation waste	Applicable	Applies to PCB-contaminated soils and debris

Table 12-3. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
40 CFR 761 50(b)(7)	PCB radioactive waste	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761 50(b)(8)	Porous surfaces	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761 50(d)(4)	Disposal requirements for PCBs	Applicable	Applies to PCB-contaminated soils and debris
Location-specific			
None			
TBCs			
DOE Order 4.3.5 1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met for excavation, handling, and transport of radionuclide contaminated soils to the ICDF to project workers.
DOE Order 5400 5	Exposures to the public will be kept ALARA	TBC	Will be met by administrative and engineering controls during excavation of contaminated soils, and construction, operation, and closure of the ICDF.
Group 3 Other Surface Soils: Alternative 4A— ICDF Design, Construction and Operation for Group 3 Soils			
Action-specific			
IDAPA 1601.01.650.16 01.01651	Idaho fugitive dust emissions	Applicable	Will be met during construction through administrative and engineering controls
IDAPA 16.01 01.585 IDAPA 16.01 01.586	Rules for the control of air pollution in Idaho	Applicable	Will be met using administrative and engineering controls
40 CFR 61.92 40 CFR 61.93	NESHAPS for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Will be met using administrative and engineering controls
40 CFR 122.26	Storm water discharges during construction	Applicable	Will be meet during excavation and disposal through engineering controls.
IDAPA 16.01.05.008 [40 CFR 264.14(a) (b),(c)]	Site security	Applicable	Applies to either soils capped in place or consolidated in the ICDF.
IDAPA 16.01.05.008 [40 CFR 264 15(a),(e)]	General inspection requirements	Applicable	Applies to either soils capped in place or consolidated in the ICDF.
IDAPA 16.01.05.008 [40 CFR 264.16(a)(1),(c)]	Personnel training	Applicable	Applies to either soils capped in place or consolidated in the ICDF.

Table 12-3. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant an Appropriate (R&A), or TBC	Comments
IDAPA 16.01.05.008 (40 CFR 264.92)	Groundwater protection standard	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.93)	Hazardous constituents	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.95)	Point of compliance	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.97)	General groundwater monitoring requirements	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.98)	Detection monitoring program	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.114)	Disposal and decontamination of equipment, structures, and soils	Applicable	All equipment will be decontaminated before leaving the ICDF.
IDAPA 16.01.05.008 (40 CFR 264.301)	Landfill design and operating requirements	Applicable	ICDF will be designed to meet minimum technology requirements or equivalent
IDAPA 16.01.05.008 [(40 CFR 264.309(a) and (b)	Surveying and recordkeeping	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 [40 CFR 264.310(a)(1)(2)(3)(4)(5)]	Landfill closure requirements	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.08 [40 CFR 264.310(b)(1)(4)(5)(6)]	Landfill post-closure requirements	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 [40 CFR 264.18(a) and (b)]	Landfill locations standards	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.302)	Landfill action leakage rate	Applicable	Substantive parts of regulations will be met
IDAPA 16.01.05.008 (40 CFR 264.553)	Temporary units	Applicable	Applies for soils that are excavated and managed on-site
IDAPA 16 01 05 008 (40 CFR 264 554)	Remediation waste staging piles	Applicable	Applies for soils that are excavated and managed on-site
40 CFR 761.75(b)(I)(2)	PCB landfill design requirements	Applicable	Applicable for PCB-contaminated soils: Substantive requirements will be met.
40 CFR 761.79(a) and(b)	PCB container and moveable equipment decontamination requirements	Applicable	Applicable for PCB-contaminated soils. Substantive requirements will be met
IDAPA 16.01.05.008 (40 CFR 264.192)	Design and installation of new tank systems or components	Applicable	Applies to the SSST
IDAPA 16.01.05.008 (40 CFR 264.601)	Miscellaneous units environmental performance standards	Applicable	Applies to the SSST
IDAPA 16.01.05.008 (40 CFR 264. Subpart I)	Use and management of containers	Applicable	Applies to the SSST
IDAPA 16.01.05.008 (40 CFR 264. Subpart DD)	Containment buildings	Applicable	Applies to the SSST

Table 12-3. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant an Appropriate (R&A), or TBC	Comments
IDAPA 16.01.05.008 (40 CFR 264.1052 through 1062)	Air emissions standards for equipment leaks	Applicable	Applies to the SSST
IDAPA 16.01.05.008 (40 CFR 264.1082 through 1088)	Air emission standards for tanks, surface impoundments, and containers	Applicable	Applies to the SSST and evaporation pond.
IDAPA 16.01.05.008 (40 CFR264.221)	Surface impoundment design and operating requirements	Applicable	Applies to the SSST and evaporation pond.
IDAPA 16.01.05.008 (40 CFR 264.552	Corrective action management units (CAMUs)	Applicable	Applies to the evaporation pond.
IDAPA 16.01.05.006 (40 CFR 262.64[a][1])	Hazardous waste accumulation time	Applicable	Applies to the SSST.
IDAPA 16.01.05.008 (40 CFR 264, Subpart 1)	Releases from solid waste management units	Applicable	Applies to closure and post-closure of ICDF Complex
IDAPA 16.01.05.008 (40 CFR 264, Subpart G)	Closure and post-closure	Applicable	Applies to closure and post-closure of ICDF Complex
Chemical-specific			
IDAPA 16.01.05.005 (40 CFR 261.20 through 24)	Hazardous waste characteristics identification	Applicable	Applies to soils received from outside the WAG 3 AOC
Location-specific			
16 USC 469 et seq 36 CFR 65	National Archeological and Historical Preservation Act	Applicable	Will be met during siting new excavations/construction in previously undisturbed areas
25 USC	Native American Graves Protection and Repatriation Act	Applicable	Will be met during siting new excavations/construction in previously undisturbed areas
TBCs			
DOE Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met in designing, constructing, and operating the ICDF to protect workers
DOE Order 5400.5	Exposures to the public will be kept ALARA	TBC	Will be met by administrative and engineering controls during excavation of contaminated soils, and construction and operation of the ICDF; and by the capping system after closure.

Table 12-3. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 3 -Other Surface Soils: Alternative 4A—ICDF Operations for Non-INTEC Soils and Debris			
Action-specific			
IDAPA 16.01.05.011 (40 CFR 268)	Land disposal restrictions	Applicable	Will be met for off WAG 3 wastes by treating remediation wastes from outside the WAG 3 AOC to be disposed of in the ICDF as required
IDAPA 16.01.05.011 (40 CFR 268.49)	Alternative land disposal restrictions treatment standards for contaminated soil	Applicable	Will be met by treating remediation wastes from outside the WAG 3 AOC disposed of in the ICDF as required.
Chemical-specific			
IDAPA 16.01.05.005 (40 CFR 261)	Identification and listing of hazardous waste	Applicable	Substantive requirements will be met for soils received from outside the OU 3-13 AOC.
IDAPA 16.01.05.006 (40 CFR 262.11)	Hazardous waste determination	Applicable	Will be met for off WAG 3 materials prior to excavation by characterizing wastes from outside the WAG 3 AOC
40 CFR 761.50(a)(5)	PCB disposal requirements	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761.50(b)(3)	PCB remediation waste	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761.50(b)(7)	PCB radioactive waste	Applicable	Applies to PCB-contaminated soils and debris
40 CFR 761.50(b)(8)	Porous surfaces	Applicable	Applies to PCB-contaminated soils and debris.
40 CFR 761.50(d)(4)	Disposal requirements for PCBs	Applicable	Applies to PCB-contaminated soils and debris.
Location-specific			
None			
TBCs			
DOE Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met for excavation, handling, and transport of off-AOC radionuclide contaminated soils to the ICDF to protect workers
DOE Order 5400.5	Exposures to the public will be kept ALARA	TBC	Will be met by administrative and engineering controls during excavation of contaminated soils, and construction and operation of the ICDF, and by the capping system after closure.

Compliance with Idaho Fugitive Dust Rules will require dust suppression during both earth-moving activities at the Other Surface Soils sites, and during ICDF construction, operations and closure. Compliance with NESHAPs will require air modeling to ensure that no member of the public will receive greater than an effective dose equivalent (EDE) of 10 mrem/yr (40 CFR 61.92) at the INEEL boundary from all INEEL activities including earth-moving activities at the Other Surface Soils site, and from ICDF construction, operations, closure and post-closure. Regulatory notification levels will be partially based upon the results of the modeling.

IDAPA Rules for Control of Air Pollution in Idaho apply because they also address releases or emissions of toxic and/or carcinogenic constituents to the atmosphere, which may occur during soil excavation, movement and consolidation. Engineering and administrative controls to be defined during remedial design will be used to maintain emissions below allowable levels. Storm Water Discharge States would be met by administrative and engineering controls on construction activities, to be defined during remedial designs.

The majority of soils excavated from WAG 3 for disposal at the ICDF will not be subject to Hazardous Waste Determination Requirements (IDAPA 16.01.05.006 [40 CFR 262.11]), Land Disposal Restrictions (LDRs) (IDAPA 16.01.05.0011 [40 CFR 268]), or Alternative LDR Treatment Standards for Contaminated Soil (IDAPA 16.001.05.11 [40 CFR 268.49]), since they will be placed directly in the ICDF because WAG 3 is considered one single AOC for purposes of disposal at the ICDF. However, any soils that may require treatment to meet the Waste Acceptance Criteria prior to placement in the ICDF are subject to LDRs. LDRs apply to contaminated soils at sites CPP-92, -97, -98, and -99. If wastes are received from areas outside the WAG 3 AOC for disposal at the ICDF, they will be required to meet the ICDF waste acceptance criteria and LDRs.

The construction and operation of an ICDF supporting complex includes a facility waste storage, sizing staging, and treatment (SSST) facility in accordance with the substantive requirements of IDAPA 16.01.05.008, Subpart I, J, X, and DD). Operations at the facility will include chemical/physical treatment prepare ICDF wastes to meet applicable Waste Acceptance Criteria and RCRA land disposal restrictions.

One or more remedial waste staging and storage areas will be utilized to stage and handle remediation waste. The storage area be operated in accordance with the substantive requirements of IDAPA 16.01.05.006.01 and 16.01.05.006.02 (40 CFR 26234 [a][1]).

Monitoring well construction and sampling wastes generated prior to construction of the ICDF and SSST (i.e., purge water and drill cuttings) may be managed using temporary remediation waste staging piles and temporary treatment units in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554). Treatment will be accomplished using mobile tankage and physical/chemical treatment and will comply with the substantive requirements of IDAPA 16.01.05.008 (40 CFR Subpart J, BB, and CC).

An evaporation pond will be constructed and designated as a corrective action management unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.08 (40 CFR 264.552 and 40 CFR 264 Subpart K and CC) for purpose of managing ICDF leachate, purge waters, and other aqueous wastes generated as a result of operating the ICDF complex.

The ICDF Complex will be operated, closed, and post-closed in accordance with the substantive requirements of IDAPA 16.01.5.008 (40 CFR 264 Subparts G, F, and N). Site access restrictions and institutional controls will be maintained throughout the post-closure period.

An area within the INTEC fence will be designated as the remediation waste storage treatment area for OU 3-13 remediation wastes. This area will be utilized under the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553). Temporary Units , and IDAPA 16.01.05.008 (40 CFR 264.554) remediation waste staging piles. These regulations apply specifically to remediation wastes. Wastes treated or temporarily stored in TUs or in remediation waste staging piles are not subject LDRs as long as they are managed within the area of contamination.

Specific sections of RCRA Standards for Owners and Operators of Hazardous Waste TSDFs apply to the ICDF (Table 12-3). Substantive portions of general facility standards (IDAPA 16.01.05.008 [40 CFR 264 Subpart B]) including IDAPA 16.01.05.008 [40 CFR 264.14 (Site Security)] will apply, and will be met the institutional control period by maintaining all required controls on entry including fences and signs.

Specific sections of IDAPA 16.01.05.008 [40 CFR 264 Subpart F (Releases From Solid Waste Management Units)] cited in Table 12-3 apply to the ICDF, including groundwater protection standards, hazardous constituents, point of compliance, general groundwater monitoring requirements, and detection monitoring program. These will be met by developing and implementing a facility monitoring plan specific for the ICDF during remedial design.

Specific sections of IDAPA 16.01.05.008 [40 CFR 264 Subpart N (Landfills)] and IDAPA 16.01.05.05 [40 CFR 261.175 (b)] cited in Table 12-3 apply to the design construction, operation, closure and post-closure of the ICDF. Not all of these sections will apply if the ICDF is used exclusively for a CERCLA onsite action, in particular those containing exclusively administrative requirements, including record keeping. All substantive requirements stated in the referenced sections will be met, and the methodology for compliance will be described in detail during remedial design for the ICDF.

The equipment decontamination section of IDAPA 16.01.05.008 [40 CFR 264 Subpart G (Closure and Post-closure)] applies to closure and post-closure of the ICDF. Additionally, sections IDAPA 16.01.05.008 [40 CFR 264.310(a)(1)(3)(4)(5) and 40 CFR 264.310 (b)(1)(4)(5)(6) from Subpart N] apply to final closure of the landfill. The specific performance standards cited will be met, and the methodology for compliance will be described in detail during remedial design for the ICDF. The IDAPA 16.01.05.008 [40 CFR 264.309(a) and (b)] requirements for surveying and record keeping also apply. All substantive requirements stated in the referenced sections will be met and the methodology for compliance will be described in detail during remedial design for the ICDF.

12.2.3.2 Chemical-Specific. RCRA hazardous waste characteristics identification is required to facilitate handling and management of hazardous waste contaminated soils. PCBs waste regulations will apply to all PCB-contaminated soils received from both within and outside the WAG 3 AOC. The substantive requirements of the PCBs regulations will be met during soil excavation and disposal. The ICDF will be designed and constructed to satisfy the PCB landfill requirements. Equipment used to handle PCB-contaminated soils will be decontaminated to satisfy the substantive PCB equipment decontamination requirements.

12.2.3.3 Location-Specific. Location-specific ARARs for this alternative relate primarily to new excavation, construction, or operations activities, including those required for the ICDF, in previously and disturbed areas. All of these ARARs will be met through the siting process for new facilities. The substantive requirements of the RCRA location standards [IDAPA 16.01.05.008 (40 CFR 264.18(a) and (b)] will be met. Archeological and Native American cultural resources will be protected by performing all activities in accordance with the National Archeological and Historical Preservation Act, and the Native American Graves Protection and Repatriation Act. No endangered species are known to be present at the proposed ICDF Study Area.

The siting evaluation study discussed in Section 11 evaluated the proposed Study Area for the ICDF against the siting criteria found at IDAPA 16.01.05.0008 (40 CFR 264.18), 40 CFR 761.75 (b)(1),19 CFR 61.40 CFR 257.3 in addition to other criteria. The ICDF proposed Study Area was determined to meet the criteria.

12.2.3.4 TBCs. Exposure to the public will be kept ALARA as required by DOE Orders 435.1 and 5400.5 during excavation and disposal of the Other Surface Soils in the ICDF. The ICDF will be designed, constructed, operated, and closed to keep public exposures ALARA and to meet DOE performance objectives. Engineering and administrative controls used under ALARA will minimize public exposures to allowable levels during construction and operation of the ICDF.

12.2.4 Perched Water Selected Remedy: Alternative 2 — Institutional Controls with Aquifer Recharge Control

Compliance with action-, chemical-, and location-specific ARARs for the selected remedy for the Perched Water. Alternative , is summarized in Table 12-4. A discussion of the ARARs and TBCs is provided below.

12.2.4.1 Action Specific. Site security will be required during the institutional control period. These requirements will be met by institutional and engineering controls, radiological safety measures, and health and safety plans implemented or planned for the site.

Idaho Fugitive Dust Emission rules. Rules for the Control of Air Pollution in Idaho, and NESHAPs would apply and would be met using engineering and administrative controls for all new construction.

If the Big Lost River is lined, or otherwise modified, the substantive requirements of Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, the Idaho Stream Channel Protection Act, and the Idaho Stream Channel alteration rules will be met as required.

The Agencies have not performed the analyses required under 40 CFR 23.10 and 11 to modify the Big Lost River channel. Prior to any stream alteration, the Agencies will provide their evaluation to the public through a Fact Sheet and Explanation of Significant Differences (ESD).

Action-specific requirements for discharge diverted from the Percolation Ponds will be met by the selected discharge alternative. Regulatory compliance will be described in the percolation pond replacement permit applications. If a permit is not obtained by the required time, the CERCLA program will design, construct, and operate replacement percolation ponds until a permit is obtained.

12.2.4.2 Chemical-Specific. Perched water that is stored or treated is subject to a hazardous waste determination (IDAPA 16.01.5.006 [40 CFR 262.11]). The annual limits for radionuclide effluent concentrations are applicable if the Big Lost River is lined. Although perched water releases to the SRPA may impact SRPA groundwater quality, compliance with IDAPA groundwater quality standards in the perched zone is not applicable. Perched water is not a drinking water source, and no excess human health or environmental risks will result from non-compliance with the Idaho groundwater quality standards. Compliance with groundwater quality standards will be addressed under the selected remedy for the SRPA discussed in Section 12.23.5.

12.2.4.3 Location Specific. No location-specific ARARs are identified for Alternative 2. Location-specific requirements for discharge diverted from the Percolation Ponds will be met by the selected discharge alternative. Regulatory compliance will be described in the percolation pond replacement permit applications.

Table 12-4. Compliance with ARARs for Group 4 Perched Water Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 4 Perched Water: Alternative 2 Institutional Controls with Aquifer Recharge Control			
Action-specific			
IDAPA 16.01.05.008 (40 CFR 264.14)	Site security	Applicable	Applies to the institutional controls
40 CFR 230.10 and 11	Substantive requirements of 404(b)(1) specifications of disposal sites for dredged or fill material	Applicable	Applies only if the Big Lost River channel is modified
Executive Order 11990	Protection of wetlands	Applicable	Applies only if the Big Lost River channel is modified
Executive Order 11988	Floodplain management	Applicable	Applies only if the Big Lost River channel is modified
Rivers and Harbors Act	Section 10 of the Rivers and harbors act of 3 March 1899	Applicable	Applies only if the Big Lost River channel is modified
IDAPA 37.03.09	Idaho Well Construction Standards	R&A	Applies to perched water monitoring
IDAPA 16.01.05.008 (40 CFR 264.114)	Disposal or decontamination of equipment, structures, and soils	Applicable	Applies to drilling, sampling, or treatment equipment that contacts perched water
IDAPA 16.01.01.650, 16.01.01.651	Idaho Fugitive Dust Emissions	Applicable	Will be met through administrative and engineering controls during construction
IDAPA 16.01.01.585, 16.01.01.586	Rules for the Control of Air Pollution in Idaho	Applicable	Will be met through administrative and engineering controls during construction
40 CFR 61.92, 61.93	NESHAPS for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Will be met through administrative and engineering controls during construction
IDAPA 37.03.07.030	Idaho stream channel alteration rules	Applicable	Applicable only if the Big Lost River is determined to be a continuously flowing water body; relevant and appropriate if the Big Lost River is determined to be an intermittent river

Table 12-4. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
IDAPA 16 01 05 008 (40 CFR 264.533)	Temporary units	Applicable	Applies to temporary tankage or treatment that may be required for purge or decontamination waters
IDAPA 16 01 05 008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Applies to drill cuttings that may be generated during monitoring well installation
Chemical-specific			
IDAPA 16 01 05 006 (40 CFR 264.554)	Hazardous waste determination	Applicable	Applies to perched water that is stored and treated
IO CFR 20 Appendix B, Table 2	Annual limits for radionuclide effluent concentrations	R&A	Only clean liner material will be used if the Big Lost River is lined
Location-specific			
None identified			
TBCs			
DOI Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met on designing, construction, and sampling perched water wells
DOI Order 5400.5	Exposures to the public will be kept ALARA	TBC	Will be met by administrative and engineering controls

12.2.4.4 TBCs. DOE Orders 435.1 and 5400.5 provide guidance on radiological human health and environmental protection requirements, on cleanup and management of residual radioactive material, and the release of property. Radiation exposures to the public, workers, and the environment will be kept ALARA as required by these orders. These performance objectives will be met through monitoring, and administrative and engineering controls to minimize exposures to contaminated perched water.

12.2.5 Snake River Plain Aquifer Interim Action Selected Remedy: Alternative 2B — Institutional Controls with Monitoring and Contingent Remediation

Cornpliance with action-, chemical-, and location-specific ARARs for the selected remedy for the Snake River Plain Aquifer Interim Action, Alternative 2, is summarized in Table 12-5. A discussion of the ARARs and TBCs is provided below.

12.2.5.1 Action Specific. IDAPA Rules for Control of Air Pollution in Idaho apply to releases or emissions of toxic and/or carcinogenic constituents to the atmosphere, which may occur during soil excavation, movement and consolidation, or during groundwater treatment system operation. Engineering and administration controls would be used to maintain emissions from soils below allowable levels. Any groundwater treatment system would be designed and operated to meet emissions limits.

State of Idaho Fugitive Dust Emission rules would apply to any activities generating fugitive dust. These rules require that all reasonable precautions be taken to prevent the generation of fugitive dust from unprotected surfaces, as well as during active operations.

National Emissions Standards for Hazardous Air Pollutants for radionuclide emissions from DOE facilities applies to these activities because radionuclides may be suspended with fugitive dust during soil movement and consolidation.The radiation dose to the public will be estimated and included in the annual INEEL calculations and reports. If radionuclides associated with fugitive dust releases exceed acceptable standards (10 mrem/yr to the public), then the need for additional measures will be evaluated and implemented as appropriate.

Storm Water Discharge During Construction Rules requiring control of contamination that discharges into waters of the United States would be met by administrative and engineering controls on construction activities, to be defined during remedial design.

If contingent groundwater remediation is implemented, the treated groundwater will either be discharged to the intermittent Big Lost River with downstream recharge of the SRPA or placed in a percolation pond. Federal and state surface water discharge requirements and wastewater land application ARARs wi1l apply, depending on which disposal alternative is selected. The disposal alternative will be determined during RD.

Substantive portions of Treatment Standards for Miscellaneous Units (IDAPA 16.01.05.008 [40 CFR 264.601]) will likely apply to any system used to treat extracted SRPA water, if contingent remediation is implemented. Standards will be met by designing, constructing, operating and closing the system so as to prevent releases to soil, groundwater, surface water or air that would result in adverse effects on human health and the environment. The remedial design report will identify specific measures to control releases. The treatment system will also need to address all COCs which are present in the groundwater.

Table 12-5. Compliance with ARARs for Group 5 Snake River Plain Aquifer Interim Action Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 5 Snake River Plain Aquifer: Alternative 2B-Institutional Controls with Monitoring and Contingent Remediation			
Action-specific			
IDAPA 37 03.09.025	Idaho Well Construction Standards	Applicable	Applies to SPRA monitoring
IDAPA 16.01.05.008 (40 CFR 264.114)	Disposal or decontamination of equipment, structures, and soils	Applicable	Applies to drilling, sampling, and treatment equipment that contacts SRPA groundwater
IDAPA 16.01.01.585,16.01.01.586	Rules for the Control of Air Pollution in Idaho	Applicable	Will be met by treatment system
IDAPA 16.01.01.650, 16.01.651	Idaho Fugitive Dust Emissions	Applicable	Will be met for contaminated drill cuttings
40 CFR 61.92, 61.93	NESHAPs for Radionuclides from DOE Facilities, Emission Monitoring and Emission Compliance	Applicable	Will be met using engineering and administrative controls
40 CFR 125	NPDES		Applies if contingent remediation is implemented and treated groundwater is discharged to the Big Lost River
10 CFR 20, Appendix B. Table 2	Annual limits for Effluent Concentrations	Applicable	Applies if treated water is discharged
40 CFR 122.26	Storm Water Discharges During Construction	Applicable	Substantive requirements will be met
IDAPA 16 0105.008 (40 CFR 264.601)	Treatment Standards for Miscellaneous Units	Applicable	Specific requirements will be clarified and met in 10% design
IDAPA 16.01.07.300	Wastewater land application permit requirements	Applicable	Applies if treated waste water is discharged to a percolation pond; substantive requirements will be met
IDAPA 16.01.02.400	Rules governing point source discharge	Applicable	Applies to treated waste water is discharged to the Big Lost River
IDAPA 16.01.02.401	Point source wastewater treatment requirements	Applicable	Applies if treated wastewater is discharged to the Big Lost River
Chemical-specific			
IDAPA 16.01.05.006 (40 CFR 262.11)	Hazardous waste determination	Applicable	Applicable to groundwater that will be stored long term or treated

Table 12-5. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
IDAPA 16.01.11.200(a) (40 CFR 141) for:	Groundwater Quality Standards (Primary drinking water standards)	Applicable	This ARAR will be met in the restoration timeframe (2095) in the SRPA contaminant plume outside of the current INTEC security fence. Any recharge to the SRPA will be limited to concentrations so that this ARAR will be met in 2095
Gross alpha particle activity (including radium-226, but excluding radon and uranium)			
Combined beta photon emitters			
Combined Radium-226 and radium 228			
Strontium-90			
Tritium			
Location-specific			
None identified			
TBCs			
DOE Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met to protect workers.
DOE 5400.5	Exposures to the public will be kept ALARA	TBC	Substantive ALARA requirements will be met to protect the public.

OU 3-13 RD/RA and OU 3-14 monitoring well construction and sampling wastes generated prior to the construction of the ICDF and SSST will be managed and treated with the WAG 3 AOC in remediation waste staging piles and temporary units in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554). Treatment will be accomplished using mobile tankage and physical/chemical treatment and will comply with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264 Subparts J, BB, and CC). The Final disposition of these wastes will be in the ICDF. The anticipated wastes include soil drill cuttings, monitoring well purge water, personnel protective equipment, and decontamination wastes.

12.2.5.2 Chemical-Specific. The groundwater quality standards promulgated under IDAPA 16.01.11.200(a) are applicable to the specific contaminants cited in Table 12-5. Computer modeling predicts that all of these contaminants will meet the groundwater quality standards by 2095.

If the COCs action level(s) are exceeded in selected monitoring wells as described in Section 11.1.5 within the SRPA contaminant plume outside the current INTEC security fence in the year 2000, then contingent remediation will be implemented.

Treated SRPA groundwater will be returned to the aquifer through land recharge in accordance with the Idaho Wastewater Land Application ARARs if a recharge impoundment is used, or in accordance with NPDES/SPDES ARARs if the treated effluent is discharged to the Big Lost River, which recharges the aquifer downstream of the INTEC facility.

It is possible that the ICPP groundwater contains listed hazardous waste at detectable concentrations. If this is found to be the case, implementation of remedies under this ROD may be impacted as the groundwater will be determined to contain listed hazardous waste. If so, the Agencies may elect to amend this ROD to include requirements to delist low concentrations of hazardous waste and/or constituents contained in extracted groundwater and sediments.

12.2.5.3 Location-specific. No location-specific ARARs are identified for the selected alternative.

12.2.5.4 TBCs. DOE Orders 435.1 and 5400.5 provide guidance on radiological human health and environmental protection requirements, on cleanup and management of residual radioactive material, and the release of property. Radiation exposures to the public, workers, and the environment will be kept ALARA as required by these orders. These performance objectives will be met through monitoring, and administrative and engineering controls to minimize exposures to contaminated SRPA groundwater

The DOE Order 5400.5 requirement that the treatment technology be selected based on an evaluation of potential technologies will be met through treatability studies and a focused feasibility study for the groundwater treatment system. The most cost-effective technology that meets ARARs will be selected.

12.2.6 Buried Gas Cylinders Selected Remedy: Alternative 2— Removal, Treatment and Disposal

Compliance with action-, chemical-, and location-specific ARARS for the selected remedy for the Buried Gas Cylinders, Alternative 2, is summarized in Table 12-6. A discussion of the ARARs and TBCs is provided below.

Table 12-6. Compliance with ARARs for Group 6 Buried Gas Cylinders Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 6 Buried Gas Cylinders: Alternative 2 – Removal, Treatment, and Disposal			
Action-specific			
IDAPA 16.01.01.650, 16.01.01.651	Idaho fugitive dust emissions	Applicable	Will be met during excavation and disposal using dust suppression
IDAPA 16.01.01.585, 16.01.01.586	Rules for control of air pollution in Idaho	Applicable	Will be met during treatment of tank contents
40 CFR 122.26	Storm water discharges during construction	Applicable	Will be met through engineering controls during excavation and construction
IDAPA 16.01.05.008 (40 CFR 264.114)	Disposal or decontamination of equipment, structures, and soils	Applicable	Applies to equipment used to treat or handle hazardous materials in the cylinders
40 CFR 300.440	Procedures for Planning and Implementing Offsite Response Actions	Applicable	Applies only to offsite disposal of the cylinder contents
IDAPA 16.01.05.005 (40 CFR 261.20 through 24)	Hazardous waste characteristics identification	Applicable	Applies for hazardous waste contaminated soils that are excavated and managed on-site
IDAPA 16.01.05.005 [40 CFR 261.7(a)(1), (b)(2)]	Residues of hazardous waste in empty containers	Applicable	Applicable to empty containers and compressed gas cylinders
IDAPA 16.01.05.008 (40 CFR 264.170 through 179)	Use and Management of Containers	Applicable	Substantive requirements will be met for treatment, storage, disposal and transportation of RCRA hazardous cylinder contents or hazardous waste contaminated soils
IDAPA 16.01.05.011 (40 CFR 268)	Land disposal restrictions	Applicable	Applies only to the treatment and disposal of hazardous waste contaminated soils
IDAPA 16.01.05.011 (40 CFR 268.49)	Alternative LDR treatment standards for contaminated soil	Applicable	Applies only to the treatment and disposal of hazardous waste contaminated soils
IDAPA 16.01.05.008 (40 CFR 264.553)	Temporary units	Applicable	Applies to the storage and treatment of hazardous remediation media
IDAPA 16.01.05.008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Applies to the staging of hazardous remediation soils/debris

Table 12-6. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
IDAPA 16.01.05.008 (40 CFR 264 Subpart X)	Miscellaneous units	Applicable	Applies to hazardous wastes that are stored, treated or disposed.
IDAPA 16.01.05.008 (40 CFR 264 Subpart J)	Tank systems	Applicable	Applies to hazardous wastes that are stored, treated or disposed.
IDAPA 16.01.05.008 (40 CFR 264 Subpart BB)	Air emission standards for equipment leaks	Applicable	Applies to hazardous wastes that are stored, treated or disposed.
IDAPA 16.01.05.008 (40 CFR 264.1080 through 1082)	Air emission standards for tanks, surface impoundments, and containers	Applicable	Applies to hazardous wastes that are stored, treated or disposed.
IDAPA 16.01.05.008 (40 CFR 264.310)	Landfills	Applicable	Applies only if cylinders are capped in place.
Chemical-specific			
IDAPA 16.01.05.005 (40 CFR 261)	Identification of Hazardous Waste	Applicable	Applies of soils containing hazardous waste area encountered
Location-specific			
None identified			
TBCs			
None identified			

12.2.6.1 Action Specific. Idaho Fugitive Dust Emission regulations, and regulations for Storm Water Discharges During Construction apply and Substantive Portions of Rules for Control of Air Pollution in Idaho will be met by characterizing the tank contents, and designing and using treatment systems that will not result in releases to the atmosphere exceeding allowable levels.

Although the gases in the buried gas cylinders are not thought to be hazardous, if hazardous substances are discovered in the cylinders these will be removed front the cylinder and treated to meet hazardous waste treatment requirements. However, a hazardous waste residue remaining in an empty container is not subject to regulation under IDAPA 16.01.05.005 (40 CFR Parts 261) through IDAPA 16.01.05.009 (40 CFR 265), or IDAPA 16.01.05.011 (40 CFR Part 268), IDAPA 16.01.05.012 (40 CFR 270), or 40 CFR 124 [IDAPA 16.01.05.005 (40 CFR 261.7(a)(1))]. A container that has held a hazardous waste or substance that is a compressed gas is considered empty when the pressure in the container approaches atmospheric IDAPA 16.01.05.005 [40 CFR 261.7(b)(2)]. The requirements of IDAPA 16.01.05.005 (40 CFR 261.7) will be met by determining that the internal pressure of the compressed gas cylinders is at atmospheric pressure, and therefore termed empty. Hazardous waste residues in empty gas cylinders are not considered hazardous waste and can be disposed accordingly.

Hazardous waste treatment residuals resulting from treatment of the compressed gas cylinder contents, if necessary, will be containerized. The use and management of hazardous waste containers will be applicable. The substantive requirements of these regulations w ill be met as specified.

If hazardous wastes are present in the compressed gas cylinders have leaked to the underlying soils, the LDRs will apply. The LDRs requirements for hazardous waste contaminated soils will be met by either a Contained in policy decision or by treating the contaminated soils to meet LDRs.

The Agencies may elect to pursue a contingent remedy of capping in place pursuant to the substantive requirement of IDAPA 16.01.05.008 (40 CFR 264.310) if safety concerns with excavation and removal of the cylinders prevent implementation of the selected remedy.

The CERCLA Procedures for Planning and Implementing Offsite Response Actions under 40 CFR 300.440 apply, and will be met for off-site shipment and disposal of any solid or hazardous wastes by shipping any hazardous wastes or hazardous waste treatment residuals derived from the cylinders to a RCRA Subtitle C permitted facility, provided the waste is acceptable to the receiving facility's authorizing state.

12.2.6.2 Chemical Specific. If a hazardous waste is determined to have been released to the soils, the soils will be subject to hazardous waste characteristics identification in IDAPA 16.01.05.005 (40 CFR 261). Soils determined to be hazardous will be disposed in the ICDF. Soils that are determined to be listed will be delisted using a no-longer contained in determination and disposed in the ICDF.

12.2.6.3 Location Specific. None identified.

12.2.6.4 TBCs. Radioactive waste management procedures will be used to protect workers (DOE Order 435.1) and to keep exposures to the public ALARA (DOE Order 5400.5).

12.2.7 SFE-20 Hot Waste Tank System Selected Remedy: Alternative 4–Removal, Treatment and Disposal

Compliance with action-, chemical-, and location-specific ARARs for the selected remedy for the SFE-20 Hot Waste Tank System, Alternative 4, is summarized in Table 12-7. A discussion of the ARARs and TBCs is provided below.

12.2.7.1. Action-Specific. Idaho fugitive dust emissions rules, Idaho rules for the control of air pollution, and NESHAPs requirements will be met using institutional and engineering controls during excavation and disposal of either on-site of off-site actions

The SFE-20 Hot Waste Tank System was previously closed and abandoned in 1976, and, therefore, was not used as a RCRA tank storage unit. As such, excavation and removal of the SFE-20 tank system is considered consolidation of a land disposal unit. Excavated tank system components and underlying soils will be managed as remediation waste within the AOC. The liquid and sludge wastes will be removed and solidified/stabilized prior to disposal in the ICDF. Since the tank system components and other wastes occur within the WAG 3 AOC and are considered remediation waste, they can be disposed in the ICDF without triggering LDRs or MTRs. The wastes will be managed in remediation waste staging plies within the AOC prior to disposal at the ICDF. Any tank system components that are treated in the SSST will be subject to LDRs. Liquid wastes that are treated to meet the ICDF Waste Acceptance Criteria will also be subject to LDRs.

If the SFE-20 tank components and waste are determined to be hazardous and are removed, treated, and disposed off-site the CERCLA Procedures for Planning and Implementing Offsite Response Actions under 40 CFR 300.440 apply. The criteria specified for the off-site response actions will be met by shipping remediation wastes only to a permitted RCRA Subtitle C facility that prevents releases of hazardous waste, hazardous constituents or substances to groundwater, surface water, soil or air. The wastes will only be shipped if they meet, or can be treated to meet, the receiving facility's waste acceptance criteria.

12.2.7.2 Chemical-Specific. Tank liquids, sludges, and underlying contaminated soils will be characterized to determine if hazardous constituents or characteristics are present. The results of the hazardous waste characterization will be used to facilitate proper management and disposal of these materials at either the ICDF or off-site. Asbestos regulations cited in Table 12-7 apply, and will be met by managing asbestos debris generated during demolition and removal of the tank vault, pump pit and associated structures in accordance with all substantive provisions of the regulations.

12.2.7.3 Location-Specific. There are no location specific ARARS.

12.2.7.4 TBCs. DOE Orders 435.1 and 5400.5 provide guidance on radiological human health and environmental protection requirements, on cleanup and management of residual radioactive material, and the release of property. Radiation exposures to the public, workers, and the environment will be kept ALARA as required by these orders. These performance objectives will be met through monitoring, and administrative and engineering controls to minimize exposures.

Specific EDE limits to the public defined in DOE Order 5400.5 will be met through monitoring, and administrative and engineering controls as required during excavation and construction in contaminated areas.

Table 12-7. Compliance with ARARs for Group 7 SFE-20 Hot Waste Tank System Selected Remedy.

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
Group 7 SFE-20 Hot Waste Tank System: Alternative 4—Removal, Treatment, and On-Site Disposal			
Action-specific			
IDAPA 16.01.01.650, 16.01.01.651	Idaho Fugitive Dust Emissions	Applicable	Will be met using engineering controls during tank waste and system removal
40 CFR 61.92, 61.93	NESHAPs for Radionuclides from DOE Facilities	Applicable	Will be met using engineering controls during tank waste and system removal
IDAPA 16.01.01.585, 16.01.01.586	Rules for the Control of Air Pollution in Idaho	Applicable	Will be met using engineering controls during tank waste and system removal
IDAPA 16.01.05.008 [40 CFR 264.193(b)]	Secondary containment and detection of releases	Applicable	Applies if hazardous wastes are pumped or transferred to a treatment system.
IDAPA 16.01.05.008 (40 CFR 264.553)	Temporary units	Applicable	Applies to any tank components or soils that are excavated
IDAPA 16.01.05.008 (40 CFR 264.554)	Remediation waste staging piles	Applicable	Applies to any tank components or soils that are excavated
IDAPA 16.01.05.008 (40 CFR 264 Subpart X)	Miscellaneous units	Relevant and Appropriate	Applies to liquids or sludges that are removed from the tank
IDAPA 16.01.05.011 (40 CFR 268)	Land disposal restrictions	Applicable	If placement is triggered, LDRs will apply.
IDAPA 16.01.05.011 (40 CFR 268.49)	Alternative LDR Treatment Standards for Contaminated Soil	Applicable	If placement is triggered, LDRs will apply.
Chemical-specific			
IDAPA 16.01.05.005 (40 CFR 261.20 through 24)	Hazardous waste characteristics identification	Applicable	Applies only to hazardous liquids or sludges in the tank or underlying soils that may have been impacted by a release
IDAPA 16.01.05.006 (40 CFR 262.11)	Hazardous waste determination	Applicable	
40 CFR 61 Subpart M, 61.145, 61.150, 61.156	Asbestos regulations	Applicable	Substantive requirements will be met
Location-specific			
None identified			

Table 12-7. (continued).

Alternative ARARs citation	Description	Applicable, or Relevant and Appropriate (R&A), or TBC	Comments
TBCs			
DOE Order 435.1	Radioactive waste management performance objectives to protect workers	TBC	Substantive requirements will be met by administrative and engineering controls during excavation, removal, treatment and disposal of the tank system and contents.
DOE Order 5400.5	Exposures to the public will be kept ALARA	TBC	Will be met by administrative and engineering controls during excavation, removal, treatment and disposal of the tank system and contents.

12.3 Cost Effectiveness

Table 12-8 summarizes the comparison of costs of the OU 3-13 remedial alternatives. In all cases, the alternative that most cost-effectively protects human health and the environment, and meets ARARs, was selected for implementation under this ROD. Each remedial action selected is cost effective in that the costs were determined to be proportional to the overall effectiveness of the remedy. The Agencies have determined that each remedial action adequately protects human health and the environment and complies with ARARs. The comparison of cost-effectiveness between alternatives is described belox for each site grouping.

12.3.1 Tank Farm Soils Interim Action (Group 1)

Alternative 3 (the selected altemative) is the most expensive, because it contains the largest amount of capital improvements to the site. It is the only altemative that will reduce contaminant transport to the SRPA and facilitate meeting water quality ARARs.

12.3.2 Soils Under Buildings and Structures (Group 2)

Alternative 2 (the selected alternative) is the most expensive alternative, because it includes both institutional controls and capital costs for containment, while Alternative 1, the least expensive. includes no active remediation. Alternative 3 is a contingency remedy that will only be implemented in the event that contaminated soils are excavated during D&D of the buildings and structures. Alternative 2 is easily implemented, effective, and protective of human health and the environment.

12.3.3 Other Surface Soils (Group 3)

The costs for each alternative progressively increase from Alternative 1 (Existing Institutional Controls), with the lowest overall cost, to Alternative 4B (Excavation, Ex Situ Treatment, and Off-Site

Table 12-8. Comparison of costs[a] of alternatives[b] for WAG 3.

Site/Grouping	Alternative 1	Alternative 2	Alternative 3	Alternative 4A	Alternative 4B
Tank Farm Soils Interim Action	$3.4M	$10.0M	**$15.1M**		
Soils Under Buildings and structures	$6.4M	**$9.2M**	$8.3M	NA	NA
Other Surface Soils	$6.9M	$15.0M	$37.5M	**$84.9M**	$244.6M
Perched Water	$7.3M	**$20.0M**	$259.2M	NA	NA
Snake River Plain Aquifer Interim Action	$13.9M	$14.8M(2A)	**$39.M**(2B)	$787.9M(3)	NA
Buried Gas Cylinders	$6.4M	**$1.8M**	$8.2M	NA	NA
SFE-20 Tank	$6.4M	$8.7M	$8.5M	**$4.6M**(4)	NA

a All costs are in millions (M) of dollars, calculated as net present value (NPV). A discount rate of 5% per EPA guidance, was used to calculate the NPV

b Costs for the selected alternative are shown in bold

c The number in parentheses following the cost refers to the alternative number for the specific group

Disposal), with the highest cost of the five alternatives evaluated. However, as the cost of each alternative increases from Alternative 1 through Alternative 4B, so does the level of overall protection and long-term effectiveness. Alternative 1, while the least expensive, provides the lowest level of protection after the institutional control period is over, and is least effective in the long-term. Alternative 4B provides the greatest level of protection and long-term effectiveness by removing the contaminated material from the site, treating it, and permanently disposing of it off-Site. Additionally, the toxicity, mobility and volume of the contaminated soils will be reduced by this alternative. Similarly, Alternative 4A (Excavation and On-Site Disposal) provides a significant level of protection and effectiveness by consolidating the contaminated soil in one location and containing it in an engineered and monitored a facility. Neither the toxicity nor the volume of the contaminated soil is reduced by this alterriative, however, Comparing Altemative 4A to 4B for all criteria but cost indicates that Alternative 4A is slightly more effective overall than Alternative 4B. However, the additional effectiveness provided by Altemative 4B compared with its significant cost makes Alternative 4A the more reasonable alternative.

12.3.4 Perched Water (Group 4)

Alternative 2 (the selected alternative) is more expensive than Alternative 1, because aquifer recharge controls are included. Alternative 2 is much less expensive than Altemative 3, which would add perched water pumping and treatment but would not significantly improve protection of human health. Alternative 2 is the least expensive altemative considered that is protective of human health after 2095 and meets ARARs. Environmental receptors are not exposed to the perched water.

12.3.5 Snake River Plain Aquifer Interim Action (Group 5)

Alternative 2B (the selected alternative) is more expensive than 1 and 2A, since it includes both the existing and additional controls defined for those alternatives, as well as contingent groundwater pumping and treatment to remove COCs. The treatment system will need to address all COCs which are present in SRPA groundwater, but are not predicted to be above risk-based levels following institutional control. It is much less expensive than Altemative 3, which would incorporate much higher pumping rates, but with no significant increase in human health protection. Alternative 2B is the least expensive alternative considered that is predicted to meet MCLs after 2095 and meets all other ARARs. Environmental receptors are not exposed to SRPA water.

12.3.6 Buried Gas Cylinders (Group 6)

Alternative 2 (the selected alterriative) is the least expensive alterriative considered, because all hazardous materials will be removed from the site and no long-term monitoring or institutional controls will be required. Alternative 2 is the least expensive alternative that is protective of human health and the environment and meets ARARs.

12.3.7 SFE-20 Hot Waste Tanks System (Group 7)

Alternative 4 (the selected alternative) is the least expensive alternative considered, because all hazardous materials will be removed from the site and no long-term monitoring or institutional controls will be required. Alternative 4 is the most cost-effective alternative that is protective of human health and the environment and meets ARARs.

12.4 Utilization Of Permanent Solution And Alternative Treatment Technology To The Maximum Extent Practicable

The selected remedies in this ROD represent the maximum extent to which permanent solutions and alternative treatment technologies can be used in a practicable manner at OU 3-13. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

The Tank Farm Soils Interim Action, Alternative 3, is not a permanent solution and does not use alternative treatment technologies. Because current information regarding the nature and extent of contamination at the Tank Farm is inadequate to support selection of a final remedy, a separate RI/FS for the Tank Farm is underway. The Tank Farm is now referenced as a separate operable unit, OU 3-14. The OU 3-14 RI/ FS will further investigate contamination at the Tank Farm and develop alternatives for a final remedy. Use of a permanent solution or alternative treatment technologies will be considered in the development of alternatives in the Tank Farm RI/FS.

The selected remedy for the Soils under Buildings and Structures, Alternative 2, is a permanent solution but does not use alternative treatment technologies. Since the contaminated soils will remain isolated onsite for up to 1,000 years, the selected remedy will result in a permanent solution for the release sites. The sites will be covered with natural earthen materials to isolate the contaminated soils and prevent exposure to humans or the environment. The barrier system will be designed to prevent future exposure for up to 1,000 years, which will allow natural radioactive decay to reduce contaminant concentrations over time to levels that are not a risk to human health or the environment. The barrier design will also minimize contaminant migration by inhibiting water infiltration. Long-term isolation will provide an effective permanent solution for these sites. Although treatment technologies exist for the nonradionuclide COCs, arsenic, mercury, and chromium, the primary COCs at these sites are radionuclides. Effective treatment technologies for radionuclides are currently unavailable. The treatment technologies evaluated were determined not to be practicable because they were ineffective, difficult to implement, or very costly. Therefore, the use of alternative treatment technologies also cannot be met except through natural radioactive decay over time.

The selected remedy for the Other Surface Soils, Alternative 4A, provides a permanent solution because the contaminated soils will be permanently removed and contained at the ICDF. Contaminated soils present at the release sites will be excavated to a minimum depth of 10 feet below ground and disposed in an engineered facility designed for long-term isolation and protection. Although treatment technologies exist for the nonradionuclide COCs, mercury, lead, and chromium, present at some of these sites, the primary COCs at these sites are radionuclides. The treatment technologies evaluated were determined not to be practicable because they were ineffective, difficult to implement, or very costly. Therefore, the use of alternative treatment technology will not be met.

The selected remedy for the Perched Water, Alternative 2, provides a permanent solution but does not use altemative treatment technologies. Alternative 2 is comprised of existing and additional institutional controls to restrict perched water use and implementation of initial phased remedies to control water infiltration and perched water releases to the SRPA. The proposed initial phased remedies are permanent actions that control sources providing water to the perched zone. These actions are designed to reduce leaching and transport of soil contaminants to perched water, to reduce the volume of water in the perched zone, and to minimize the potential for perched water releases to the SRPA. The low yield of the perched zone limits implementation of active remediation. The inability to implement active

remediation because of perched zone characteristics eliminates the need for alternative treatment technologies. Therefore, this remedy will not meet the statutory requirement for alternative treatment technologies.

The Snake River Plain Aquifer Interim Action, Alternative 2B, is not a permanent solution and does not use alternative treatment technologies unless active remediation is implemented. The SRPA action outside the current INTEC security fence is a final action. SRPA groundwater actions inside the current INTEC security fence, if needed, will be addressed in OU 3-14. If groundwater remediation is implemented, treatability studies will be implemented to evaluate and select appropriate treatment technologies. Alternative treatment technologies will be considered in the treatability studies. Active groundwater remedtiation would provide a permanent solution by removing groundwater from the zone of maximum contamination. Because current information regarding the nature and extent of contamination at the SRPA inside the current INTEC security fence is inadequate to support selection of a final remedy, a separate RI/FS that includes this portion of SRPA will be implemented. Further evaluation of the SRPA inside the current INTEC security fence will be deferred to OU 3-14. The OU 3-14 RI/FS will further investigate contamination in the SRPA inside the current INTEC security fence and develop alternatives for a final remedy. Use of a permanent solution or alternative treatment technologies will be further considered in the development of alternatives in the OU 3-14 RI/FS.

The selected remedy for the Buried Gas Cylinders, Altemative 2, provides a permanent solution and uses treatment technologies, where necessary, as the principal remedy. Alternative 2 consists of the excavation and permanent removal of the gas cylinders, treatment of the tank contents, if necessary, and recycling of the gas cylinders. Excavation will be conducted to minimize the potential for any gas releases to the environment. The gases in the cylinders will be vented to the atmosphere if they are benign or treated using a method suitable for a particular gas. The specific treatment methods will be selected during RD/RA.

The selected remedy for the SFE-20 Hot Waste Tank System, Alternative 4, provides a permanent solution and uses treatment technologies, where necessary, as the principal remedy. Alternative 4 will permanently remove the tank and associated structures for disposal on-Site. The tank liquid will be removed and treated at the PEW Evaporator. The tank sludge will be removed and treated ex-situ using a suitable grout to solidify and stabilize the contaminants in the sludge. The sludge will be drummed and either disposed on-Site or off-Site at a suitable engineered disposal facility. Depending on waste characteristics, the remaining components of the tank system will be permanently excavated, removed, and disposed at either the ICDF or off-Site, depending on the ICDF waste acceptance criteria.

12.5 Preference for Treatment as a Principal Element

This ROD meets the statutory requirement to utilize permanent solutions and treatment technologies to the maximum extent practicable, given the nature and extent of contamination present at OU 3-13. OU 3-13 COCs are primarily radionuclides. Treatment technologies exist to reduce radionuclide mobility, and the volumes of radionuclide-contaminated media, however no viable technology exists to reduce radionuclide toxicity. The Group 1, 2, and 3 radiologically contaminated soils which represent principal threat wastes will not be treated under this action. Natural radioactive decay is the only means by which toxicity reduction occurs. Technologies to reduce mobility and volume (soil washing, ground water pump and treat) ofcontaminated media were considered in this FS and utilized to the extent they were determined to be technically feasible and cost-effective.

Risks presented by Soils under Buildings and Structures were determined to be most cost effectively addressed through containment in situ, since they are presently under buildings and structures,

and are almost exclusively contaminated with radionuclides. Containment of radionuclides, either in situ or at an engineered facility, will effectively provide isolation from the environment, allowing for radioactive decay to continue while inhibiting exposures to human and ecological receptors. However, containment is not considered treatment, since no technologies to permanently reduce toxicity, mobility or volume are directly implemented.

Treatment of radionuclide-contaminated soils at the Other Surface Soils sites to reduce volume prior to disposal was not found to be cost-effective. Disposal at the proposed ICDF, without treatment, was determined to have equivalent long-term effectiveness, higher short-term effectiveness and lower cost.

Groundwater pumping and treatment was selected as a contingent remedy to reduce mobility and volume of COCs in the SRPA, if action levels are exceeded before 2095. Both pumping and treatment aspects of this alternative would require treatability study evaluation prior to implementation. The treatment study will also need to address tritium and mercury that are present in SRPA groundwater, but are not predicted to exceed risk-based levels following institutional control.

Hazardous constituents in gases at the Buried Gas Cylinder sites will be treated by neutralization or other means to render them non-hazardous. Immobilization by grouting to reduce radionuclide mobility was selected for the SFE-20 tank contents only. These are regarded as relatively permanent treatment technologies.

12.6 Five-Year Review

The entire area of INTEC covered by this ROD will be included in a single periodic 5-year review. The CERCLA 5-year review process will ensure the protectiveness of the remedial actions taken under the ROD where contaminants remain at the sites that requires access controls or land use restrictions. Five-year reviews will also ensure that any changes in the physical configuration of any INTEC facility or site where there is suspicion of a release of hazardous or radioactive substances (such as D&D) will be managed to achieve remediationgoals established in the ROD. As part of the 5-year review process, the Agencies will periodically review the protectiveness of their decisions and adjust to updates in public protectiveness levels.

13. DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD. A few changes have been made in the ROD that are different than presented in the Proposed Plan. Although the changes may not be considered significant, they are included in this section of the ROD to accurately reflect changes since the Proposed Plan was issued.

13.1 New Sites

Four new sites have been identified in this ROD using the FFA/CO new site inclusion process. These sites are described below, as well as the OU 3-13 release site group each site has been placed in for remediation.

13.1.1 CPP-96— Tank Farm Interstitial Soils

Release site CPP-96 is a new Group 1 site that consolidates all of the previously defined Tank Farm Soils release sites and the intervening Tank Farm interstitial soils that occur within the boundaries of CPP-96 that were not previously identified as release sites. The previously defined Tank Farm Soils release sites included within Site CPP-96 include: CPP-15, -16, -20, -24, -25, -26, -27, -28, -30, -31, -32, 33, -58, and -79. Site CPP-96 will be subject to the Group 1 Interim Action under this ROD. Site CPP-96 will be further investigated under OU 3-14 where a final remedy for this site will be selected.

13.1.2 CPP-97— Tank Farm Soil Stockpiles

This site includes two stockpiles of soil located in the northeast comer of INTEC. The stockpiles were generated during the high-level Liquid waste Tank Farm upgrade project. Potential contaminants contained in the stockpiled soils include radionuclides and suspected PEW listed wastes. These soils will be remediated using the selected remedy for Other Surface Soils. The Tank Farm Soil Stockpiles are included in OU 3-13, Group 3.

13.1.3 CPP-98— Tank Farm Shoring Boxes

This site consists of 118 boxes of contaminated shoring material. The boxes contain wood and metal shoring material from the Tank Farm. These boxes will be remediated using the selected remedy for Other Surface Soils. The shoring boxes are included in OU 3-13, Group 3.

13.1.4 CPP-99— Boxed Soils

Consists of 59 boxes of soils staged near the CPP-92 Waste Storage Facility. These soils were generated during the Tank Farm upgrade project and the CPP-604 Egress Tunnel project. The boxed soils are similar to the boxed soils in site CPP-92, and will be remediated using the selected remedy for Other Surface Soils. The boxed soils are included in OU 3-13. Group 3.

13.2 Sites Included in Other Programs or Other OUs

In the Proposed Plan, four sites (CPP-37, -38, -65, and -66) were directed to other programs. One of those sites (CPP-37) has been split into two sub-sites, (CPP-37a and -37b) that will be remediated under this ROD.

- Site CPP-37a, a former seepage pit receiving runoff from the Tank Farm will be addressed under Group 3. Other Surface Soils. A presumptive remedy of excavate and dispose at the ICDF will be implemented. This site discussed in the Proposed Plan as part of "sites to be transferred to other programs."

- Site CPP-37b (former construction landfill inside the fence) will be addressed as a Group 3 soils site. This site was discussed in the Proposed Plan as part of "sites to be transferred to other programs."

- Site CPP-66 Fly Ash Pit was discussed in the Proposed Plan as part of' "sites to be transferred to other programs". This site has been moved to OU 10-04 for further evaluation of ecological risk.

- Sites CPP-61, -81, and -82 previously identified as "No Further Action"(CPP-61) and "No Action" (CPP-81 and 82) sites in the Proposed Plan, have been determine to require additional information to make a decision. These site are transferred to OU 3-14 for further evaluation.

13.3 Other Changes

- The Agencies reviewed the site characterization data for Site CPP-41 and decided that the site should be split into two sites that will be designated CPP-41a and CPP-41b. The Agencies have decided in this ROD that Site CPP-41 a has insufficient data to make a "No Further Action" decision. Site CPP-41a will be included in this ROD as a Group 2 site. The Agencies have decided that the risks posed by Site CPP-41b are less than 1×10^{4} or an HI <1 and that this site requires "No Action".

- The Proposed Plan indicated that "No Action" or "No Further Action" be taken at 51 sites. After further review of the "No Action" and "No Further Action" decisions, the Agencies have decided in this ROD that 11 of these sites have insufficient data to support either "No Action" or "No Further Action". These 11 sites will be managed as follows:

  - Sites CPP-16, -24, and -30 will be included vithin the new Group 1 -Tank Farm Interstitial Soils consolidation site CPP-96.

  - Sites CPP-41a, -60, -68, and -86 will be included within Group 2 - Soils Under Buildings or Structures.

  - Site CPP-85 has been closed in place as part of the WCF closure. The WCI was closed under an approved HWMA closure plan. The WCF will be included with the Group 2 Soils Under Building and Structures sites in the CERCLA -5-year reviews.

  - Sites CPP-61, -81, and -82 will be transferred to OU 3-14 for further evaluation.

- As part of the Agencies review of the "No Action" and "No Further Action" site decisions, the Agencies have decided that 34 of the release sites evaluated under OU 3-13 will meet the RAOs established under this ROD and require "No Action." Ten sites were previously designated as "No Action" sites under the FFA/CO. The Agencies have also decided that six of the release sites have existing or potential contaminant sources but do not have an

exsposure route under current site conditions. The Agencies have designated these sites as "No Further Action".

- The SRPA remedy will be implemented as an interim action under OU 3-13. The decision for the SRPA outside the current INTEC security fence is a final action under this ROD. The final remedy for the SRPA inside the current INTEC security fence will be determined under OU 3-14.

- Fifteen legacy waste soil samples from previous INTEC site investigations will be placed in the ICDF for permanent disposal.

- Site CPP-6 7 Percolation Ponds

  - The Proposed Plan discussed the need to close the existing percolation ponds to eliminate recharge to the perched water zones (Group 4). The Proposed Plan did not specify the location of the replacement percolation ponds. The location of the replacement percolation ponds is selected under this ROD and is shown on Figure 11-5. A wastewater land application permit will be submitted for the replacement percolation ponds on or before 2001, and the existing ponds will stop receiving water by, December 3l, 2003. If the new wastewater land application permit (WLAP) cannot be in place to support this date, then the ponds will be replaced under CERCLA authority, and the CERCLA ER prograrn will finalize design and authorize construction.

- The Agencies have determined that lining the Big Lost River may be a necessary second step to reduce recharge to the perched water. Therefore, relocation of the river is no longer being considered. The Agencies will do additional environmental and cost analyses to determine it lining the Big Lost River is necessary.

- Site CPP-48 (French Drain South of CPP-633) was previously included in the Proposed Plan as a "No Further Action" site based on the results of the RI/BRA. However, under the COCA. Site CPP-48 retained a RCRA land disposal unit (LDU) designation. Under the FFA/CO, units retaining an LDU designation will be remediated under CERCLA. As a result, Site CPP-48 will be remediated under the selected remedy for Group 3. This will simplify closure of this site.

- The WCF his been closed under an approved HWMA closure plan and a post-closure monitoring and maintenance plan is required. In order to reduce the duplication of effort for monitoring and maintenance of the WCF, maintain consistency with the public-noticed WCF closure plan, and acknowledge the RCRA CERCLA parity policy these requirements will he addresed under this ROD as ARARs. The WCF will be included during the CERCLA 5-year reviews with the Group 2 Soils Under Buildings and Structures sites and will address the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.310). Additionally these requirements will be incorporated into the post-ROD monitoring plan for OU 3-13.

- Through a prelimenary evaluation of all relevant decision criteria, the Agencies have determined the Study Area siting the ICDF to be the CPP-67 Percolation Ponds and adjacient areas to the west as depicted in Figure 11-4 based on the preliminary geotechnical information. However, the specific ICDF cell locations will be determined through the

completion of a comprehensive geotechnical evaluation of the entire Study Area, which shall be reviewed and approved by the Agencies.

- OU 3-13 RD/RA and OU 3-14 monitoring well construction and sampling wastes prior to the construction of the ICDF and SSST will be temporarily (not to exceed 1year managed and treated within the WAG 3 AOC in remediation waste staging piles and temporary units in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.553 and 40 CFR 264.554). Treatment will be accomplished using mobile tankage and physical chemical treatment and will comply with the substantive requirements of IDAPA 16.0 1.05.008 (40 CFR 264 Subparts J, BB, and CC). The final disposition of these waste will be in the ICDF. The anticipated wastes include soil drill cuttings, monitoring well purge water, personnel protective equipment, and decontamination wastes.

- This ROD recognizes that the INTEC facility is an operating facility. As such, periodic maintenance and upgrade activities will be conducted during, the implementation of the remedial actions under this ROD. Prior to conducting any site disturbance activities, the Agencies will be notified of the extent of any disturbance and provided a plan for agency approval that includes the necessary corrective actions that will be performed to ensure that the remedies identified in this ROD remain operational and functional. A formal system for notification and approval of disturbances to OU 3-13 sites will be developed during remedial design.

14. RESPONSIVENESS SUMMARY

In accordance with CERCLA Sections 113(k)(2)(B)(I-V) and 117, a series of opportunities were made available for public information and participation throughout the OU 3-13 investigation and decision process. The Proposed Plan, describing the Agencies preferred remedies for OU 3-13 was released for public review and comment on October 18, 1998. Public review of the Proposed Plan took place between October 23 and December 22, 1998, which included an automatic 30-day extended comment period. An additional 30-day extension, until February 12. 1999, was requested and granted. Public meetings were also held in Idaho Falls, Twin Falls, Boise, and Moscow, Idaho on November 16, 17, 18, and 19, 1998. Written comment forms were available in the Proposed Plan and at the public meetings. A court reporter was also present at the public meetings to record transcripts of the discussions and public comments. The Responsiveness Summary was prepared by the Agencies to provide responses to both written and verbal comments received during the public comment period and at the formal comment session of the meetings. The Responsiveness Summary is included as Appendix A to this ROD.

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WINCO, 1992k, *Track 1 Decision Documentation Package Waste Area Group 3, Operable Unit 2, Site CPP-62 Mercury Contamination Area near CPP TB-4,* Westinghouse Idaho Nuclear Company Inc., Revision 0.

WINCO, 1992, *Track 1 Decision Documentation Package Waste Area Group 3, Operable Unit 2, Site CPP-64 Hexone Spill West of CPP-660,* Westinghouse Idaho Nuclear Company. Inc., Revision 1.

WINCO, 1992m, *Track 1 Decision Documentation Package Waste Area Group 3, Operable Unit 12, Site CPP-82 Abandoned Line 1.5 in. PLA 776 West of Beech Street,* Document No. 5292, Westinghouse Idaho Nuclear Company, Inc., Revision 1.

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WINCO, 1993e, *Track 2 Summary Report for Operable Unit 3-11 (CPP-621 Area Spills) Sites CPP-45, CPP-58E, and CPP-58W,* Westinghouse Idaho Nuclear Company, Inc., Revision 2.

WINCO, 1993f, *Track 1 Decision Documentation Package Waste Area Group 3, Operable Unit 2, Site, CPP-63 Hexone Spill by CPP-710,* Westinghouse Idaho Nuclear Company, Inc., Revision 2.

WINCO, 1993g, *Track 1 Decision Documentation Package Waste Area Group 3, Operable Unit 2 Site CPP-68 Abandoned Gasoline Tank CPP-VES-UTI-652,* Westinghouse Idaho Nuclear Company, Inc., Revision 2.

WINCO, 1993h, *Track 1 Decision Documentation Package Waste Area Group 3 Operable Unit 4 Site CPP-38, Transite on CPP-601/602/603/604/605/606/640/644/648,* Westinghouse Idaho Nuclear Company, Inc., Document Number 5303, Revision 1, June.

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WINCO, 1993j, *Track 2 Summary Report Waste Area Group 3, Operable Unit 3-05, Old Sewage Treatment Plan West of CPP-664,* Westinghouse Idaho Nuclear Company, Inc., Document Number 5606, Revision 2, April.

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WINCO, 1994a, *Track 2 Preliminary Scoping Summary Report Operable Unit 3-02, CPP-23 Injection Well, CPP-37 Gravel Pits No. 1 and 2, and CPP-59 Kerosene Tank Overflow East of CPP-633,* Westinghouse Idaho Nuclear Company, Inc., Revision 2, August.

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Appendix A

Operable Unit 3-13 Responsiveness Summary

Public Comments and Responses on the OU 3-13 Proposed Plan

OVERVIEW

The Idaho Nuclear Technology and Engineering Center (INTEC), formerly known as the Idaho Chemical Processing Plant (ICPP), constitutes the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13, at the Idaho National Engineering and Environmental Laboratory (INEEL). There have been 99 releases or potential release sites (95 discussed in the Proposed Plan) and 15 OUs identified at INTEC. Operable Unit 3-13 is the latest investigation completed and represents the INTEC comprehensive remedial investigation/feasibility study (RI/FS), including the 18 sites not previously assessed. Selected remedies were chosen for the 99 sites contained in this Record of Decision (ROD)

Forty of these sites were determined in the comprehensive RI/FS to have contamination that poses a potential risk to human health and the environment and that requires remedial action to reduce or eliminate those risks. During the RI/FS and Proposed Plan, these 40 contaminated sites were grouped into the following seven remedial action groups: (Tank Farm Soils [Group 1], Soils Under Buildings and Structures [Group 2], Other Surface Soils [Group 31], Perched Water [Group 4], Snake River Plain Aquifer [Group 5], Buried Gas Cylinders [Group 6], and SFE-20 Tank System [Group 7]. This grouping was done on a media or geographical location basis. Additionally, four sites have recently been added to WAG 3 that are similar to other WAG 3 sites within the remedial action groups requiring remediation. These sites have been added to the appropriate remedial action group (Site CPP-96 has been added to Group 1 and Sites CPP-97, -98, and -99 have been added to Group 3) and will be remediated using the same remedial action alternatives. For these seven remedial action groups, remedial action alternatives were evaluated, and preferred alternatives were selected. Also, there are two sites (CPP-38 and CPP-65) that will be remediated or closed under other regulatory programs and one site (CPP-66) that has been transferred to WAG 10 for further evaluation. One site (CPP-48), a proposed "No Action" site, has been determined to require additional action and will be part of Group 3. In addition to the 46 sites in the remedial action groups, two other sites requiring a remedial action, and one-transferred site, 50 sites were determined to pose an acceptable risk to human health and the environment and were identified by the Agencies as "No Action" and "No Further Action" sites.

A Proposed Plan that summarized the results of the RI/FS and presented the preferred remedial alternatives was released by the Agencies for public review on October 16, 1998. The initial Public review of this document took place between October 23, 1998, and December 22, 1998, which included an automatic 30-day extension to the comment period. Comments were received from 10 of the 55 people who attended the formal portions of the 4 public meetings. Written comments were received from 19 persons or groups. An additional 30-day review period (to February 12, 1999) was requested and used by 5 persons or groups to submit written comments. Public meetings were held in Idaho Falls, Twin Falls, Boise, and Moscow, Idaho on November 16, 17, 18, and 19, 1998, respectively.

This Responsiveness Summary responds to both written and verbal comments received during the comment period and meetings. Generally, support for the selected alternatives for each remedial action group was mixed.

BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Section 113(k)(2)(B)(I-V) and 117, a series of opportunities were available for public information and participation in the remedial investigation and decision process for OU 3-13, WAG 3 of INTEC (ICPP), from 1991 to present. For the public, the activities included receiving fact sheets that briefly discussed the status of the investigations to date, *INEEL Reporter* articles and updates, a Proposed Plan, and focus group interaction, along with teleconference calls, briefings, presentations, and public meetings.

During the week of October 18, 1998, the U.S. Department of Energy, Idaho Operations Office (DOE-ID) issued a news release to more than 100 media contacts concerning the beginning of the a 30-day public comment period pertaining to the WAG 3 OU 3-13 Proposed Plan. This period began on October 23, 1998; however, the comment period was automatically extended by the Agencies an additional 30 days in anticipation of large public interest. During the extended comment period, a request to extend the comment period was received. As a result, the extended comment period ended on February 12, 1999. Additionally, two "update fact sheets" were distributed to approximately 700 citizens on the INEEL Community Relations Plan mailing list. The first "update fact sheet" was distributed in November 1997 and the second was mailed out in September 1998. The purpose of the documents was to keep citizens appraised of the development during the RI/FS and to include a schedule of the investigation and announce the approximate dates that the public meetings would take place. These fact sheets also offered technical briefings to those interested in the WAG 3 investigation. The news releases gave notice to the public that WAG 3 INTEC (ICPP) supportive documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls, Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow. Copies of the Proposed Plan were mailed to about 700 members of the public on the INEEL Community Relations Plan mailing list for review and comment. In addition, public meetings were held at Idaho Falls, Twin Falls, Boise, and Moscow, Idaho, on November 16, 17, 18, and 19, 1998, respectively. Written comment forms were available at the meetings, and a court reporter was present at each meeting to record transcripts of the discussions and public comments. A total of 34 citizens provided formal comments; of these, 10 provided verbal comments and 24 provided written comments.

This Responsiveness Summary has been prepared as part of the ROD. All formal verbal comments, as given at the public meetings, and all written comments, as submitted are included in the Administrative Record for the ROD. Those comments are annotated to indicate which response in this Responsiveness Summary addresses each comment. The ROD presents the selected alternative for each remedial action ,group along with the decisions on the "No Action" and "No Further Action" for the remaining sites. The preferred alternatives, in the Proposed Plan, were selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan [NCP]). The decisions presented in the ROD are based on the information contained in the Administrative Record. Additionally, the Administrative Record is available on the Internet at http: ar.inel.gov/home.html.

SUMMARY

Comments and questions raised during the public comment period on the Proposed Plan for the WAG 3 comprehensive RI/FS for OU 3-13 at INTEC (ICPP) are summarized below. The public meetings were divided into an informal question and answer session and a formal public comment session. The meeting format was described in published announcements, and reviewed with meeting attendees at the beginning of each meeting. The informal question and answer session was designed to provide immediate responses to the public's questions and concerns. Many questions were answered during the informal period of the public meetings on the Proposed Plan. Although this Responsiveness Summary does not respond to issues and concerns raised during the informal part of the public meetings, the Administrative Record contains complete transcripts of these meetings, which include the Agencies' responses to these questions, issues, and concerns.

Comments received during the formal comment session of the meetings are addressed by the Agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, verbally during the public meetings, or by recording a message using the INEEL's toll-free number.

More than 25 individuals and/or groups provided oral and written comments on *the Proposed Plan for Waste Area Group 3 at the Idaho Chemical Processing Plant.* The U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the State of Idaho agreed to extend the comment period an additional 30 days twice, giving the public an unprecedented 90 days to provide comments. The WAG 3 Proposed Plan garnered the most public interest of any Environmental Restoration (ER) project since Pit 9 was first discussed in 1992.

About one-third of the Commentors agreed with the preferred alternatives. Another one-third thought the Agencies were not taking enough cleanup actions. While a third still thought the Agencies should take little or no action at the INTEC facility.

What makes the WAG 3 Proposed Plan unique is the national interest the document, and preferred alternatives, generated. All members of Idaho's Congressional Delegation provided written comments. The comments received were beneficial in our development of this ROD. Of principal concern to the Delegation was the siting of a site-wide contaminated soil repository at the INTEC facility, the INEEL CERCLA Disposal Facility (ICDF), which lies about 450 feet above the Snake River Plain Aquifer (SRPA).

A majority of public comments also focused on the site-wide soil repository. The major concern was the long-term protection of the sole-source SRPA. Many members of the public worried about: future contaminant migration from the soil repository; the proposed location of the repository; and ensuring that applicable or relevant and appropriate requirements (ARARs) are met.

Many public comments also addressed existing groundwater contamination beneath the INTEC facility. Some Commentors stated that the Agencies were not going far enough in implementing remediation to quickly reduce contamination. Others commented that the Agencies should let dilution and natural attenuation occur to reduce the groundwater contamination. Still, others questioned the hydrogeological assumptions made in the Proposed Plan and RI/FS. These comments focused on the relationship of the percolation ponds to the perched water contamination, and on the relationship of the perched water bodies to groundwater contamination.

In general, protection of the SRPA was a significant concern to regional news media. Editorials ran in the Twin Falls *Times-News*, *Wood River Journal* (Hailey), and *Idaho Statesman* (Boise), criticizing the proposed soil repository for leaving contaminants over the SRPA.

LISTING OF COMMENTORS AND COMMENT NUMBERING

All of the formal comments submitted by the public in either written or oral form were tabulated, summarized briefly and assigned a comment number. If the Commentor affiliation is unknown or the Commentors are expressing their individual opinion. "Concerned Citizen" is shown as the affiliation. An index of the comments and the page number that the comment appears on is provided at the end of this Responsiveness Summary. Comments are indexed based on the initials of the author (U for unknown) and identified as either written (W) or public meeting along with location (TI for Idaho Falls meeting, TT for Twin Fails, TB for Boise and TM for Moscow). Table 1 presents the Commentors, their affiliation, initials code, and comment type (written or public meeting) for the Commentor's comments.

Table 1. Authors of the comments on the Proposed Plan, their affiliation, and the codes used for comment numbering.

Name	Affiliation	Commentor's Initials	Comment Type
Mr. Jobe	Coalition 21	LJ	TI
Beatrice Brailsford	Snake River Alliance	BB	TI
Peter Rickards	Concerned Citizen	PR	TT
David Kipping	Snake River Alliance	DK	TT
Margaret McDonald Steward	Snake River Alliance	MMS	TT
Pamela Allister	Snake River Alliance	PA-SRA	TB
Pamela Allister	Concerned Citizen	PA	TB
Steve Ramono	American Ecology, Inc.	SR	TB
Chuck Broscious	Environmental Defense Institute	CB	TM
Jeff Jones	Concerned Citizen	JJ	TM
Chuck Rice	INEEL Citizens Advisory Board	CAB	W
Albert Taylor	Concerned Citizen	AT	W
Paul Randolph	Concerned Citizen	PaR	W
Chuck Broscious	Environmental Defense Institute	CB-W	W
Thornton Waite	Concerned Citizen	TW	W
Shannon Ansley	Concerned Citizen	SA	W
Robin VanHorn	Concerned Citizen	RV	W
Representative, Helen Chenoweth	Idaho First Congressional District	HC	W
Jack Lemley	Lemley and Associates	L	W
John Commander	Coalition 21	C21	W
Chris Coperfield	Concerned Citizen	CC	W
Margaret McDonald Steward	Snake River Alliance	MMS-W	W
David Hensel	Concerned Citizen	DH	W
Anonymous	Concerned Citizen	A	W
Robert Bobo	Consultant to Shoshone-Bannock Tribes	SBT	W
Beatrice Brailsford	Snake River Alliance	SRA	W
James McCarthy	Concerned Citizen	JM	W
Christinna ?	Concerned Citizen	C	W

Table 1. (Continued).

Name	Affiliation	Commentor's Initials	Comment Type
Frank Priestley	Idaho Farm Bureau Federation	IFBF	W
Representative Mike Simpson, and Senators Larry Craig and Mike Carpo	Idaho Congressional Delegation	MS	W
Barbara Robertson	Concerned Citizen	BR	W
Richard Kuehn	Concerned Citizen	RK	W
Unknown	Concerned Citizen	U	W
Beatrice Brailsford	Snake River Alliance	SRA2	W

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ACRONYMS

AIP	Agreement in Principle
ANL-W	Argonne National Laboratory-West
AOC	area of contamination
ARARs	applicable or relevant and appropriate requirements
BLR	Big Lost River
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COCs	contaminants of concern
D&D	decontamination and dismantlement
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ESD	explanation of significant differences
FFA/CO	Federal Facility Agreement and Consent Order
FS	feasibility study
FSS	feasibility study supplement
HEL	Highly Enriched Uranium
HI	hazard index
HLW	high level waste
HWMA	Hazardous Waste Management Act

IC	Institutional Control
ICDF	INEEL CERCLA Disposal Facility
ICPP	Idaho Chemical Processing Plant
Idaho HLW & FD EIS	Idaho High Level Waste and Facilities Disposition Environmental Impact Statement
IDW	investigation derived waste
IDWH DEQ	Idaho Department of Health and Welfare Division of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	Land Disposal Restriction
LLW	low-level waste
M&O	management and operations
MCLs	maximum contaminant levels
MLLW	mixed low-level waste
MTRs	Minimum Technical Requirements
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priority List
NPV	Net Present Value
NRC	Nuclear Regulatory Commission
NSI	New Site Identification
NWCF	NEW Waste Calcining Facility
OMB	Office of Management and Budget
OU	operable unit
PCB	polychlorinated biphenyl
RAO	remedial action objective

RCRA	Resource Conservation and Recovery Act
RI/BRA	remedial investigation. baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
SBW	Sodium Bearing Waste
SNF	Spent Nuclear Fuel
SRPA	Snake River Plain Aquifer
SRS	Savannah River Site
STP	Sewage Treatment Plant
STP	Site Treatment Plan
TAN	Test Area North
TAP	
TBC	to be considered
TCLP	toxic characterization leaching procedure
TI	Technical Impracticability
TRA	Test Reactor Area
TRU	transuranic
TSCA	Toxic Substances Control Act
USGS	United States Geological Survey
WAC	waste acceptance criteria
WAG	waste area group
WIPP	Waste Isolation Pilot Plant
WLAP	wastewater land application program

SUMMARY OF COMMENTS WITH RESPONSES

Comments presented during, the public comment period on the Proposed Plan for the INTEC Comprehensive RI FS are given below. The public meetings were divided into a presentation, an informal question-and-answer session, and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginning of the meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal period of the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings. However, the Administrative Record contains complete transcripts of these meetings, which include the Agencies responses to these informal questions.

Comments received during the formal comment session of the meetings and written comments received during the public comment period are addressed by the Agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, orally during the public meetings, or by recording a message using the INEEL's toll-free number. The comments below are printed and occasionally summarized. Edits made were to correct minor spelling, editorial errors, and elimination of non-comment related information. In those cases where written comments were received that were difficult to read, a best attempt to interpret the comment is provided. Copies of the originally written comments are provided in the Administrative Record file for INTEC.

The comments made on the Proposed Plan, from the formal part of public meetings and written, have been grouped into various subject categories. These comments have been grouped into four general categories: A: WAG 3 Cleanup and Public Participation, B: The CERCLA Process at WAG 3, C: Release Site Groups at WAG 3, and D: Other Issues. Each of these major categories has subcategories for the specific comment topics. These subject categories and corresponding comments are presented below. For each comment, a response has been developed and is presented following the comment.

A. WAG 3 CLEANUP AND PUBLIC PARTICIPATION

A.1. Overall Goals and Structure of the INEEL ER Program

Comment 1: A concern was expressed that the Agencies are looking at the risks associated with leaving the identified sites in place or remediating them. but are not considering the other contaminated sites which are still at the INTEC and thus, not looking at the "whole" picture. [TW-W]

Response: We are looking at source areas on a case by case basis and extending from the individual unit to the OU and to the WAG 3 as a whole. The scope of the WAG 3. OU 3-13 is defined as the known or suspected release sites identified in the Federal Facility Agreement and Consent Order (FFA/CO) and supporting documents. Although we will be revisiting selected aspects of the WAG 3 investigation under the OU 3-14 RI/FS, our evaluation of source areas listed under the FFA/CO, did address the potential cumulative effects of each "source area" on INTEC as whole. Consideration of the ultimate fate and disposition of buildings and structures at INTEC is not part of the scope for OU 3-13, The Idaho High Level Waste and Facilities Disposition Environmental Impact Statement (Idaho HLW & FD EIS) is currently considering options for the disposition of INTEC facilities associated with the generation, treatment, or storage of high level waste (HLW). In addition, the Idaho HLW & FD EIS is also considering the other facilities at INTEC for their impact oil the cumulatve risk. With this in mind, the Idaho HLW & FD EIS should complement the WAG 3 RI FS in addressing the "whole picture." Refinements to the risk calculations will continue as sites are remediated and facilities and structure

closed. Other programs (e.g., Hazardous Waste Management Act [HWMA]. Governor's Agreement. [TAP]) oversee other elements of INEEL environmental management. Together, along with DOE-ID decontamination and dismantlement (D&D) planning, these programs should achieve a protective end state for the future.

Comment 2: A concern was expressed that the Agencies seem to lack of a comprehensive decision process. "Where will we be when we get there? What is this site going to be like when we're through cleaning up?" If it's leaving soil in place that you folks are proposing to put in an engineered landfill, and how do those two decisions relate? Down the road we are going to have a lot of bits and pieces? By the time of WAG 10 we will have made a lot of our commitments. There is no overall controlling philosophy for what is going on at the different WAGs. [BB-TI]

Response: The scope of the WAG 3, OU 3-13 is limited to known or suspected release sites identified in the FFA/ CO. The process followed is a consistent one, applied for all INEEL WAG decisions made to date. We do look at site-wide issues, but the hazards and potential hazards occur at the "source" level. Our decision process is based on identification and response to threats posed on a source-by-source basis. A case in point is the ICDF where we do attempt to look at the INEEL-wide needs through the creation of a site-wide CERCLA disposal facility. WAG 10 is intended to evaluate the cumulative impacts within the SRPA from the overlapping groundwater plumes as a result of INEEL activities and to make a final assessment of ecological risks and impacts. As such, decisions can be made at the individual WAGs and then be rolled into WAG 10 for analysis of cumulative risks. In addition, the remedial actions taken on the SRPA are intended to ensure the aquifer meets acceptable risk concentrations and drinking water maximum contaminant levels (MCLs) for future residents, and workers are protected from drinking water which exceeds MCLs, or risk-based concentrations. For the SFE-20 Tank System, complete removal, treatment, and disposal is the most cost effective and risk reducing option evaluated. As for the ultimate disposition of waste remaining in the INTEC Tank Farm tanks, the decision is expected to be made in the ROD for the Idaho HLW & FD EIS, and the HWMA closure process.

Comment 3 :A Commentor identified that as a visitor through the Chemical Processing Plant when under construction around 50 years ago, he was interested in the clean up process now going on. "It's too bad so many mistakes were made in past years. I think your recommendations are the best available. Please continue to protect the Snake River Aquifer from ANY serious contamination." [AT-W]

Response: We thank the Commentor for his thoughts on the cleanup of INTEC. One of the primary goals of the OU 3-13 project is to ensure the portion of the SRPA, a sole source aquifer, impacted by INTEC operations meets acceptable risk concentrations and drinking water MCLs for future residents, and workers are protected from drinking water that exceeds MCLs, or risk-based concentrations.

Comment 4 :A Commentor requested. "Simply get all the crap off of and out of the Aquifer! Please!" [PaR-W]

Response: We appreciate the comments and are committed to protecting potential future users of the SRPA from INEEL activities. One of the primary goals of the OU 3-13 project is to ensure the portion of' the SRPA, a sole source aquifer, impacted by INTEC operations meets acceptable risk concentrations and drinking water MCLs for future residents, and workers are protected from drinking water which exceeds MCLs, or risk-based concentrations.

Comment 5 :A concern was expressed to the Agencie of the importance of the SRPA, not only the economic value, but the related perceptual value. [SR-TB]

Response: Although the Commentor is correct in that perceptions were not formally analyzed in the RI FS evaluation, impacts from perception can be assessed through our Community involvement process. In addition to informal and formal public comment opportunities, an Idaho-Citizens Focus Group and the INEEL Citizens Advisory Board (CAB) both provided their input. Community input is an important factor in our decision process.

Comment 6: A concern was expressed that the Agencies' decisions about the Tank Farm were not made. These other decisions will limit the soil clean-up options as will the cleanup of dozens of buildings at the Chem Plant. The plan doesn't address how or when to decontaminate those buildings. We won't even know what waste will be allowed in the ICDF until after it's approved. "Where will we be when we get there? What will be left behind?" [PA-SRA-TB]

Response: The scope of the WAG 3, OU 3-13 is defined as the known or suspected release sites identified in the FFA/CO. In the case of the Tank Farm, the proposed interim action will not be inconsistent with the final action and will not limit the cleanup options. Consideration of the ultimate fate and disposition of buildings and structures at INTEC is not part of the scope for OU 3-13. The OU 3-13 ROD and Idaho HLW & FD EIS ROD will be linked together for the purpose of restoring the area of INTEC to an acceptable risk. The scope of the Idaho HLW & FD EIS does not cover facilities and structures outside of INTEC. Analysis and decisions on the non-INTEC facilities and structures will be covered in future documents. Also, although the D&D program is not part of OU 3-13, new sites can be added to the FFA/CO if found to present an unacceptable risk to human health and the environment.

In the case the ICDF, the waste acceptance criteria will be developed during the remedial design. Candidate materials for disposal in the repository were identified and evaluated (see Appendix C of the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL Part B, FS Supplement Report* (DOE/ID- 10619), which is contained in the Administrative Record). The waste acceptance criteria, developed in the remedial design, will limit the material acceptable for disposal such that the repository will not adversely impact the SRPA or surface receptors. Information concerning the schedules and approaches are contained in the INEEL 2006 Plan. Also, conceptual issues and approaches are contained in the DOE End State Planning document.

Comment 7: A concern was expressed that the Agencies adopt a site-wide policy that active radioactive disposal facilities overlying the SRPA are permanently closed during the initial 5-year period covered by the department's upcoming INEEL management and operation (M&O) contract. This policy direction should be prominently featured in the final Request for Proposals issued by the department. [HC-W]

Response: We believe the Commentor is referring to the existing on-site 1ow-level waste (LLW) disposal facility located at the Radioactive Waste Management Complex (RWMC), which is not part of the WAG 3 decision process. With regards to the new M&O contract, the Agencies are fully committed to environmentally sound management practices. Given the subject matter, this comment was also forward to the Source Evaluation Board working on the new M&O contract for consideration.

Comment 8: A Commentor was concerned that tremendous pressure would exist to bury other heterogeneous wastes at the new facility after it was built. The cumulative effect of these factors merits analysis. [L-W]

Response: Non-CERCLA wastes <u>will not</u> be placed within the ICDF and further, would be subject to state and federal permitting requirements outside the scope of this ROD. The waste acceptance criteria (WAC) for the ICDF will factor in the cumulative effects of the wastes that will be placed within the

landfill and establish limits to safeguard the aquifer. This approach is consistent with our method for determining if an unacceptable risk exists under our baseline risk assessment, in the RI/FS.

Comment 9: One Commentor recommended that we adopt a comprehensive, INEEL-wide policy of minimizing further burial of radioactive and mixed wastes over the SRPA, and pursue alternatives to the accelerated use and full utilization of remaining RWMC Subsurface Disposal Area burial capacity. [L-W]

Response: This comment relates to waste management practices at the INEEL and the future use of the RWMC. The proposed Plan and this ROD address the most cost-effective remedial action for past practice source areas at WAG 3. The ICDF will provide safe management for INEEL CERCLA waste. The RWMC also overlies the SRPA and is operated to dispose of low-level radioactive waste. The ICDF will accept soil and debris contaminated with both radionuclides and hazardous constituents. Disposal of the Toxic Substances Control Act (TSCA) and RCRA wastes require stringent engineering controls that the ICDF will incorporate.

Comment 10: A concern was expressed that the Agencies'plan on the Chem Plant cleanup seems fine in and of itself. The problems lie mainly in that it doesnt address the difficult cleanup problems, nor does there seem to be an overall view of what the final outcome for the whole site will be. For example, the tank farm and the soil under it are considered in the Environmental Impact Statement (EIS). This will be a daunting and expensive cleanup project. Will there be money for this project? Where and when does it fit in the final outcome— a clean INEEL? [DH-W]

Response: It is recognized that cleaning up will be a complex and difficult task. The Proposed Plan summarized the information contained in the Remedial Investigation/Baseline Risk Assessment (RI/BR.A) Report (DOE/ID-10534), Feasibility Study (FS) Report (DOE/ID-10572), and the Feasibility Study Supplement (FSS) Report (DOE/ID- 10619), which can be found in the Administrative Record. The final cleanup of INTEC will result in an acceptable risk (1 in 10,000 cumulative carcinogenic) for both the SRPA (also restored to safe drinking water standards) and surface receptors. The Idaho HLW & FD EIS will evaluate the treatment of the waste in the tanks and evaluate the disposition of facilities associated with the generation, treatment, storage, and disposal of HLW. Concerning the funding issue, sufficient funding will be requested from Congress to complete the cleanup activities. The decision to fund cleanup activities lies with Congress and the President. As facilities are closed and dispositioned, the impacts will be factored into the cumulative risk for INTEC. Waste Area Group 10 will evaluate the cumulative impacts to the SRPA from across the entire INEEL.

Comment 11: A concern was expressed to the Agencies that CERCLA requires 5-year reviews of decisions, even if they are not interim actions. How many such reviews are contemplated for each OU at the Chem Plant? [SRA-W]

Response: As long as a CERCLA area requires restricted or limited access or use to safeguard human health and the environment, reviews at least every 5 years are required. The entire area of INTEC (ICPP), covered by the scope of the ROD, would be included into a single periodic review. These 5-year reviews will apply to both access and use restrictions. In addition, these reviews will continue until the Agencies determine that they are no longer necessary.

Comment 12: A question was asked. "Are there individual facilities or OUs that are covered both by Resource Conservation and Recovery Act (RCRA) and by CERCLA? Will the CERCLA ROD incorporate RCRA concerns?" [SRA-W]

Response: The agencies are committed to minimizing, the duplication of work between the HWMA (i.e., RCRA) and (CERCLA) and CERCLA programs. Toward this end the FFA CO incorporates RCRA corrective action and

CERCLA remedial action under a single process. In addition, considering the general equivalency of the RCRA HWMA closure and post-closure process to the FFA/CO remedial actions, the Agencies will make every attempt to incorporate the monitoring and maintenance of closed units (e.g., Old Waste Calciner) under this action, if requested by the authorized program.

Comment 13 : A concern was expressed that at Page 49, 1st partial paragraph, of the Proposed Plan, hints that CERCLA may be a permanent program at the INEEL. "When does the FFA/CO end and the RCRA Corrective Action process begin? Routine operational releases should not be included as new sites under the FFA/ CO. They must be addressed through a spill cleanup, or if a SWMU, through RCRA Corrective Action. Once the RODs are written for OU3-14 and WAG 10, the CERCLA process at ICPP should be complete, except for the "5-year" reviews and ongoing remediation. There should be no "new sites" under CERCLA." [C-W]

Response: The CERCLA and RCRA corrective action at INEEL is an ongoing program. The program is responsible for assessing the risk from releases and potential releases of hazardous substances on the INEEL. Following assessment of this risk, the sites are restored to acceptable risk-based levels. Ongoing releases from RCRA/HWMA permitted operations are not addressed under the FFA/CO, but instead under the permit. Routine operational releases are not part of the FFA/CO. If the operational releases represent an unacceptable risk to human health and the environment, and are not under a RCRA/HWMA permit, additional actions under the FFA/ CO may be necessary and undertaken. When newly identified contaminated areas (release sites) are discovered, the information is compiled and placed into the system for consideration as a "New Site" under the FFA/CO.

Comment 14 : A request was made that the Agencies compare the "risk" posed by tank farm soil with the "risk" posed by pits and trenches. [SRA-W]

Response: Risks are compared against a national standard (the NCP) as to acceptable risk, 10E-4 to 10-E6 cumulative carcinogenic and a hazard index (HI) >1. If risks are found outside this range, remedial action is necessary. Comparing the risks from the INTEC Tank Farm soils against the waste in the pits and trenches at the RWMC, would identify that both areas are outside the acceptable risk range and require remedial action to be protective of human health and the environment.

A.1.1 Results/Outcomes of the ER Program

Comment 15 : A Commentor summarized the preferred alternatives for managing contaminated soils contained in the Proposed Plan. [SRA-W]

Response: The Commentor's summary was correct. Contaminated soil will be capped by this action, either within the ICDF, or under an existing building or contained in place.

Comment 16 : A concern was expressed to the Agencies that, when the INEEL "cleanup" is done, an enormous amount of nuclear contamination will remain above the Snake River Aquifer and we won't know the cumulative extent of the remaining peril until most of the predicted cleanup resources are gone. (SRA-W]

Response: The resources available to address nuclear contamination are indeed limited at INEEL and other federal facilities. However, we believe that the actions we have selected represent au appropriate balance between cost and effectiveness. One of our goals is to reduce the footprint of contaminated areas on INEEL we will need to restrict access to and monitor indefinitely. Another goal is to clean up the aquifer so that it is available to future generations.

Comment 17 : A concern was expressed that neither the tank farm nor the surrounding soil is covered in the current plan. Decisions about the waste tanks themselves have yet to be made; those decisions may limit the soil cleanup options. Further, there are dozens of buildings at the Chem Plant, and some are highly contaminated. The current plan doesn't address how or when to decontaminate those buildings. We won't even know what waste will be allowed in the ICDF until after it's approved. Many of the specific concerns grow out of the general lack of a clear end state or end time for Chem Plant operation. remediation, and closure. [SRA-W]

Response: The Commentor is correct that highly contaminated areas at INTEC are located within the Tank Farm area. The tanks and the waste in the tanks in the Tank Farm are being addressed under the Idaho HLW & FD EIS. Although the waste in the tanks is not covered in the Proposed Plan, the soils in the Tank Farm area are covered and are contained in Group 1 (Tank Farm Soils). We do not have a complete understanding of the threat posed to the underlying groundwater by the contaminated soil column at the Tank Farm. This is why we are implementing an interim action for the Tank Farm Soils. Concerning decisions made regarding the tanks and tank waste impacting the soils remediation, this is an issue that will be factored into the remedial action alternatives evaluation, in the OU 3-14 RI/FS. For the ICDF, the soils and debris that will be accepted will be limited to minimize the threat to the SRPA. Some soils and debris will likely require pretreatment prior to disposal in the repository or off-site disposal. At this time there is not an approved final end-state developed for INTEC.

Comment 18 : A concern was expressed on how much residual risk had been left site-wide after cleanup? What will be the cumulative risk left at the Chem Plant ? [SRA-W]

Response: Remediation under the CERCLA program is directed at restoring the environment to an acceptable risk level (10E-4 to 10E-6 cumulative carcinogenic). Cleanups that have occurred and will occur under this ROD are designed to reduce the risk from the 99 source areas to an acceptable level. Site-wide cumulative risk is being evaluated under WAG 10 for impacts on the ecological receptors and the SRPA from INEEL operations and activities.

Comment 19 : A request was made to describe how much nuclear waste from the Chem Plant cleanup will likely leave Idaho. [SRA-W]

Response: Both the transuranic (TRU) and HLW from INTEC cleanup under this ROD will be transported off-site for disposal. We do not estimate this to be a large volume. The wastes contained within the High Level Tanks and Calciner Bins are a subject of the Governor's Agreement and not addressed under this action.

Comment 20 : A Commentor exclaimed. "Cleanup this nuclear hazard ... Now! With most of Superfunds monies going to lawyers over litigation, it is no wonder that when all is said and done, there is more said than done! However, with two facts clear to anyone concerned about their quality of life in Idaho: i.e.. (1) 200 million dollars over budget on cleanup. (2) 26 months behind schedule on cleanup." [RK-W]

Response: The Agencies are committed to expeditious cleanup at INEEL. These cleanups are funded through agency (DOE) appropriations by Congress. Implementation of federal facility remedial actions, like that under the FFA CO, do not generally involve litigation. The remedial action that the Commentor is referring to, the Pit 9 project, has experienced difficulties with sub-contractors. Measures have been taken to address those problems and fulfill the requirements of this earlier ROD.

A.2. Public Participation and Community Relations

Comment 21 : A Commentor stated that providing drafts of proposed plans is a constructive process that extends the comment period beyond the traditional "decide, announce, defend" mode formerly used by DOE. [CB-W]

Response: The Agencies used a different approach for the development of the OU 3-13 Proposed Plan. The approach included using a focus group and the INEEL CAB for review and comment during the development of the OU 3-13 Proposed Plan.

Comment 22 : A Commentor appreciated the fact that we are spending so much time and energy going into the communities and appreciated the presentations as was clear, concise, speedy, and very understandable. [PA-SRA-TB]

Response: We thank the Commentor for the comment. A considerable amount of effort was expended to develop the presentations that would answer some of the questions the public would have on the information in the Proposed Plan.

Comment 23 : A Commentor thought that it's great that the Agencies went out and tried to spread to the public and get the public involved and let them know what's going on. [JJ-TM]

Response: We thank the Commentor for the comment. The Agencies are committed to informing the public on the risks and alternatives being considered to remediate the contamination areas.

Comment 24 : A Commentor requested an extension of the comment period. [HC-W]

Response: Due to the expected public interest in the Proposed Plan for the ICPP, we initially held a 30-day comment period with a 30-day extension which started October 23rd, 1998 ended December 22nd , 1998. The Commentor was unable to participate during the first extension and was very concerned that members of the public be given additional time to submit comments. Due to these unusual circumstances, we extended the comment period until February 12th, 1999.

Comment 25 : A Commentor requested that each participating agency carefully weigh the public's input before final remedy selection. [L-W]

Response: The Agencies have continued to support a strong public involvement process to include many briefings before the INEEL CAB, Community Focus Group and two 30-day extensions to the public comment period. Comments received from the community are evaluated and factored into the decision making (remedial alternative selection) through the modifying criteria of "community acceptances." In addition, the comments received along with responses are contained in this Responsiveness Summary, which is part of the ROD.

Comment 26 : A Commentor offered a comment based on professional experience observing the diminished influence of science in our society, public mistrust of government handling of radiation safety issues, and the in- formation revolution which has forever ended the days when programs such as this could be implemented with little public attention. It is essential that the Department work within the decision environment, and undertakes environmental restoration actions based on permanent solutions that will stand the tests of time and scrutiny. The Commentor believed that the proposed approach to SRPA protection fell short of this standard. [L-W]

Response: We recognize the importance of public participation and deliberate execution of well founded responses. Our decision environment is highly dependent on involvement by Stakeholders and the public.

The process followed is that established nationally for the cleanup of National Priorities List (NPL) sites and incorporates scientific and engineering services, compatible with the state of the practice. Our contingency action for the drinking water aquifer will assure that the aquifer is restored to drinking water standards and available for future generations.

Comment 27 : A Commentor felt that the Agencies are trying to approach and describe the problems presented by the pollution at the Chem Plant in a refreshingly real world fashion. [SRA-W]

Response: We thank the Commentor for their complement.

Comment 28 : A Commentor felt that the Agencies were opening a legal dump for plutonium and requested that an EIS scoping process be used to identify the total amount of plutonium being buried. [PR-TT]

Response: Evaluation of the ICDF was conducted as part of a CERCLA investigation and decision making process. It is the Agencies' position that CERCLA is functionally equivalent to the National Environmental Policy Act (NEPA) process. As such, no additional scoping or NEPA is required for the ICDF. Also, the ICDF would be restricted to the acceptance of waste with TRU-constituents at a total maximum concentration of <10 nCi/g.

Comment 29 : The INEEL CAB recommended that the Agencies more seriously consider comments submitted by the Board informally (not just fomal recommendations) and through discussions. [CAB-W]

Response: The Agencies regret that the INEEL CAB felt that its comments were not fully incorporated in the Proposed Plan. We believe that the issue related primarily to the identification of the specific location of the ICDF in the Proposed Plan. At the time of the public comment period, the Agencies had not completed a siting evaluation on the best location for the ICDF. We did suggest in the Proposed Plan that the location was in the vicinity of the existing Percolation Ponds within the area of contamination (AOC). We have only completed a portion of the siting evaluation, which is included in this ROD.

Comment30 : The INEEL CAB appreciated the opportunity to be involved in this document throughout its preparation. The Board, primarily through our High Level Waste Committee, was provided with ample information and with the opportunity to ask questions and make suggestions on the plan at various stages. This experience contrasted with the CAB's earlier experience evaluating other proposed plans. [CAB-W]

Response: We appreciate the comment. The approach to developing the Proposed Plan for OU 3-13 was different that used in developing previous Proposed Plan at the INEEL. In addition to working with the INEEL CAB, a citizen's focus group reviewed and commented on a draft version of the Proposed Plan. By working with both the INEEL CAB High-Level Waste Committee, issues were addressed prior to finalizing the Proposed Plan. We felt that this was helpful in taking a complex project, OU 3-13, and being able to present the information to the public in an understandable way.

Comment 31 : A Commentor thanked us for extending the comment period, and for releasing the plan for public comment. While efforts (as indicated below) at public relations have a long way to go, the effort made thus far is commendable. [U-W]

Response: We thank the Commentor. The comment period was extended to allow for additional public comment on the Proposed Plan. In addition to the Propoed Plan, meetings on the Proposed Plan were held in Idaho Falls, Twin Falls, Boise, and Moscow, Idaho to inform and received input from the public.

A.3. Content and Organization of the Proposed Plan

Comment 32 : A Commentor felt that a great deal of effort was made with this particular plan. I think it's one of the most clearly and easily read plans that I have had to tackle on my late night journeys through these documents. [PA-SRA-TB]

Response: We thank the Commentor for the comment. A considerable amount of effort was expended to try and summarize the information contained in the OU 3-13 RI/FS into summary discussions for the Proposed Plan, which were understandable. It appears that we were successful.

Comment 33 : A Commentor felt that the Proposed Plan was certainly an improvement over the draft plan, and thought that it pointed to the usefulness of including the public and the Stakeholders earlier in the process, so as to try to encourage ironing out problems prior to getting into a formal thing that gets out on the street, and by that time most everybody is kind of into a locked position of what they've decided, they present it, and then they defend it. [CB-TM]

Response: A different approach than used in the past was used for the development of the OU 3-13 Proposed Plan. The approach included using a focus group and the INEEL CAB for review and comment during the development of the OU 3-13 Proposed Plan.

Comment 34 : A Commentor felt that the document did not give basic information that a member of the public could use to make an informed decision about whether the Agencies were really addressing the problem. [CB-TM]

Response: The Proposed Plan is only a summary document on the information contained in the RI/BRA, FS, and FS Supplemental Reports. The detailed information on the contaminant concentrations, risks, and alternative evaluations is contained in these documents. Additional information for the release sites at INTEC is contained in the Track 1 and Track 2 documents. All of these documents are contained in the Administrative Record.

Comment 35 : A Commentor recommended listing and definitions of acronyms used in the Plan. [C21-W]

Response: We are sorry for the confusion concerning acronyms and definitions. Many of the acronyms and concepts in the Proposed Plan were discussed in the sidebars of the document. Documents in the future may include a table showing the acronyms along with complete words. In addition, the concepts will continue to be discussed in either a table or sidebars.

Comment 36 : A Commentor recommended providing a list of key references. [C21 -W]

Response: The key references for the OU 3-13 Proposed Plan were included in the text on Page 2, Paragraph 4. In the future, more attention will be given to pointing the readers to where additional information can be found, either by highlighting or a table.

Comment 37 : A Commentor recommended the addition of a simplified method for enabling the readers to understand the relationships between "group numbers." "operable units," and "CPP numbers" as used throughout the Plan. [C21-W]

Response: We agree with the Commentor. The use of the group numbers, OUs, and CPP numbers was confusing. With the development of the FFA CO. WAG 3. INTEC was divided into individual release

sites. These release sites were assigned the CPP numbers. The release sites were then grouped into OU numbers based on type of release, location of release, and other criteria. The OU and CPP numbers were used in assessing the risk individually and as a whole for WAG 3. As a result of the risk assessment, not all release sites presented an unacceptable risk and were eliminated from further consideration. In developing the FS, the unacceptable risk release sites were grouped by the expected remedial actions into the group numbers. This was done to simplify and reduce the number of sites being discussed. In the future, a better attempt will be made to simplify and explain the release sites within a WAG.

Comment 39 : As a member of the focus group that helped INEEL devise a "publicly readable" document, a Commentor appreciated the time and effort that had gone into the Proposed Plan. It was indeed readable, "user friendly," and visually, the best WAG Cleanup Plan I've yet seen. However, the contents of the plan left the reader with feelings of uncertainty, of reading a plan published in a hurry without enough solid science and technology to back up the plan, and without a clear definition of what cleanup really means. [MS-W-W]

Response: We are sorry that the Commentor was left with the feeling that the Proposed Plan was inadequate. The Proposed Plan was a summary of the information in the RI/FS for OU 3-13. There is a balance between detailed and summary information in order to produce a Proposed Plan that presents sufficient information without being excessively lengthy and complex. We will endeavor, in future Proposed Plans to reduce the uncertainty for the reader while remaining user friendly.

Comment 39 : A Commentor felt that we'd know more if contaminants of concern (COCs) were listed by level of concern rather than more or less alphabetically. Attaching half-lives (when applicable) would be appropriate. As it is, it's difficult to see whether 2095 has anything other than an administrative value. [SRA-W]

Response: A list of COCs has been included in this ROD showing how the contaminants rank from a level of concern. In addition, the half-lives, where applicable, of the various COCs are presented in the ROD. The use of the year 2095 relates primarily to what the Agencies believe to be a reasonable time frame that governmental ownership of the land will remain. Beyond this time it is difficult to predict what land use pressure may exist and unless there are other factors to consider, we assume that residential use is a reasonable scenario unless other extenuating, circumstances exist.

Comment 40 : A Commentor found no complete discussion of the ICDF and wanted a more complete discussion on the ICDF. Included should be: details of construction; where waste would come from; how much waste; and how much of the cost would be assigned to WAG 3. [C21-W]

Response: Only a summary level discussion of the ICDF was contained in the Proposed Plan. For evaluation purposes in the FS and Feasibility Study Supplement (FSS) Reports, a conceptual remedial alternative concerning on-site disposal was developed. This conceptual alternative was evaluated for risk (surface and groundwater) impacts along vith other criteria including cost. Additional details concerning construction, wastes, and cost of the ICDF is contained in the ROD. More discussion on the design parameters are found in this ROD. The actual design and construction details of the ICDF will be developed in the remedial design. Information on the candidate wastes and volumes can be found in Appendix C of the FSS Report. Concerning the ICDF costs assigned to WAG 3, the bottom of Table 11 (page 48) of the Proposed Plan presented both the total cost (all WAGs) and the cost for WAG 3 only.

Comment 41 : A Commentor felt that at Page 12. Table 1. of the Proposed Plan, the values given appeared to be the predicted peak aquifer concentrations for the year 2095, not the year 2095 and beyond. With the exception of I-129, all the values are inconsistent with the values given in the RI report.[JM-W]

Response: We assume the Commentor was referring to Page 18. Table 1. The concentrations shown are for year 2095 and not as stated in the Proposed Plan (2095 and beyond). These concentrations were presented and used for the evaluation of cleanup criteria (MCLs and risks). In addition, some of the values presented in the Proposed Plan are less than presented in the RI/BRA Report. For the RI/BRA, the values that were presented were the maximum contaminant concentrations at various time intervals without respect to spatial locations. This resulted in contaminants from multiple locations to be added together, resulting in over prediction of impacts.

Comment 42 : A Commentor questioned why the term "mostly" was used at Page 36, Snake River Plain, and 1st paragraph. "The COCs are mostly radionuclides and mercury." What other contaminants were of concern ? [C-W]

Response: We are sorry that this is confusing in the Proposed Plan. The correct list of COCs for the SRPA are radionuclides and mercury. Other contaminants like Chromium listed on Page 15 is a result of evaluating the cumulative impacts on the SRPA from both INTEC (ICPP) and the Test Reactor Area (TRA).

Comment 43 : A Commentor questioned how, as stated at Page 36 of the Proposed Plan, additional monitoring can limit exposure? [C-W]

Response: We are sorry for the confusion. Monitoring of the groundwater does not limit exposure. Additional institutional controls will be used to control the usage of the contaminated groundwater and thus, limit exposure. Monitoring only provides a measure of contaminant levels.

Comment 44 : A Commentor was not clear on the difference between costs projected in Net Present Value versus "97$"s. [TW-W]

Response: Net Present Value (NPV) estimates are calculations of the costs taking into account the amount of money necessary today to pay for the project over the lifetime of the project when considering the expected inflationary factors. The total shown in "97$"s is the estimated cost prior to NPV calculation and is presented to provide an estimate of what the costs would be to DOE future budgets, assuming that the project is completed within a one year implementation timeframe. The use of NPV comes from the NCP and is used to provide a consistent and comparable basis used in cost estimating for decision-making purposes across the United States. For the NPV cost estimates presented, a timeframe of 100 years was used in the calculations.

Comment 45 : The INEEL CAB recommended the use of simplified formats and nomenclature in future Proposed Plans. [CAB-W]

Response: We agree that information presented to the public should be understandable and presented in a logical manner. The information on remediation of INTEC (ICPP) is complex, interrelated, and , subject to interpretation. The OU 3-13 Proposed Plan presented information contained in the RI/BRA, FS, and FSS Reports. This information was Summarized during the development of the Proposed Plan. For future projects, that are not as complex, a simplified format and nomenclature could be for the Proposed Plan.

Comment 46 : A Commentor recommended that the Agencies use the format employed in the Proposed Plan for WAG 1. [CAB-W]

Response: The Proposed Plan mentioned in the comment was developed after the OU 3-13 Proposed Plan and the amount of information contained and presented in the OU 3-13 Proposed Plan was considerably more than that contained in the WAG 1 Proposed Plan. Converting the OU 3-13 Proposed Plan to the format used for WAG 1 would have resulted in a much longer Proposed Plan. We agree that for simpler projects, the WAG 1 format should be used.

Comment 47 : A Commentor recommended the addition of graphics or maps to enhance the reader's ability to understand the terms used in the Proposed Plan [CAB-W]

Response: We recognize the confusion resulting from the use of the group numbers. OUs, and CPP numbers throughout the Proposed Plan. In the FFA/CO, INTEC (WAG 3) was divided into 13 OUs. Within each of these OUs, a number of release sites were listed using the CPP numbers. For the risk assessment conducted at INTEC, the RI/BRA Report and scoping investigations (Track 1 and 2 investigations), the release sites were evaluated on an individual basis (site by site using the CPP numbering system). At the conclusion of the RI/BRA, many release sites were found to present an acceptable risk and were not carried forward for remedial action under the FS Report. With the reduced number of sites for the FS, the group numbers were developed based on expected remedial actions, geographic location, and other factors.

Comment 48 : The INEEL CAB recommended that DOE-ID embrace Secretary Richardson's recent suggestion to communicate with "plain language." [CAB-W]

Response: We thank the CAB for their comment. INEEL Proposed Plans and Fact Sheets are generally written to be understandable by the general public. We recognize this as a continuing responsibility.

Comment 49 : A Commentor noted that the discussion of average flow rates in the SRPA could easily result in a conclusion that the contaminant plume is moving at the same linear rate as the water. Plain language would enhance the public's ability to more fully understand the issues that challenge the agency. [CAB-W]

Response: For certain contaminants like tritium (H-3), the movement of the contaminant is at the speed of groundwater. This is because the contaminant does not adsorb to the solid media (basalt) while moving with the ground. Other contaminants like Sr-90 adsorb and desorb as the groundwater move through the area. This results in the leading edge of a contamination plume moving the groundwater. However, the concentrations at the leading edge are not necessarily at a concentration presenting a risk. It is recognized that this is a difficult topic to describe at a summary level.

Comment 50 : A Commentor questioned why the term Contaminants of Concern didn't seem to be carefully followed throughout the Proposed Plan. [U-W]

Response: The COCs for each of the groups are presented for the entire group. Within the various remediation groups, the COCs are dependent upon the location of contamination within the group. In the case of Group 5, the COCs outside of the INTEC fence are a subset of the entire set of COCs. Remedial actions will be undertaken to deal with the COCs at the spatial location of the remediation. As the remediation for group 5 under this ROD is dealing with outside of the INTEC fence, the two COCs are I-129 and Sr-90. Both of these contaminants will be considered in the remedial design and remedial action activities.

Comment 51 : A Commentor questioned the use of OUs. Group numbers, and CPP numbers simultaneously as it was extremely confusing. [U-W]

Response: The use of group numbers, OUs, and CPP numbers was confusing. In the FFA CO, the release sites are referred to by both OU numbers and release site numbers. For evaluation in the RI/BRA, risks at individual release sites were evaluated. In the FS, the sites presenting unacceptable risks were grouped together into the remedial action groups.

Comment 52 : A Commentor questioned the use of techno-babble, in a plan presented to the Public. [U-W]

Response: In the Agencies'opinion, considerable effort was expended in writing the Proposed Plan with a minimum amount of technical jargon for this very complex remediation project.

Comment 53 : A Commentor questioned the frequent bad grammar, punctuation, and so forth as abundant evidence that the INEEL either didnt care to hire a technical editor, or didnt bother letting the editor complete the job. [U-W]

Response: In trying to simplify a very complex project into understandable and summary information, some concepts may not have been fully or completely explained. The Agencies did employ professional technical editing and a public focus group in its development of the Proposed Plan.

Comment 54 : A Commentor suggested Proposed Plans and other public documents be carefully edited for clarity, accuracy, and conciseness, the readers are far less likely become so immediately exasperated that they scrutinize every part of the presentation to pounce on every possible problem. [UW]

Response: We are sorry for the difficulty the Commentor had with understanding the plan. WAG 3 is a very complex site. Great effort was made to simplify and summarize highly technical concepts in layperson terms. Since the readership of the Proposed Plan has a wide range of backgrounds, the tradeoffs between too much information, versus too little detail, makes meeting the needs of all readers quite challenging. The science and analysis backing up the plan are the best available. The Proposed Plan, which is a summary document of the information in the RI/FS, presented a very complex project in a simplified and straightforward manner.

Comment 55 : A Commentor stated that in the Evaluation of Site Risks section of the Proposed Plan, the entire the entire section was very unclear. [U-W]

Response: The Proposed Plan is a summary of the information contained in the RI/FS along with recommendations concerning selection of remedial action alternatives (preferred alternatives). The Proposed Plan summarized the information and referred the reader back to the RI/BRA for additional information, if necessary, for the risk assessment. Without summarizing and referencing the RI/BRA, the evaluation of Site Risk section would have been considerably longer without presenting additional summary information.

Comment 56 : A Commentor asked why at Figure 9, page 13, of the Proposed Plan, didnt we label the injection well and the ICPP main stack ? [UW]

Response: We recognize that additional labeling (injection well and main INTEC stack) could have been added to the graphic. However, this graphic was intended to present in a simplified manner, the various pathways for exposure that exist at INTEC. Unfortunately, the Agencies believed that a simplified profile of the INTEC with the stack depicted was self-explanatory.

Comment 57 : A Commentor stated that the conceptual model graphic is lovely, and except for the incomplete labeling and too-small size, very informative. [U-W]

Response: We feel that the graphic presented a good conceptual representation of how the various exposure pathways are related to the contamination in the surface soils, perched water, contaminated groundwater. In addition the graphic presented a depiction of how the contamination can migrate.

Comment 58 : A Commentor stated, "Page 48, Table 11. The first heading is "Soil Group." That is wrong. The first group reads "Tank Farm." That is wrong. Under recommended alternatives, listing any for Group 1 is misleading. Only an interim action is described in the text. Under recommended alternatives, listing number 2 for Group 2 is misleading. The text indicates that Alternative 2 OR Alternative 3 may be selected, depending on discoveries made during D&D." [U-W]

Response: The Commentor is correct. "Soil Group" is a misleading heading. "Remedial Action Group" would have been a more accurate and clearer heading. However, the Tank Farm Soils (Group 1) are included within this ROD as a remedial action group. For Group 2, the selected remedy (recommended in the Proposed Plan) is Alternative 2. Alternative 3 for Group 2 would only be implemented if D&D removes the structure.

A.4. Current and Future Activities at INTEC

Comment 59 : A Commentor stated that it was extremely unlikely that the INTEC would ever become a residential area, if only due to the lack of water and the location. This was an assumption which is too conservative and which drives the conclusions to expensive alternatives. [TW-W]

Response: The use of the 100-year future residential scenario serves as our point of departure for making risk-based decisions that will affect the future use of the land for many generations. Beyond 100 years, it is difficult to predict what land use pressure may exist. Unless other extenuating circumstances exist (e.g., proximity to closed facilities requiring perpetual care) the assumption of future residential use provides a level of cleanup that assures the remedy will remain protective.

Comment 60 : A Commentor stated that "Institutional memory is short and if the past is any guide, people in the future may use contaminated resources for some time and make investments before they discover the contamination. They will then be faced with wrenching decisions of whether to abandon their investments or live with what would normally be unacceptable risk or pursue remediation that, in many cases, may be far more costly than the original remediation and waste management solutions." [BB-TI]

Response: As part of the implementation of the alternatives in the OU 3-13 ROD, a commitment is made to develop an "Institutional Control (IC) Plan." The approach to institutional controls for each Group is discussed in Section 11 of the ROD. The IC Plan will be developed during remedial action activities. This IC Plan will discuss the contaminated areas and the controls and periodic evaluations that will be placed on the areas over the long-term. In addition, the IC Plan discusses what will be required to release the areas for future developments or uses. This should minimize the impacts to future investments concerning the use of various areas.

Comment 61 : A commentor stated their personal concern about the percolation ponds and about the use of the millions of gallons of water that are, basically, sucked up out of the aquifer, dispersed through this DOE facility and then dropped back down into the aquifer, pushing contaminants along. The Commentor believed that until Cleanup was accomplished in a satisfactory way, DOE should not begin

another mission of any great extent at INEEL, particularly if it used the natural resources of water or the natural resources that are involved in generating electricity for these enterprises. [PA-TB)

Response: We share the Commentor's concern regarding the percolation ponds and their affect on the migration of contaminants based on their present location. This is why this action will require the shutdown of the ponds at their current location and care will be taken to eliminate future contaminant loadings to the aquifer.

Comment 62 : A Commentor stated concerns about the ongoing work of the plant after the cleanup and continued waste being put into the environment and aquifers. [JJ-TM]

Response: The ICDF will be used to contain and control waste from impacting the SRPA and surface receptors from many of the identified release sites. In addition, actions are planned to ensure that portion of the SRPA, a sole source aquifer, impacted by INTEC operations meets acceptable risk concentrations and drinking water MCLs for future users.

Comment 63 : A Commentor questioned what operations will occur at the ICPP in the future, specifcally concerning uses for [CPP 691? [SRA-W]

Response: As the HLW at INTEC is required to be "road ready" by 2035, it was assumed that all treatment of the HLW was completed by 2035. Most of the operations planned at INTEC prior to 2095 will deal with the treatment of both the liquid waste in the Tank Farm and the waste in the calcine bins. In addition, activities dealing with spent nuclear fuel will occur until 2035. A period of 10 years was assumed to be needed for the disposition of the necessary INTEC facilities, which results in the year 2045. Depending on the decisions made for the Idaho HLW & FD EIS, the timeframes for the disposition of INTEC facilities could change. Currently, there is not a mission for the CPP-691 Facility. However, future activities at INTEC will consider the use of CPP-691 to accomplish the future activity in the decision.

Comment 64 : A Commentor questioned. "Where are we when we get there?" [MMS-TT]

Response: The Commentor is correct in that contaminated soils will be left behind at INTEC following the completion of cleanup activities. However, completion of the cleanup activities will result in the consolidation of contaminated soils restoring many existing contaminated areas to an acceptable risk level for both short-term and long-term impacts.

Comment 65 : A Commentor questioned why the use of the year 2095, and the 100 years figure. Where do these numbers come from ? What are their significance? The Commentor noted that 100 years from now is 2099, not 2095. [U-W]

Response: The year 2095 and 100 years numbers are derived from the *Long-Term Land Use Future Scenarios for the Idaho National Engineering Laboratory*. In this future land use document, the area of INTEC was assumed to remain under federal control until 2095. Beyond 2095 the future land use document does not define the future land use at INTEC. Based on this future land use document, remediation of the INTEC area needs to be completed by 2095.

Comment 66 : A Commentor questioned what is the actual basis for the future resident evaluation. Which assumes that people will be clamoring to build houses out here in 100 years ? The Commentor further asked if the Agencies could produce regional economic forecasts, local County city real estate

association formulations, demonstrations, surveys, or plans that clearly document that such an interest and or need exists ? [U-W]

Response: In developing the Long-Term Land use Future Scenarios for the Idaho National Engineering Laboratory document with various interested parties and groups, no consensus could be reached concerning the use of the INEEL beyond 2095. Based on this, risk assessment scenarios (current and 100 year future occupational along with 100-year future residential) were developed. These land use scenarios were used in the baseline risk assessment. This does not mean that INTEC will be used starting 2095 for future residential development, but these are reasonably conservative assumptions to ensure that the remedial action is protective to future generations.

Comment 67 : A Commentor questioned that if no evidence exists to forecast a land scarcity so pressing as to require use of current INEEL areas for future suburbs, it seems that institutional controls would be much, much cheaper and far, far more realistic than removal. [U-W]

Response: The use of the 100-year future residential scenario serves as our point of departure for making risk-based decisions that will affect the future use of the land for many generations. Beyond 100 years, it is difficult to predict what land use pressure may exist. Unless other extenuating circumstances exist (e.g., proximity to closed facilities requiring perpetual care) the assumption of future residential use provides a level of cleanup that assures the remedy will remain protective.

A.5. WAG 3 Remediation Planning and Costs

Comment 68 : Commentor recommended that a cost comparison be done between a Plan, based on a high radiation dose and current Plan. "The public should be informed of the cost differential. If the public is informed of the cost associated with little or no risk benefit, we do not believe they would approve the expenditure of millions of dollars on radiation protection that provides no measurable benefit." [C21 -W]

Response: For sites listed on the NPL, cleanup must proceed to achieve an acceptable risk range listed in the NCP. Comparing the cleanup cost of a non-protective cleanup versus a protective cleanup is inappropriate. Only protective Alternatives are evaluated which meet this goal and the most cost effective alternative selected. While there is some controversy over what constitutes an acceptable radiation risk, our best evidence supports the current approach of the linear no-threshold theory. This forms the basis for the protective levels established to protect our air and drinking water and is nationally accepted. As part of our 5-year review process. we will periodically review the protectiveness of our decisions and adjust to any updates in published protectiveness of our decisions and adjust to any updates in published protectivness levels.

Comment 69 : A Commentor questioned why the Plan does not mention the fate of "IDW" still present at ICPP. [C-W]

Response: The Commentor is correct. A small amount of investigation derived waste (IDW) is remaining at INTEC. A section was added to this ROD to address the disposition of the existing IDW. The new section in the ROD also discusses the disposition of IDW that will be generated under the OU 3-14 RI FS.

Comment 70 : A Commentor stated that the O&M costs for leaving VES-SFE-20 in place will not be increased significantly due to the fact that is adjacent to CPP-603. Although it is shown to be a significant cost over time, it will not be significant since it will not be done in conjunction with CPP-603 surveillance costs. [TW-W]

Response: The evaluation under OU 3- 13 is of past practice sites (e.g., spills and abandoned sites). Other programs are currently operating and closing facilities to ensure that the public and environment are protected. The closure of CPP-603 is outside the scope of this action and therefore, the costs projected for VES-SFE-20 do not assume potential cost savings that may be realized.

Comment 71 : The Commentor asked about the remediation of Group 7 being completed well before any substantive action is taken oil the main Tank Farm? [DK-TT]

Response: The Commentor is correct. The major portion of the remediation for the INTEC Tank Farm occur after 2008. Remedlation of the Group 7 SFE-20 Hot Waste Tank System will be completed will before the HLW tank at the Tank Farm.

Comment 72 : A Commentor stated "quit talking about nuclear waste clean up at INEEL and do it!" [RK-W]

Response: The CERCLA process at the INEEL is a carefully engineered and structured program that leads to specified cleanup and risk reductions. The process consists of: (1) evaluation of risks, (2) evaluation of response actions to reduce risk to acceptable levels, (3) selection of the response action, including public input on the selection process, and (4) implementation of the response action. This ROD has selected the response action to be implemented for the various contaminated areas at INTEC. Implementation of the various response actions will begin following approval (signature) of this ROD.

Comment 73 : A concern was expressed that "cleanup is being planned out of context with the previous operations. Although it is appropriate to indicate that the old mission of chemical processing in ICPP has forever ceased, it is dangerous to forget what went on there-the source of the waste and contamination. We have learned through involvement with other organizations and operations at other DOE sites that the cleanup of nuclear materials processing facilities requires careful planning, based on a detailed technical understanding of the conditions at the facility. For example the stabilization and cleanup of the PUREX and B-plant at Hanford (WA) was based on significant detailed knowledge of the operations of the facilities. The public had information on historic air emissions (including the Green Run), throughput of spent fuel and output of plutonium and uranium (including but not limited to HEU) and HLW. This information was useful for providing certain specific technical information useful in planning the cleanup, as well as providing a general sense (with factual support) of the operations leading to the existing problems (recent or historic, batch/campaign or steady state, etc.)." [SRA2-W]

Response: We understand the Commentor's concern with using appropriate information in the planning of cleanup activities. Cleanup operations are planned using the available information including information from previous operations. It is not necessary to know every operation that was conducted at a release site to plan the cleanup activities. Appropriate summary information is sufficient for planning purposes. During the implementation of remedial actions, planning includes actions to deal with the uncertainties. General information as to activities conducted at INTEC are discussed in Section 1 of the RI BRA Report. This Information discusses the major activities and facilities at INTEC. Discussion on the sources of contamination are discussed in the Sections 8 through 26 of the RI/BRA Report. Additional information is contained in the various Track 1 and Track 2 documents. The planning of remedial action is based oil the best available information. Information on historic air emissions can be found in the various monitoring report published at the INEEL.

B. THE CERCLA PROCESS AT WAG 3

Comment 74 : A Commentor felt that at Page 20, Alternative Development, 1st paragraph, if actual technologies are modified after the ROD during remedial design, those modifications must be examined to see if thev require an ESD or ROD amendment as described in CERCLA guidance on preparing CERCLA Decision documents. The Public has reviewed and commented on the Plan. Significant modifications after the ROD would diminish, or negate, the public participation process. [C-W]

Response: The Commentor is correct. If the alternative is modified or changed following the approval of the ROD, an Explanation of Significant Difference (ESD) or ROD Amendment would be required. Whether an ESD or ROD Amendment would be required depends to the significance of the change. Representative technologies were evaluated in the FS and FSS Reports and then discussed in the Proposed Plan. Some changes to the alternatives were made following the Proposed Plan and subsequent public comment. These changes are discussed in the Section 13 (Documentation of Significant Changes) of this ROD. If it was determined that an ESD was the appropriate level of change to documentation, the ESD would be developed along with a fact sheet to inform the public of the changes. For a significant enough change, a ROD Amendment would be developed along with a Proposed Plan and subsequent public comment period to inform the public of the changes. Neither of these types of changes to the ROD would diminish nor negate public participation.

B. 1. The Comprehensive RI/FS

Comment 75 : A Commentor stated that the Natural Resources Defense Council petition to Nuclear Regulatory Commission July 28,1998 that legally challenges DOE's attempt to change HLW to "incidental" LLW should be reviewed and considered. [CB-W]

Response: Tank Farm source areas are identified with spills of HLW and Sodium Bearing Waste (SBW). However, we are not excavating Tank Farm contaminated soils under this action. There is no need to refine our definitions at this time. Under the Tank Farm RI/FS, the issue of waste classification will be further evaluated. Decisions concerning the waste classification may also be made under the Idaho HLW & FD EIS ROD.

Comment 76 : A Commentor felt that there is information in the WAG 3 RI/BRA document to indicate that there is no provable impact on the perched water from the percolation pond discharges. In fact, the data suggests there is no impact. This information is successfully buried in the 800 or so pages of the document. In addition, the model created for that study has not been field calibrated, regardless of what the author says. It should be done, verified, and peer reviewed before we spend anymore $$$$ to recycle or build new percolation ponds.

The Commentor also strongly recommend that additional evaluations be done (i.e.. tracers put in the ponds and looked for in tank farm wells, increased sampling, of tank farm wells to verify a chemical connection). To put it bluntly, there are many within the company who recognize this issue and have questioned the players with no logical resolution. [SA-W]

Response: Approximately 70% of the infiltrating water, which contribute to the observed perched water, is from Percolation Pond discharges. The model used for the simulation was calibrated, based on observed field data (e.g., water elevations, chloride, and Sr-90). It is the best information currently available on which to make it reasonably conservative judgement. We believe that our decision process is consistent national and state guidance. Given the overall uncertainty in transport mechanism at the INTEC facility and the fact that we control the anthropogenic water, it has been determined that

moving, the percolation ponds is certainly"best management" practice. Our position is supported not only by the public, but was supported by an external peer review of the vadose zone program at the INEEL.

Concerning additional work at the Tank Farm, we are in the process of developing a Work Plan for conducting additional studies to better assess fate and transport questions for contaminants at the Tank Farm soils. This investigation will focus on obtaining data to quantify the overall uncertainty in model predictions, concerning Tank Farm soils. Also, we will obtain necessary data required for the purposes of calibrating the transport model in terms of concentrations as the existing model was calibrated to perched water elevations. This additional characterization may use tracers, if appropriate, to help quantify the migration paths of subsurface solutes. In addition, we will monitor vadose zone state variables to determine in-situ moisture flux and direction. However, even these studies will not answer the entire uncertainty issue at the INTEC facility because of the temporal variability in recharge from natural sources such as underflow, overland flows, rain, snow, and snow-melt.

Comment 77 : A Commentor inquired about the transport assumptions for the vadose zone that were used in the evaluations and modeling. [SRA-W]

Response: In conducting the computer modeling for the vadose zone, a number of assumptions were used. The retardation coefficients for the various contaminants were based on default values that have been used for other INEEL evaluations. The vadose zone was assumed to be a homogeneous material with the surface soils, basalt layers, and major interbeds contained within the vertical column. Average (non-varying) properties were used throughout the horizontal and vertical dimensions for the various materials in the vadose zone. Known sources of water, both manmade and natural were also considered in the modeling. A summary discussion of the baseline risk assessment modeling is contained in Section 6 of the RI/BRA Report. The detailed discussion, including modeling parameters and assumptions, for the baseline risk assessment is contained in Appendix F of the RI/BRA Report. The modeling in support of the FS and FSS Reports are contained in Appendix B of each document. The modeling used in the FS and FSS Reports used the same assumptions and approach as used in the RI/BRA Report.

Comment 78 : A Commentor felt that in order to understand the full range of cleanup issues at the Chem Plant, the department should provide a detailed historic description of the operations conducted at the Chem Plant. [SRA2-W]

Response: A summary of the operations and activities conducted at INTEC was presented in Section 1 of the RI/BRA Report, which is part of the Administrative Record. This summary information discuss the major activities and operations that were conducted at INTEC. In addition, several of the major facilities were described in this section. For CERCLA investigation and evaluation purposes, this summary level of information was sufficient to conduct evaluations and make decisions.

B.1.1 General Comments on the RI/FS

Comment 79 : A Commentor stated that the entire cleanup plan reeks of "cart before the horse" and that the cleanup plan doesn't appear to be very technically thought out. [MMS-WW]

Response: The Proposed Plan is a summary of the various remedial investigations and feasibility studies conducted for INTEC. In the evaluation of both risk and remedial alternatives, the information that has collected from the Track 1, Track 2, and OU 3-13 remedial investigation were utilized. Although this information is not perfect, there was sufficient information to conduct the risk evaluations and evaluate remedial action alternatives. As INTEC will continue to operate for many years prior to final closure, remedial alternatives were developed and considered this issue during the evaluations. Most of the relevant information and evaluations can be found in the RI BRA, FS, and FSS Reports. Additional

information for the release sites at INTEC (ICPP) is contained in the Track 1 and Track 2 documents. All of these documents are contained in the Administrative Record.

Comment 80 : A Commentor referred to Page 16. SFE-20, 1st paragraph in asking that an identification of whether the waste in the tank is a RCRA listed or characteristic waste be provided. The Commentor felt that if the characterization of the waste is not known, a more through investigation should be preformed. The Commentor also stated that "the 1984 investigation was not a CERCLA preliminary investigation" and "don't characterize it as such." The Commentor also requested that statements be made concerning whether the vault has leaked and that the site be removed from the Proposed Plan until further characterized. [C-W]

Response: The waste in the SFE-20 Tank is not suspected of having listed waste. There may be contaminants in the tank waste that have sufficient concentrations for the waste in the tank to be classified as RCRA characteristic. Further, detailed, characterization of the tank contents is the first activity in the selected remedy (Alternative 4: Removal, Treatment, and Disposal). We agree that the 1984 investigation was not a CERCLA activity. However, data from non-CERCLA investigations is routinely used in the INEEL CERCLA risk assessment and alternative evaluation activities. During the 1984 investigation, there was evidence that water had infiltrated into the vault, which shows that water leaked into the vault and could leak out of the vault. Based on the available information and analysis conducted, there is sufficient information to select a remedy for this site.

Comment 81 : A Commentor referred to Page 37, Alternative 2B, 2nd paragraph concerning the sampling location in the aquifer for the quarterly samples and whether the samples would be diluted with less-contaminated portions of the aquifer above or below that which bears the highest I-129 concentrations. The Commentor stated a fear that the Agencies would take their samples, declare that action levels are met, due to dilution, and then decide that remedial action is not required. The Commentor also wanted to know when the investigation and evaluations would be completed on the aquifer. The Commentor requested that this OU be removed from the ROD pending further investigation and evaluation. [C-W]

Response: We disagree with the Commentor. During construction of the monitoring wells, samples will be collected and analyzed from various zones within the aquifer to determine the zone or zones with highest concentrations. Monitoring would continue in the zone or zones with the highest concentrations, which can yield water at a rate of at least 0.5 gpm. An adequate and complete RI/FS was conducted for OU 3-13. The OU 3-13 RI/FS is sufficient to make decisions concerning the contaminated portion of the SRPA outside of the INTEC fenceline. The active remediation portion of the selected remedy (Alternative 2B: Institutional Controls with Monitoring and Contingent Remediation) is only implemented depending on the monitoring results obtained. A Final interim action on the INTEC groundwater plume in the SRPA outside of the INTEC fenceline is included in this ROD. The final action on the INTEC groundwater plume inside the INTEC fenceline will be selected under OU 3-14.

Comment 82 : A Commentor stated that "Based on the comparisons given in Appendix F of the RI report the perched water Sr-90 concentrations are over predicted (by the computer model) by factors of 10,000 to 100,000 (it is difficult to tell for sure with the huge log scale used). In addition, the predictions show plutonium concentrations of hundreds of pCi/L in the perched water. This is not supported by the perched water data. Based on these predictions, there Is huge uncertainty in the models predicted Sr-90 or plutonium concentrations in the aquifer. Any decisions made based on these predictions are being made under essentially unbounded uncertainty." [JM-W]

Response: For certain perched water wells away from major source terms, large over-predictions in the concentrations for contaminants occur. However, near large source term, Sr-90 concentration

predictions are within a factor of 10. It is recognized that plutonium is over-predicted based on the available sampling data. Plutonium mobility is one of the major issues to be resolved under the Tank Farm RI/FS (OU 3-14). Predicted concentrations of Sr-90 in the SRPA match the measured concentrations within reasonable limits. Under OU 3-13, an interim action is being, undertaken on the SRPA area outside of the INTEC fenceline, with the final action to occur under OU 3-14. Operable Unit 3-14 may attempt to quantify the uncertainty in the modeled concentrations.

Comment 83 : A Commentor stated that "As shown in the vadose zone model transport calibration and Sr-90 predictions, contaminants are laterally spread much further in the computer model than is supported by the available data. This vadose zone lateral spreading has been assumed to be conservative in that it allows water to spread in the model from the percolation ponds and Big Lost river to the area under the tank farm and accelerate the transport of contaminants from the upper perched water to the aquifer. However, this overestimate of lateral spreading means there is an underestimate of vertical movement of water and contaminants. Therefore, it is possible that the vadose zone contaminant travel time to the aquifer has been underestimated in the model thereby underestimating the future risk in the aquifer (in particular for Sr-90)." [JM-W]

Response: The Commentor is correct. It is recognized that the Sr-90 is laterally spread in the model more than is observed in the measured values shown. The true lateral spreading of water is maintaining the saturation front of the subsurface (vadose zone). Minor impacts on the upper perched water zone results from the lateral spreading, but a major impact (effect) is modeled in the deep perched water. The largest source terms are in the Tank Farm Soils (Group 1) and the impacts on the SRPA within the fenceline will be further refined under OU 3-14.

Comment 84 : A Commentor stated that "The inconsistencies between the computer model predictions (that decisions are based on) and the observed movement of contaminants in the perched water must be clearly acknowledged. The uncertainty in the predicted aquifer risk should be quantified or the results should be qualified in the strongest terms. The risk assessment uncertainty has not been sufficiently stated in this Proposed Plan or in the supporting documentation for the Proposed Plan. [JM-W]

Response: There are recognized differences between the modeling and measured results. These differences are shown graphically in Appendix F of the RI/BRA Report, which is part of the Administrative Record. There are predicted impacts on the aquifer from the surface and near surface source terms, but the major impact currently and in the near future is from the use of the injection well. Aquifer impacts from the major source term in the Tank Farm Soils will be refined under the OU 3-14. The Proposed Plan is a summary document. In addition, uncertainty was not quantified in the risk assessment for OU 3-13.

Comment 85 : A Commentor felt that on Page 14, Perched Water, 2nd paragraph a statement should have been made concerning the perched water having been contaminated with RCRA listed waste. A Commentor requested that the specific Idaho Groundwater Quality Standards be identified and that the time frame for impacts on the aquifer be identified. The Commentor also inquired about the evidence that the perched water is a transport pathway between surface soils and the deep aquifer. Also, the Cornmentor was concerned about the K_ds used for the contaminants absorbed adsorbed onto surficial soil and layers of soil in the basalt when dealing with infiltrating water. The Commentor requested that a statement be made concerning whether the perched water presents a risk to the aquifer from the contaminants already in the perched water or from additional contaminants leached from soil percolating surface water.[C-W]

Response: Given the leaks that have occurred in the Tank Farm, listed hazardous wastes are present in the perched aquifer. Hazardous constituents and characteristic hazardous waste was injected into the

perched water and aquifer through tile injection well. Additional information concerning this subject is available in the Administrative Record, specifically Appendix G of the FS Report. The Idaho Groundwater Quality Standards being referred to in the Proposed Plan are the Safe Drinking Water standards applied to the SRPA. The perched water is not available source of water for consumption, but does represent a threat to the SRPA. The intent of this remedial action is to restore the SRPA impacted by INTEC operations to usability by 2095 outside of the INTEC fence line. Inside of the INTEC fence line will be addressed under OU 3-14. With water being the mechanism that transports contaminants through both the unsaturated and saturated zones, the perched water is a transport mechanism for the contaminations to the SRPA. It is recognized that the INTEC injection well failed and backup into the unsaturated zone. The residual contamination from these failures can not explain the existing contamination in the SRPA without the additional contamination being transported through the perched water and into the SRPA. Default Track 1 and Track 2 K_ds were used for the modeling parameters when dealing with contamination in the surficial sediments and interbed materials. Based on the information contained in the RI/BRA, FS, and FS Supplement Reports, the perched water does represent a threat to the SRPA without remedial action being taken to mitigate the risks.

Comment 86 : A Commentor had a concern about whether the contaminants found in the perc pond water posed a threat. The Commentor also was concerned about the inventory of contaminants in soil basalt above the perched water. The Commentor had a question concerning the K_ds used in evaluating the impacts from the perc pond wastewater on the aquifer. Also, the Commentor inquired about which of the contaminant(s) in the soil basalt are a threat and over what time frame. [C-W]

Response: Yes, there are contaminants found in the water being discharged into the existing percolation ponds. However, there are questions concerning the concentrations of the contaminants in the water. Sampling activities are being conducted to resolve the COCs and concentration issues with the water. Recent sampling results indicate that the contamination levels are below the MCLs for the primary contaminants of concern. Tens and thousands of years into the future.

B. 1.2. Inclusion of Sites in the RI/FS

Comment 87 : A Commentor stated that “The Plan notes that the CPP-37 gravel pits and CPP-66 Fly-ash Pit (which both sounds innocuous) will be closed under Idaho Solid Waste Rules (IDAPA 16.01.06). However, the Site Treatment Plan and the Remedial Investigation, Feasibility Study (RI/FS) show the Gravel Pits as a mixed waste discharge site with a volume of 84.393 cubic meters of waste dumped in the two pits. The RI/FS lists seven radionuclides in pit #2. The RI/FS lists the fly-ash pit with four radionuclides and RCRA listed hazardous waste contaminates. [INEL-95 0056(@ 3-22] Similarly, DOE wants to close the CPP-65 Sewage Lagoon under Idaho Waste Water Land Application Rules, yet the RI/FS lists the site as having, contaminates in the lagoon wastewater. [3-22] These waste sites must be remediated under the same RCRA requirements as the other mixed hazardous radioactive waste sites.” [CB-W]

Response: Site CPP-65 and CPP-66 are not being addressed under this ROD as we believe that other regulatory programs are better able to address proper closure. A review of the IN EEL Site Treatment Plan (STP) was conducted. It was found that these sites are not part of the STP. Both Sites CPP-37a and CPP-37b are being addressed as part of Group 3 (Other Surface Soils) under this ROD. Release Site CPP-66 was transferred to WAG 10 for further ecological risk evaluation and remedial action, if necessary. The sewage lagoons (CPP-65) will be closed in accordance with the permit requirements.

Comment 88 : A Commentor felt that “There are a number of sites in this Plan which are not properly characterized. “ The Commentor stated that these sites should be removed from the Plan and subsequent ROD until characterization is complete. [C-W]

Response: We do not understand what sites the Commentor is referring to. All sites were characterized, either from process knowledge, interviews, or actual sampling, and analysis. Investigations under the FFA CO have followed a tiered approach. The approach started with Track 1 investigations along with analysis and then preceded through Track 2 investigations and analysis. These Track 1 and Track 2 investigations were then factored into the RI/FS Work Plan and further investigations were conducted where necessary. Some characterization activities will take place as part of the various remedial actions.

Comment 89 : A Commentor felt that on Page 14, Other Surface Soils, 1st paragraph, "Soil which is currently stored in boxes and which was not generated during CERCLA investigation or removal activities (CPP-92), should not be included in this Group." The Commentor stated that "This waste is no different than any other waste generated by the INEEL during routine maintenance or upgrade activities. The INEEL has facilities and dispose of such routine waste. It should not be included in CERCLA simply because it simplifies, and may reduce, regulatory compliance requirements. Including this kind of soil in the CERCLA program allows the INEEL a way to circumvent the RCRA disposal requirements, which might otherwise attach to the soil. Remove boxed soils, which did not originate from the CERCLA program from this Group. [C-W]

Response: We disagree with the Commentor. The soils in the Site CPP-92 were included in the FFA/CO through the New Site Identification (NSI) process. In order to add the site to the FFA/CO, concurrence was obtained from both the EPA and Idaho Department of Health and Welfare/Division of Environmental Quality (IDHW/DEQ) along with DOE. Also, the waste that was generated and placed into the boxes originated from CERCLA release sites. Lastly, the boxed soils at Site CPP-92 are subject to HWMA/RCRA ARARs, particularly hazardous waste determinations and land disposal restrictions and storage ARARs. No RCRA requirements were #circumvented.&

B.1.3. Classification of Contaminants

Comment 90 : A Commentor felt that DOE failed to correctly categorize the other waste as mixed low level (MLLW) which requires either approved treatment or disposal in a permitted RCRA Subtitle C hazardous waste dump. [CB-W]

Response: An evaluation of whether the wastes are subject to RCRA disposal requirements in a RCRA Subtitle C landfill was made in the Feasibility Study Supplement Report, which is part of the Administrative Record.

Comment 91 : A Commentor stated that "Two of the contaminated soil sites (CPP-28 and CPP-79) have transuranic (TRU) elements that cumulatively exceed the TRU definition of 100 nCi/g. This waste must go to a Nuclear Regulatory (NRC)/ Environmental Protection Agency (EPA) approved geologic ICDF specifically permitted for TRU waste. Since this contamination resulted from over 100 leaks in the high-level liquid and calcine waste pipes, and acknowledged in DOE's work plan document as HLW, a legitimate case can be make that it still HLW and subject to Nuclear Regulatory Commission disposal regulations." [CB-W]

Response: Tank Farm source areas are identified with spills of HLW and SBW. However, we are not excavating Tank Farm contaminated soils under this action. There is no need to refine our definitions at this time. Under the Tank Farm RI/FS, the issue of waste classification will be further evaluated. Decisions concerning the waste classification may also be made under the Idaho HLW & FD EIS ROD. In addition, there were not over 100 releases of waste at INTEC associated with the HLW operations or facilities.

Comment 92 : A Commentor stated that trying to get the Agencies to properly characterize the waste has been an ongoing effort. The Commentor also stated that without proper characterization, disposal of the waste would not meet the basic requirements for disposal. In addition, the Commentor felt that previous disposal activities have been illegal. [CB-TM]

Response: An evaluation of whether the wastes are subject to RCRA Subtitle C was made in the FSS, which is part of the Administrative Record. It was determined that there was a significant amount of INEEL CERCLA soils and debris having contaminants other than and in addition to radionuclides. Management of the non-radionuclides is subject to the RCRA requirements. We are unaware of any "illegal" disposal actions taken under the FFA/CO or under previous RODs. We have characterized contaminated media and wastes to the extent necessary to properly manage them. At Test Area North (TAN) groundwater, when we learned that the waste was a listed hazardous waste, we voluntarily modified the ROD through an ESD to achieve compliance.

Comment 93 : A Commentor felt that the gravel pits were mixed waste based on the site treatment plan and that the waste would need to be dealt with as a RCRA listed waste. The Commentor also felt that the flyash and the sewage lagoons had similar issues and could not be written off as "No Action Sites." In addition, the Commentor stated that further explanation is required in the document. [CB-TM]

Response: The gravel pits, flyash pit and sewage lagoons do not appear in the INEEL STP. The STP only deals with waste that has been generated and requires treatment under RCRA for dealing with the hazardous components. These sites are under the CERCLA program and were assessed for risk. Both the human health and ecological risks were determined to be acceptable for the gravel pits and sewage lagoons. Remedial action on the gravel pit will be undertaken in Groups 2 (closed pit) and 3 (open pit). For the flyash pit, the human health risk was determined to be acceptable, but presented a potential ecological risk. This site was transferred to WAG 10 for further ecological risk evaluation and remediation, if necessary. Closure of both the sewage lagoons will occur under other programs. The Proposed Plan is a summary document and does not have the detailed information and rationale. Additional information can be found in the RI/BRA, FS, and FSS along with this ROD.

Comment 94 : A Comment stated that "There are a number of environmental media at ICPP which are known to be contaminated with RCRA listed waste. They include the tank farm perched water system, the aquifer, and several soil wastes. There are other soil wastes that may be contaminated with RCRA listed wastes. It would be a good idea to address these problems through a risk-based delisting in the ROD. By establishing risk-based delisting concentrations in the ROD, then media meeting those concentrations could be managed as non-listed (though they might still exhibit a characteristic of hazardous waste). This would simplify issues of AOC and LDR at the ICDF, if it is built." [C-W]

Response: The Commentor is correct. There are areas at INTEC that have been contaminated with waste having listed waste constituents. Delisting of the waste is not being pursued under this ROD. Delisting would not change how the waste is managed on-site. In addition, delisting decisions under the ROD would not apply to off-site shipments.

Comment 95 : A Commentor stated that "None of the SFE-20 Hot Waste Tank System (Group7) (CPP-69) cleanup alternatives offered in the ICPP plan meet regulatory requirements." The Commentor also stated that the classification of the waste in the SFE-20 Hot Waste Tank concerning TRU constituent was not correct. [CB-W]

Response: Preliminary information supports that concentrations of TRU may be high enough to require disposal of the Tank's contents at Waste Isolation Pilot Plant (WIPP). However, due to the radiological hazards and access controls. We have not completed characterization of this tank and do not know how

this waste will be classified at this time. As we have elected to excavate and remove the tanks and its contents in full compliance with all applicable regulations, we must disagree with the Commentor concerning our commitment to comply with regulatory requirements.

Comment 96 : A Commentor felt that the waste in the SFE-20 tank system was not adequately characterized. [CB-TM]

Response: Preliminary information supports that concentrations of TRU may be high enough to require disposal of the Tank's contents at WIPP. However, due to the radiological hazards and access restrictions, we have not completed characterization of this tank, which would be required even if we elected to leave the tank in place. In addition, because the tank contents have not been completely characterized, whether the contents of the tanks are mixed waste has not been determined. Under evaluation of alternatives, we concluded that Alternative 4 (Removal, Treatment, and Disposal), which includes characterization activities, best satisfies the evaluation criteria. In addition, as we have elected to excavate and remove the tank and its contents in full compliance with all applicable regulations, we must disagree with the Commentor concerning our commitment to comply with regulatory requirements.

Comment 97 : A Commentor felt that the Tank Farm soils are transuranic waste. The Commentor also inquired as to whether additional sampling would be conducted and if it would change the waste classification. The Commentor also stated that if the Tank Farm soils have sufficient concentrations of TRU constituents to be classified as TRU waste the soils would require disposal at a transuranic, deep geologic repository. [CB-T.M]

Response: Some of the data from sampling activities in the Tank Farm indicate that there may be soils with sufficient concentrations of neptunium (Np), plutonium (Pu), and americium (Am) isotopes to be classified as TRU (i.e., greater than 100 nCi/g). Additional sampling is being planned under the Tank Farm RVFS (OU 3-14) to determine the concentrations and classifications of the soils. Based on the new and existing information, risks to the environment would be determined and remedial alternatives developed. If the soils are excavated and are classified as TRU, disposal in a deep geological ICDF would be the disposal location. For altematives that do not excavate (generate waste) the soils, the soils left in place would not be subject to disposal at a deep geological ICDF, but would be required to meet a performance objective considering the impacts on the SRPA and surface receptors.

B.2. Risk Assessment

Comment 98 : A Commentor felt that the definition of clean that the Department of Energy is using is a far cry from what the general public would determine as clean. The Commentor felt that imploding a contaminated building above contaminated soil, and then capping it would not meet most peoples definition of clean as the amount of contamination that was there before the implosion process began, will be there when the capping is completed. [MMS-W-W]

Response: The use of 1 in 10,000 is the upper end of the National Contingency Plan risk range. A risk of 1 in 1,000,000 is considered the point of departure for additional consideration concerning risks. In compliance with the NCP, INEEL is using the upper limit in making the risk management decisions concerning the need for remedial action. For the CERCLA program, restoration activities are directed at restoring an area to an acceptable risk. At the INEEL, an acceptable risk has been defined as 1 in 10,000, due to the background contaminant concentrations that represent a 1×10^{-5} risk. Therefore, some contamination remains following the cleanup activities, but the residual is considered acceptable from a risk perspective. There are several alternatives evaluated in the final disposition of facilities, with "imploding" and leaving the building in place being one of the alternatives. Criteria (risk to the SRPA,

risk to surface receptors, worker risk, cost, implementability, etc.) are evaluated in selecting the building disposition alternative. If the environmental risks (aquifer and surface) are in the acceptable range for the alternative, leaving the building in place with the contaminated soil beneath may be a viable alternative. Closure decisions and approaches are within the purview of the HWMA/RCRA closure plans for the interim status unit, not the CERCLA OU 3-13 ROD. Alternatives for consideration in the HWMA/ RCRA closure plans are being evaluated in the Idaho HLW & FD EIS. As part of the remedial alternative for the building, an engineered barrier (cap) may be necessary to reduce the risks to acceptable levels. It is true, that for some facility closure, with implosion, that the amount of contaminants remaining will be the amount that was present before facility disposition. This would be considered a viable alternative provided that the SRPA is not adversely impacted. Actions are being taken to reduce impacts to the SRPA to acceptable levels and then all future actions will need to be within the cumulative acceptable risk range.

Comment 99 : A Commentor agreed with the risk assessment approach established, and the specific objectives of the Proposed Plan. [C21-W]

Response: Thanks, we appreciate the comment. The risk assessment was prepared in accordance with the EPA national guidance. Standard or default assumptions along with 95% upper confidence concentrations were used to assess the risks. Following the risk assessment, remedial alternatives were developed and evaluated to mitigate and /or reduce the risks to acceptable levels. This information is then summarized into the Proposed Plan along with a recommended (preferred) alternative.

Comment 100 : A Commentor inquired concerning Page 47, Table 10, what the cumulative risk at INTEC would be if all of these sites were included into the calculations. The Commentor stated that “Risk should be calculated across ICPP from all of the CERCLA sites, not just those chosen for inclusion in the Proposed Plan.” The Commentor also requested that the cumulative risk from all CERCLA sites at INTEC be stated. [C-W]

Response: The cumulative risk at INTEC for the CERCLA release sites was determined to be unacceptable. The baseline risk assessment considered all of the known CERCLA release sites. The release sites presented in Table 10 of the Proposed Plan are release sites that individually do not have an unacceptable risk and do not significantly affect the cumulative risk for CERCLA sites at INTEC. It should be noted that an individual will chronically have exposure to soil at only one location, but that individual will breathe air and drink groundwater that potentially can be affected by contaminants from all of the sites. This results in the risk assessment essentially evaluating the cumulative risk from all of the sites. Section 27 of the RI/BRA Report presents the cumulative risk assessment results.

Comment 101 : A Commentor could not find a section on the uncertainty in the risk assessment, in the Proposed Plan. Particularly, the uncertainty in the groundwater risk predictions and whether the uncertainty can be quantified. The primary source of this uncertainty is the uncertainty in the Sr-90 and plutonium inventory released to the environment, the rate at which the Sr-90 and plutonium is moving from the surface sediments to the underlying basalts, and the transport through the vadose zone to the aquifer. [JM-W]

Response: There was no uncertainty discussion in the Proposed Plan. The Proposed Plan is a summary document containing, information found in the RI/ BRA, FS, and FSS Reports. A qualitative discussion of the uncertainty in the modeling, is contained in Section 6 and Appendix F of the RI/BRA Report. Most of the uncertainty in the source terms for Sr-90 and plutonium is in the Tank Farm Soils (Group 1), which will be further investigated and evaluated in the Tank Farm RI FS (OU 3-14). In addition, the analysis presented in the RI BRA, FS, and FSS did not attempt to quantify the uncertainty as this would require a considerable additional amount of data and subsequent analysis.

Comment 102 : A Commentor questioned whether some sites in this Plan present a real risk to human health/environment. If they don't, they should be removed from the Plan or a viable risk should be demonstrated. [C-W]

Response: We are not sure which sites the Commentor refers to. Release sites without an unacceptable risk were recommended for "No Action" or "No Future Action" depending on the condition of the source term for the release site.

Comment 103 : A Commentor wondered, since the proposed ICDF will be outside the 100-year floodplain and thus will be acceptable under both RCRA and TSCA, how long will the radioactive portion of the waste present a risk to the environment? DOE Order 5820.2A requires a risk assessment for the radionuclide portion of the waste. What are the results of this risk assessment? [C-W]

Response: In the evaluation of the materials for potential disposal in the ICDF, some waste could remain sufficiently radioactive to present an unacceptable risk to human health receptors for approximately 800 years. This information is presented in the RI/BRA, FS, and FSS Reports. In addition, the ICDF will be designed, constructed, operated, and closed to not adversely impact the SRPA or surface receptors. Additional risk analysis will be conducted under remedial design activities. The specific WAC will be developed with agency concurrence during remedial design.

B.2.1. Human Health Risk Assessment

Comment 104 : A Commentor was concerned that DOE is not using "maximum" contaminant data. For instance, the Snake River Aquifer risk assessment -90 levels used by DOE is 8.1 yet DOE's own sampling data in the RI/FS shows 14 aquifer monitoring wells that exceed the MCL including USGS-047 with Sr-90 levels over 60 pCi/L. [INEL-95/0056; D-19] DOE additionally fails to acknowledge aquifer tritium contamination in excess of the MCLs. DOE's use of arbitrarily low or averaged sample data results in unreliable and non-conservative risk assessments. [CB-W]

Response: There are a number of aquifer wells near the INTEC facility that currently measure concentrations of radionuclides exceeding the MCLs. In assessing the risk to a hypothetical future resident, the maximum contaminant concentrations predicted by the computer modeling were used. The MCL for radionuclides, beta and gamma emitters is 4mrem/yr from all sources. The MCLs listed are calculated as if they were the only radionuclide present. Tritium, Sr-90 and I-129 all exceed MCLs today. However, the reasonable timeframe that we would expect before the aquifer may serve as a drinking water source in the vicinity of the ICPP by future residential users is year 2095. MCLs for this year 2095 future use scenario, are modeled to be within acceptable levels for all but Iodine- 129 and Sr-90. The 8.1 pCi/L Sr-90 referred to by the Commentor is the predicted value, rather than a measured value.

Comment 105 : A Commentor thought the Proposed Plan for the clean up for the contaminated soils in the groundwater appeared to be well done under the overall conservative assumptions in the regulations by which they have to abide. The major concern was with the estimate and the calculations, in that overly conservative values have been used due to using a linear- and no-threshold approach, which has been shown to be incorrect.

The Commentor pointed to recent scientific values of at least 5 rem -- and there are actually two more recent values of 10 and 20 rem that have been reported instead of the 15 mR would lead to much lower cost figures for accomplishing a cleanup. Therefore, they felt that either these higher figures should be used, or at least evaluated as an alternative cost estimate basis. [LJ-TI]

Response: Although this issue is controversial, we must conclude that based on the limited data concerning low dose epidemiological studies, the epidemiological data base is of very limited value in assessing dose response relationships. Based on the assessment of our experts and others, no alternate- dose response relationship appears to be more plausible than the linear non-threshold model on the basis of present scientific knowledge. For radiation protection purposes, the weight of evidence causes us to continue to conclude that the risk from radiation increases linearly with the dose, in the low dose range above natural background radiation levels.

Comment 106 : The measure of acceptable risk to human health as being 1 in 10,000 is very conservative. However, we can accept that criterion if the risk assessment is done in an acceptable science-based manner. Our major concern is that the risk assessment values calculated in this plan are based upon a nonscientific hypothesis. All risk calculations are based on the "linear-no-threshold" hypothesis, which links risks of cancer to radiation doses down to zero. There is no scientific evidence to support this theory. In fact the Council of Scientific Society Presidents has stated that radiation levels below 10 rem per year are not clearly linked to an increased risk of cancer for adults. Therefore following recommendations are offered on the Proposed Plan. [C21-W]

Response: The use of 1 in 10,000 is the upper end of the NCP risk range. A risk of 1 in 1,000,000 is considered the point of departure. The INEEL is using the upper limit in making the risk management decisions concerning the need for remedial action.

Although this issue is controversial, we must conclude that based on the limited data concerning low dose epidemiological studies, the epidemiological data base is of very limited value in assessing dose response relationships. Based on the assessment of our experts and others, no alternate-dose response relationship appears to be more plausible than the linear non-threshold model on the basis of present scientific knowledge. For radiation protection purposes, the weight of evidence causes us to continue to conclude that the risk from radiation increases linearly with the dose, in the low dose range above natural background radiation levels.

Comment 107 : A group of Commentors recommend that risk calculations be done based upon more scientific criteria. For example: Take the Federal Limit on Public Radiation Exposure from the NRC General Public Limit of 0. 1 rem/yr as the baseline or threshold for zero risk of cancer for the public. Take the Federal Limit on Worker Radiation Exposure of 5.0 rem/yr as the baseline for zero risk of cancer to a worker. [C21-W]

Response: Within the EPA regulations, a dose of 15 mRem/yr is considered the maximum allowable exposure for the general population. This dose roughly corresponds a risk of 3 in 10,000. Because there currently is not a better theory on radiation dose effect than the linear-no-threshold hypothesis, risks are calculated with zero risk at zero dose. A dose of 0.1 rem/yr (100 mRem/yr) would correspond to a risk of 7 in 10,000 and a dose of 5.0 rem/yr (5,000 mRem/yr) would correspond to a risk of 3 in 100. Both of these doses are considerably over the EPA standard and would be considered an unacceptable risk. In addition, the EPA is considered the primary organization responsible for determining risks to human health and the environment.

Comment 108 : Regarding the human health risk assessment portion of the Proposed Plan, page 17, a Commentor questioned, “w hat happened to the future resident beyond 2095? [C-W]

Response: We are sorry for the confusion. The risks to workers both current and future (2095 and beyond) were analyzed in addition to the future resident (2095 and beyond). There were not any release sites that had an unacceptable risk to workers, either current or future, that did not also have an unacceptable risk to the future resident. Based on this, the need to take remedial action for release sites

was specified using the future resident. It should be noted that for all land use scenarios (current and future worker along with future resident) an unacceptable risk was defined as 1 in 10,000. Also, workers are additionally protected with worker controls that were not taken into account in assessing the risks.

Comment 109 : A Commentor stated, "but you promise to clean it up. And if I haven't died from trace exposure to atomic waste in my aquifer I just may live to see it. [RK-W]

Response: The CERCLA program is committed to cleaning up the contaminated areas at the INEEL, including contaminated soils. This ROD has selected remedial actions to remediate various areas located at INTEC. The risk numbers calculated by CERCLA methods are the probability that an exposure will lead to a tumor. The exposure is calculated based on a number of factors resulting in a chronic dose. This chronic dose is evaluated as being received over many years (30 years for residential scenario). Even if the exposure results in a tumor, the tumor will not necessarily lead to a fatal cancer. No off-site impacts from the INEEL that result in unacceptable risk to the public were discovered by the OU 3-13 RI/FS.

B.2.2. Ecological Risk Assessment

Comment 110 : A Commentor wanted to know how the Agencies propose to address ecological risks such that species ranging the entire INEEL will be protected. [C-W]

Response: For the ecological risk evaluation (screening level risk analysis) conducted at WAG 3 or INTEC, evaluations were done on an individual release site basis. These ecological risk evaluations used both actual uptake factors and hypothetical uptakes (based on similar species) for ecological receptors. These ecological risk evaluations resulted in some sites having a potential ecological impact. Release sites without a potential ecological impact were eliminated from ecological concerns. Many sites at WAG 3 had a potential ecological risk at the same release site as an unacceptable human health risk. For release sites having both an unacceptable human health and potential ecological risk, the remediation of the site to human health standards will also be designed to address the potential ecological risk issues. Some sites had a potential ecological risk without an unacceptable human health risk. For these sites, the remediation levels are designed to reduce the contamination to levels below the concentrations resulting in a potentially unacceptable ecological risk. One site. CPP-66: Fly Ash Pit, is being deferred to WAG 10 to address the potential ecological risk impacts from the release site. In addition, a final INEEL-wide ecological risk assessment, including the impacts on populations, will be conducted under the WAG 10 RI/FS.

Comment 111 : A Commentor stated the ecological risk assessment method and results are misrepresented and this section needs to be clarified. For example, the first step of the ERA process is a background and EBSL screening, however an additional (much less conservative) assessment is then performed on those sites that are not eliminated by this screen. This information needs to be included or the paragraph rewritten, since currently it gives the impression that the preliminary screen is the only step performed. More importantly is the inclusion of an appropriate discussion concerning the additional site and contaminate elimination step requested by the DOE-ID, EPA, and IDHW. Based on the results of the ERA, those sites that had hazard quotients (HQs) greater than 1.0 (27 sites) were eliminated as a concern by the risk managers if the soil concentrations (at the 95% UCL or max [which ever was lower]) was less than 10X background or if the HQ was less than 10. This eliminated all but 16 sites of the 27 sites (as well as multiple contaminants). Of these 16 sites, 4 were solely an ecological risk. This needs to be more clearly stated in the text since it gives the impression that of the 27 sites, 4 were solely an ecological risk and this is not the case. The statement that the remaining 64 sites do not pose risk to ecological receptors should be rewritten to state that the remaining 64 site were eliminated as a concern to ecological

receptors by the risk assessment process. Due to the uncertainty in the risk assessment process (also true of human health) it is not responsible to state that "no risk" (implying zero risk) is posed. [RV-W]

Response: No changes were made to the final Proposed Plan to address this issue. The ecological risk evaluation in this ROD was written and expanded upon the Proposed Plan to address this comment.

B.3. Remedial Action Objectives

Comment 112 : A Commentor was concerned that the RAO of 2E-4 is consistent neither with NCP nor the statement on page 17 of this Plan which states that: ". . . total excess risk may not exceed one in 10,000." achieved by adding the risks from groundwater and soil. The RAO should be to reduce the risk at the site, from all pathways to acceptable levels. In addition, CERCLA identifies 1E-4 as the point at which remediation is required, not the point at which it stops. Ideally remediation, once begun, should reduce risk to as close to 1E-6 as is possible within the CERCLA decision making criteria. Strongly suggest the RAO be modified to comply with the NCP. [C-W]

Response: The NCP defines the acceptable risk range as 1×10^{4} to 1×10^{-6}. The RAO is to reduce the risk from all pathways to within this risk range for the residential scenario. Due to the fact that the risk from background radiation at the INEEL is approximately 1×10^{5}, it has been determined appropriate to remeidate to the upper end of the NCP risk range. In addition, this RAO is using a residential scenario for the INTEC, which is a conservative assumption.

Comment 113 : A Commentor felt it is not a reasonable presumption that a person might build a house inside the current, ICPP fence, but drill a drinking water well outside the current fence. Thus establishing RAOs for the groundwater outside the fence only while allowing people to live within the fence is not acceptable or consistent. Choose - where will people live and get drinking water, inside or outside the fence? Be consistent!! If this results in different, less aggressive, remedial actions inside the fence, that is acceptable, just make it clear to the public. [C-W]

Response: The Commentor is correct. There is an apparent inconsistency in the approach for groundwater discussed in the Proposed Plan. Due to this inconsistency issue, the remedy for the SRPA has been changed to an interim action the area outside of the INTEC fenceline. The final action on the SRPA, including the area inside the INTEC fenceline, will be evaluated and the decision made under the OU 3-14 RI/FS project.

Comment 114 : Reserved.

Response:

Comment 115 : A Commentor questioned whether the proposed 100 year RAO will adequately protect the future value of regional groundwater resources and the economic activities they support. [L-W]

Response: The remedial action objective (RAO) of year 2095 is based on our prediction that government control of INEEL may end and uncontrolled development may occur unless we commit to additional remedial controls. This scenario is used in our risk assessment process rather than assume that we will maintain all of INEEL as a government facility in perpetuity. Areas like the ICDF will have these remedial controls placed on the ICDF area. It will be designed, constructed and maintained as long as the threat to human health and the environment persists. These controls will include periodic reviews that the remedy remains protective, land use restrictions, cap maintenance and other tangible physical controls as

necessary . Our commitment to the SRPA is that it be restored by the year 2095 so that it is available for use in the future economic development of the area.

Comment 116 : A Commentor questioned whether the goals of the current plan were: 1) that the Chem Plant be clean enough for people to live there by 2095; 2) and that the contamination levels then in the Snake River Aquifer be low enough for people to get water nearby? (SRA-W]

Response: The Commentor is correct. Our goal is to restore soil areas where excavation will take place and the underlying aquifer so that future users will not be at an unacceptable risk. The ICDF and other capped soil areas will be maintained so as to prevent future access. Also, there are areas at INTEC that will not be clean enough for people to live or work unrestricted by 2095. For these areas, engineering and institutional controls ,will continue to be maintained until the risk is acceptable.

Comment 117 : A Commentor asked why the proposed MCL for I-129 is approximately 20 pCi/L or more than 4 times the computer model predicted peak I-129 concentrations after year 2095. The Commentor recognized that 20 pCi/L was not the legal standard but was of the understanding it is the current scientific standard. The Commentor wanted clarification to the public that the proposed groundwater remedial action is based on groundwater action level concentrations that are significantly below the MCL supported by the scientific community. The Commentor noted the EPA proposed the MCL of 20 pCi/L been recognized by the U.S. Government's own scientist as more appropriate than the 25 to 30 year old legal standard of 1 pCi/L. [JM-W]

Response: The Commentor is incorrect. At one time, a method for calculation of the MCLs resulting in the I- 129 MCL of 20 pCi/L was proposed. This approach was **not promulgated**. New proposed MCLs have been proposed by the EPA and the proposal includes a MCL for I-129 MCL of 1 pCJ/L. These new standards are expected to become effective by November 2000. In addition, the I-129 MCL of 1 pCi/L is derived from the 4 mRem/yr dose MCL under the Safe Drinking Water Act.

B.4. Compliance with ARARs

Comment 118 : A Commentor was concerned that the Agencies have been vague about the definition of AOC for WAG 3 and other WAGs. The “AOC” has varied, depending on what was "convenient" at the time. As an example, refer to the removal action conducted for the electrical system upgrade. For that removal action, the AOC was defined very strictly around each OU. Now the Agencies want to make it much broader. This is not consistent. Also, the area proposed for the ICDF cannot be part of the AOC since it is not part of "continuous or contiguous" contamination associated with WAG 3. The ICDF cannot be considered part of the WAG 3 AOC. [C-W]

Response: The definition of the AOC is consistent with being within the “continuous or contiguous” area of contamination at INTEC. Release Site CPP-95 (ICPP Windblown Plume) has a contaminated area extending both south and north of INTEC. The areal extent of CPP-95 used in establishing the AOC is the area that is not available for free release or unrestricted used due to the existing contamination. Existing institutional controls (access restrictions, land use restrictions, and radiological monitoring) must remain in place until 2095 for the site to become available for free release or unrestricted used. Based on the restriction on the land use for CPP-95 and that the other sites in WAG 3 requiring remediation are within the areal extent of CPP-95, the restricted portion of CPP-95 is defined as the AOC. The areal extent of the AOC is presented with Figure 2-1 for Appendix C of the FSS Report. This is a large area of continuous or contiguous contamination and includes the location of the ICDF. Removal actions do not have the ability to establish an AOC outside of the scope of the project and are generally conducted on limited scope or area. This ROD is making decisions for all of the known release sites at INTEC and is determining the WAG 3 AOC.

Comment 119 : A Commentor wanted to know what kind of air emission controls will be in place during Chem Plant cleanup, particularly soil movement? [SRA-W]

Response: Various controls and actions will be used during the remedial actions to control air emissions. These controls and actions, such as dust suppression, will be applied to all remedial actions, including soil movement as appropriate and necessary. Also, short term risk concerns for workers, the community, and the environment will be further addressed at part of the remedial design and cleanup activities to ensure protectiveness.

Comment 120 : A Commentor noted perched water under ICPP is considered to be "waters of the state" and is covered by Idaho Water Quality Standards, ARARs for this OU. Alternative 2 does very little to actively pursue compliance with these requirements, these ARARs. Please do not boldly state that Alternative 2 meets all of the ARARs. It does not. The Agencies are lying to the public again. [C-W]

Response: The selected remedy for Group 4 (Perched Water) consists of reducing recharge to the perching zones. This remedy will ensure that in the future, insufficient quantities of water in the contaminated zones are available for drinking water purposes. During the drainout period, the perched zones will be institutionally controlled to ensure the perched water is not utilized for drinking water purposes. Additionally, this remedy will reduce the flux of surface contamination to the regional aquifer. Since much of the contaminant mass in the vadose zone at INTEC is adsorbed to sedimentary material, rather than soluble in the perched water itself, actively pumping and treating these perched zones offers little additional long-term benefit, at significantly increased expense. This issue was openly discussed during the public meetings for cleanup of OU 3-13. The selected remedy is consistent with the provisions of the Idaho Groundwater Quality Rule and meets ARARs.

Comment 121 : A Commentor noted, regardless of the alternatives selected, clean-up activities must be done in compliance with all mandated requirements. Most of the activities involved in WAG 3 are located within previously disturbed areas within the fenced area of INTEC. Historic structures are present within the study area, and a complete assessment of effect will need to be completed. This is required under Section 106 of the National Historic Preservation Act.(36 CFR 800.2(o)(1)) [SBT-W]

Response: Compliance with Section 106 will be achieved as will compliance with all applicable or relevant and appropriate requirements.

Comment 122 : A Commentor pointed out that groups 1, 3, 6, and 7 include preferred alternatives which require surface-water control, and/or soil excavation. These actions may disturb cultural resources during excavation. In that case, all work must halt if buried cultural resources are encountered, and notification made to the LIMITCO Cultural Resources Staff so that they can work with the Tribes in assessing the resources, mitigating the damages as necessary, and authorizing continuance of excavation. Group 2. Solis Under Buildings: The D&D of all buildings must be done in compliance with Section 106 of the Historic Preservation Act, as stated above. Soils from the borrow area need to be closely monitored to insure that cultural deposits are not inadvertently introduced into the construction area. If deposits are found, a stop-work policy should be put into place and notification made to the proper technical groups as outlined in the Agreement in Principle (AIP) between the Shoshone Bannock Tribes and the DOE. For Groups 3, 4, and 5: selection and construction of the disposal areas will need to be carefully considered. The areas will need to be surveyed for cultural resources that may be present, which would require substantial testing. This is especially true if the Big Lost River is diverted or lined because of the historical importance of the river to the Tribes. [SBT-W]

Response: Performing an archeological survey prior to any site disturbance is a long practiced requirement at INEEL. If cultural resources are encountered, work will be halted or moved from the affected location until proper precautions can be taken to protect invaluable cultural resources.

Comment 123 : A Commentor noted that because of the proposed use, the facilities will be very long term. The effect to cultural resources, in the event they are present in the area, would also be long term. Many of these resources are a non-renewable testament to the Shoshone- Bannock history, or are resources that still have considerable importance to the Tribes. After the areas have been closely inspected prior to construction, close monitoring during construction will be required to insure that cultural resources are not damaged or destroyed. Mitigation of damage to cultural resource sites will need to be coordinated with the Shoshone Bannock Tribes and contractors as outlined in the AIP. [SBT-W]

Response: Performing an archeological survey prior to any site disturbance is a long practiced requirement at INEEL. If cultural resources are encountered, work will be halted or moved from the affected location until proper precautions can be taken to protect invaluable cultural resources. The location of the ICDF is in a partially disturbed area. The Group 3 soils are in already disturbed areas. Also, both of these areas are within the existing archeological survey zones. This will help to minimize cultural resource impacts.

Comment 124 : A Commentor noted that where the preferred alternative calls for the removal, storage and treatment of contaminated water, it should be kept in mind that this action might indirectly affect cultural resources. The full scope treatment and storage plan will need to be reviewed and commented on. The feasibility of cleaning up water resources will need to be demonstrated, and assurances given that the process of cleaning up perched and aquifer waters will not cause more problems and contamination than currently exist. [SBT-W]

Response: If necessary to restore the aquifer to drinking water quality, the groundwater extraction and treatment system will be sited so as to minimize the impact to cultural resources. Implementation of the contingency action for aquifer cleanup, will only be in response to clear evidence that: (1) extraction and treatment is necessary to meet the aquifer restoration time frame; and (2) treatment technology can cost-effectively remove the hazardous contaminant (i.e., I-129) from the groundwater. Disposal of the treated groundwater will also be such as to minimize the impact on cultural resources and comply with ARARs.

Comment 125 : A Commentor suggested reasons against siting a new disposal site at the Chem Plant is found in the NRC's 10 CFR Part 61 regulations for land disposal of radioactive waste, which should be included with other Applicable or Relevant and Appropriate ("ARARs"). RCRA subtitle C requirements do not apply to LLW Under Part 61. "The primary emphasis in disposal site suitability is given to isolation of wastes, a matter having long-term impacts, and to disposal site features that the long-term performance objectives of Subpart C of this part are met, as opposed to short-term convenience or benefits 10 CFR 61.50(a). This same primary emphasis appears in the joint NRC-EPA siting guidelines. NRC's regulations go on to note that *"The disposal site must designed to complement and improve, where appropriate, the ability, of the site's characteristics to assure that the performance objectives of Subpart C of this part will meet 10 CFR 61.51 (a)(4)."* [L-W]

Response: The Commentor is correct. RCRA Subtitle C requirements do not apply to disposal of LLW. However, the design criteria for a RCRA Subtitle C disposal facility are more conservative and prescriptive. DOE Order 435.1 was added as a To Be Considered (TBC) ARAR to deal with the LLW issue. In addition, the Commentor apparently cited an incorrect section of the Code of Federal Regulations (CFR). The correct citation is 10 CFR 61.51(a)(3).

Comment 126 : A Commentor felt that the ICDF is a transparent attempt by the Agencies to avoid treating mixed waste to LDR standards prior to disposal. Please describe how a groundwater monitoring system would be designed to detect releases from the ICDF when the "background" concentrations of contaminants is already high? Where would the upgradient "'clean" well(s) be located'? Where would the downdgradient wells be located so that on contamination from the ICDF would be detected'? [C-W]

Response: The ICDF is not an attempt to avoid treating and appropriately disposing of mixed and other hazardous wastes. INEEL CERCLA waste (soil and debris) from within the AOC would not necessarily require treatment prior to disposal. The in-AOC waste would be required to meet the acceptance criteria for the ICDF. If treatment is necessary for in-AOC waste to meet the acceptance criteria (stabilization for subsidence or leaching control), the waste would be treated prior to disposal. INEEL CERCLA waste from outside the AOC, would be required to meet the requirements of Phase IV of the Land Disposal Restrictions (LDRs) regulations. For OU 3-13 soils and debris, which have triggered placement, treatment to the Phase IV LDRs will be required prior to disposal in the ICDF. The monitoring network for ICDF will be designed and evaluated during the development of the remedial design. In addition, the monitoring network will be designed to detect releases from the ICDF. Wastes to be disposed of in the ICDF would be pre-treated as necessary to minimize leachate generation in the ICDF landfill environment. The LDR restrictions were enacted to assure that wastes disposed in landfills not leach and contaminate the underlying aquifer. The WAC and pre-treatment requirements required for the ICDF will achieve this goal.

Comment 127 : A Commentor wanted it made clear to the public, that if the ICDF is determined to be within the WAG 3 AOC, that RCRA hazardous waste may be placed into the facility without treatment to meet LDRs. (C-W]

Response: We agree. Discussion is contained in the ROD that states WAG 3 CERCLA wastes, which are consolidated within the AOC, will not be required to meet LDRs. INEEL CERCLA waste material from outside of the AOC will be required to meet the Phase IV LDRs. In addition, only waste from INEEL CERCLA remedial or removal projects will be considered for disposal in the ICDFand these wastes will be required to meet the acceptance criteria.

B.5. Development of Alternatives

Comment 128 : A Commentor felt that it does not make sense to dig up contaminated materials and bury them somewhere else.[TW-W]

Response: The goal of the OU 3-13 project is to reduce the risk posed by the OU 3-13 sites to acceptable levels. Leaving wastes in place would require perpetual long term monitoring and maintenance. Removal of the contaminated soil and debris will result in being able to use the area for other future purposes. Removal of the contamination and appropriate disposal will result in a larger reduction in risk than leaving the waste in place. Based on this we concluded that removal and disposal of contamination best satisfied the evaluation criteria.

Comment 129 : A Commentor felt that under “Alternative Development Evaluation and Recommendations”, the alternatives and costs are meaningless without quantitative information on the risk reduction that will result from implementing the action. What are the taxpayers buying with this money? In all the gray cost margin boxes, please include the estimated risk reduction information next to the cost of the alternative. The risk reduction information should include both the initial estimated risk and the estimated risk after implementation of the alternative. It is absolutely impossible to make an informed decision on which alternative is most appropriate without knowing, the predicted risk reduction.[JM-W]

Response: The alternatives in the FS and FSS Reports were developed and evaluated to reduce the risks to acceptable levels. Alternatives were not developed to reduce the risks to different levels below and including acceptable levels given the existing background contaminant concentration alternatives were not developed. All of the alternatives selected in this ROD will reduce the risk to acceptable levels. A quantitative risk reduction analysis would be useful if cleanups were being considered at different levels or points of compliance.

B.6. Implementation of Alternatives

Comment 130 : A Commentor recommended that for Group 2 the contaminated dirt should be left in place. The Commentor thought this is logical, but in other instances, such as VES-SFE-20, you intend to perform total removal. This is not consistent. If you can indeed leave Group 2 soil in place, it follows that you should be able to leave VES-SFE-20 and other contamination in place. [TW-W]

Response: Group 2 represents a unique problem for managing contaminated soils at INEEL. These areas are still in operation and located under structures. We could have chosen to wait several decades for the determinations to be made on the above ground structures. However, we have elected to establish a performance standard at this time. The end state of these contaminated soils will be to provide sufficient protection to the underlying groundwater and future site users. As for the SFE-20 Tank System, the most cost effective and risk reducing alternative is Alternative 4. Based on this we concluded that Alternative 4 (Removal, Treatment, and Disposal), best satisfied the evaluation criteria.

Comment 131 : A Commentor wondered, how long are engineered barriers assumed to last? The engineered barrier for the soil under buildings will be designed to last 1,000 years, but how does that relate to the length of time residual contamination will pose a hazard? [SRA-W]

Response: The design life of engineered barriers is based on the material used in the construction. The contaminants at INTEC will present an unacceptable risk for a significant period of time (beyond 2095). Based on this, the engineered barriers will be constructed using native or natural materials having useful properties in the geological time frames (1,000+ years). For most of the radioactive contaminants expected to be disposed in the ICDF, a 1,000-year design will result in greater than one millionfold decrease from the initial concentration, due to radioactive decay. For non-radioactive metal contaminants, these will remain hazardous indefinitely. Contaminants will not be placed in the landfill which have a high potential to leach to groundwater. Cap maintenance to prevent future intrusion will continue as long as an unacceptable risk remains. The engineered barriers (caps) will be designed to remain effective to at least the amount of time that the contamination present would present an unacceptable risk.

Comment 132 : A Commentor asked, "will any of the caps or covers proposed for the Chem Plant require maintenance? Please describe this effort fully." [SRA-W]

Response: Yes, there will be monitoring and maintenance activities for the engineered barriers (caps) following the construction activities. A strong post-closure monitoring and maintenance program is required to insure that any landfill contains the disposed wastes. The Final cover will be designed to minimize maintenance needs. Requirements for the monitoring and maintenance plans will be developed as part of the remedial design process.

B.6.1. Environmental Monitoring

Comment 133 : A Commentor wondered, since the preferred Alternative 2 calls for continuing existing environmental monitoring. What monitoring is currently underway? I know of no groundwater monitoring, in particular, which is intended, or capable, of detecting releases from any particular unit. How will the lack of such monitoring be deemed protective of human health and the environment? This Alternative is a "feel good" alternative because it makes the public feel good - because they don't know enough to realize they've been hoodwinked again. This alternative, as worded, is not acceptable. [C-W]

Response: Environmental monitoring for Group 2 soils where the hazard is based on surface exposure is a periodic evaluation of what exposures workers and the public are exposed to in and around the Group 2 buildings. A detailed post-ROD monitoring plan will be developed during remedial design/remedial action.

Comment 134 : A Commentor stated that “Most of the Alternative include continued “environmental monitoring.” The fact is few, if any, of these sites are currently subject to site-specific environmental monitoring. Your portrayal that they are is misleading, at best, and a damned lie, at worst. The INEEL cannot detect contaminant releases from any specific site, and would be lucky to detect additional releases from the ICPP as a whole.” [C-W]

Response: Discussion of the proposed type of environmental monitoring for the various remedial action groups is included within this ROD. We recognize the difficulty in detecting releases at INTEC. A monitoring plan is being developed to conduct the long-term monitoring at INTEC. This monitoring plan will address the issue of releases from specific locations at INTEC.

Comment 135 : A Commentor when referring to Page 43, Alternative 1 stated that "There is no site-specific environmental monitoring, to my knowledge, at this site. Don't state there is; it's a lie." [C-W]

Response: The environmental monitoring referred to for this non-selected alternative would have consisted of monitoring the perched water wells in the immediate area. In addition, two additional monitoring wells clusters would have been constructed next the SFE-20 Tank System and monitored to identify releases.

Comment 136 : A Commentor was unsure what the Proposed Plan meant in the Evaluation of Site Risks section. Environmental monitoring. What will this consist of? Is any such program currently carried out at these sites? If a specific environmental program now exists, what budget is it under? [U-W]

Response: Environmental-monitoring activities can consist of various types of monitoring (air exposure, direct exposure, and groundwater contamination). The environmental monitoring for each of the remedial action groups, if necessary, is different. Additional details concerning the environmental monitoring for the remedial action groups can be found in various sections of the ROD. Many of the sites requiring remedial action are not currently monitored for releases to the environment. Currently, there are several programs conducting environmental monitoring at the INEEL. Each of these monitoring programs has different criteria and purposes along with budgets.

B.6.2. Institutional Controls

Comment 137 : A Commentor wanted to know how long are institutional controls (e.g.,fences, regulatory restrictions) assumed to last? Page 19 says residences might be built at ICPP after 2095 but that water supply wells will be prohibited within the current fence. How will that prohibition be maintained? By whom? How does the current ICPP fence relate to the I-129 plume? [SRA-W]

Response: Institutional controls will be maintained long after the 2095 -restoration time frame has passed for areas where an unacceptable risk remains. Whether fencing will be required or other controls are sufficient to prevent unauthorized access to these areas is under review and will be part of the remedial design process. . It is recognized that other actions may be necessary to deal with the contamination in the SRPA within the INTEC fence and therefore an interim action will be implemented on the SRPA. This will allow for actions to be taken to deal with the contamination outside the fence and additional investigation along with remedial action alternative evaluation to be conducted in support of the Tank Farm RI/FS. Land use and other restrictions will be placed on the areas requiring long-term institutional control and will be maintained by DOE or another government agency. The area of the I-129 plume that currently presents an unacceptable condition (exceeds drinking water standards) extends both inside and outside of the INTEC (ICPP) fence downdgradient to approximately the Central Facilities Area (CFA). The institutional controls to be implemented under this ROD are contained in Section II of the ROD. These institutional controls are presented in tabular format for each of the remedial action groups.

Comment 138 : A Commentor wondered how the Agencies would implement institutional controls over engineered barriers or design a combination of the two [SRA-W]

Response: Selection of institutional and engineering controls is determined during the development of the remedial action alternatives for evaluation purposes. Additional controls, both institutional and engineering, may be applied during the remedial design process. Combinations are factored into the alternative as necessary. The ICDF will consist of a combination of institutional controls and physical (engineering) barriers. Institutional controls, like land use restrictions are a necessary part of the remedial action. Prevention of biointrusion and material degradation are not institutional controls, but these issues are addressed by physical (engineering) controls.

Comment 139 : A Commentor felt it was unclear how land use restrictions can be, or will be, imposed and documented. This BLM property is currently under DOE control. Will DOE provide a legal description of restricted property to the BLM? How will BLM control the restricted property? Please describe, in the ROD, how land use restrictions will be accomplished. [C-W]

Response: This ROD contains a description of institutional controls to be implemented. A detailed IC plan will be developed during remedial design to describe the controls that will be placed on the land beneath and surrounding the CERCLA release site area at INTEC.

C. RELEASE SITE GROUPS AT WAG 3

C.1. Group 1: Tank Farm Soils

Comment 140 : A Commentor wondered if the cost of tank farm soil remediation included in the current ICPP cleanup cost estimates? [SRA-W]

Response: The cost of final remediation of the Tank Farm oils is not included in the cost estimates. Under this ROD for the Tank Farm Soils (Group 1), an interim action is selected. The Tank Farm Soils cost estimate only reflects the scope of items described in the interim action alternative evaluation and scope discussion in the cost estimate. For the final action on tile Tank Farm Soils, cost estimates will be developed for the remedial action alternatives that will be developed and evaluated for Tank Farm RI FS (OU 3-14).

Comment 141 : A Commentor recommended that DOE move quickly in making its final risk management decision for the Tank Farm Soils. [CAB-W]

Response: We support the need for action where feasible. However, under the OU 3-13 R I/FS, evaluation of the INTEC Tank Farm Soils was done using the limited information from the scoping investigations (Track 1 and Track 2 studies) and process knowledge. With this limited knowledge the final action the Tank Farm would have had a very large associated contingency (hundreds of millions of dollars). Based on this, it was decided to consider an interim action on the Tank Farm Soils for the near future and collect the necessary information to make a decision without such a large uncertainty. Collecting and analyzing data along with the decision making activities is being conducted under the OU 3-14 Tank Farm RI/FS.

Comment 142 : A Commentor noted that the Proposed Plan states that a final risk management decision is anticipated for the Tank Farm Soils in 2004. The Commentor wondered why it will take that long to make that decision and recommend DOE move quickly to safely manage the risks posed by the Tank Farm Soils. [CAB-W]

Response: We appreciate that we need to expedite the cleanup process where feasible. However, the tank farm soils interim action will reduce the risk to the environment and in particular the SRPA. Even if a final action would have been selected under this ROD, the implementation of the alternative would have been phased in over a long period of time. The final part of the action would likely occur around 2045, following D&D of the area around the Tank Farm. The actions taken under the interim action will be continued, along with other activities to reduce the impact on the environment, until the final activities are implemented. This approach means that we will manage the risk at the Tank Farm safely and efficiently. Insufficient information was collected prior to and during the OU 3-13 RI/FS to make a final decision without a very large contingency and uncertainty. In order to collect the necessary information, develop and analyze alternatives, and conduct the decision making activities, a new RI/FS is being undertaken. This RI/FS (OU 3-14 Tank Farm RI/FS) will collect and analyze samples from within the Tank Farm. In addition, the results from the Idaho HLW & FD EIS will be considered in the remedial alternatives developed and analyzed. Recent evaluations on the scope, schedule and budget for the OU 3-14 RI/FS indicate that it will take more time than expected when the Proposed Plan was released. A final risk management decision for OU 3-14 is now expected to be completed prior to 2008.

Comment 143 : A Commentor had questions regarding Group 1 Tank Farm Soils: If only an interim action is currently contemplated, why is this site group/OU group/CPP group included in this Proposed Plan? [U-W]

Response: An interim action was selected for the INTEC Tank Farm to reduce the impact on the perched water and SRPA. In the evaluation of risks to the groundwater, the largest source of contamination was identified as the INTEC Tank Farm. As the contamination is migrating vertically downward, reducing the driving mechanism (water) will increase the travel time and decrease to impact on the groundwater. The interim action selected is intended to significantly reduce the amount of water driving the contamination into the groundwater. As such, the sites within the INTEC Tank Farm group are included in this ROD.

Comment 144 : A Commentor had questions regarding Group 1 Tank Farm Soils. It is stated that "non-radionuclide contaminants may be present." Why don't we know? Weren't the RI, BRA, FS, or FS supplement completed'? Or were they incomplete? If so, why? If no, why isn't the characterization of contaminants fully presented here? If the complete characterization of the Tank Farm Soils has to be deferred to the OU 3-14 RI FS, as stated on page 13, why not just pull this whole group out of this document?[U-W]

Response: Within the INTEC Tank Farm, there is incomplete knowledge concerning the contaminants, both radionuclide and non-radionuclide, and their corresponding concentrations. Previous sampling

efforts in the INTEC Tank Farm have generally not analyzed for non-radionuclides. The RI/BRA, FS, and FSS Reports were complete documents. These documents identified the data gaps in the existing knowledge. To fill in the data gaps and make a more informed and better decision on the INTEC Tank Farm. A RI FS project is being planned to resolve the data gaps, evaluate remedial action and eventually select the final remedy for the INTEC Tank Farm group.

C.1.1. Group 1 Description

Comment 145 : A Commentor pointed out that Tank Farm Soils: Site CPP-33, listed as a Tank Farm Soils Group site on page 12, is not shown in Figure 4. [U-W]

Response: The Commentor is correct in that Site CPP-33 was left off of figure 4. Site CPP-33 is part of remedial action group 1 (INTEC Tank Farm area). For future documents, additional effort will be expended to insure that sites listed in text match the figures.

C.1.2. Group 1 Alternatives

Comment 146 : A Commentor felt that grading to control surface water is an activity which should have been conducted as soon as there was reason to believe that surface water infiltration presented a risk. However, the Agencies have not demonstrated, through published/ measured K_d and measured infiltration rates, that surface percolation is a risk-driver at this site. Therefore selection of this alternative in a ROD is premature. It would better fit a removal action than a ROD. [C-W]

Response: The infiltrating water requiring control is not only from the Tank Farm fenced area. Additional water impacts comes from the drains located on the building and structures in and surrounding the Tank Farm. Reducing the infiltration of water through the Tank Farm Soils will increase the travel time of the contaminants in the soils, irregardless of the contaminant specific retardation factor (K_d). This reduction in infiltration will subsequently reduce the impacts on both the Perched Water and SRPA. Under this ROD, an interim action on the Tank Farm Soils is being undertaken. The final action on the Tank Farm Soils will be evaluated and selected under the OU 3-14 project. There is no need to undertake or consider a removal action to implement the interim action for the Tank Farm Soils when the activities are part of this ROD.

Comment 147 : A Commentor was concerned the interim solution is, in essence, capping it, putting some dirt on it, bury it. That's the first step. Question: Is that going to be the first step towards a defacto cap and fill approach? It's not at all clear that's the right thing to do for the Tank Farm and to leave the soil in place, capped over. [DK-TT]

Response: The proposed Tank Farm interim action is not a capping solution. The goal of the interim action is to reduce the amount of water infiltrating through the soils within the Tank Farm area. Reduction of the infiltration is not necessarily the first step in a defacto capping approach. The OU 3-14 RI/FS will evaluate a range of remedial action alternatives.

Comment 148 : A Commentor was concerned that the interim solution will turn out, migrate into the final solution. You made it very, very clear that this is merely an interim solution and does not in any way affect whatever the final solution will be made. [DK-TT]

Response: The proposed Tank Farm interim action is not a final action. Interim actions that are taken cannot be inconsistent with the final remedy. The OU 3-14 RI FS will evaluate a range of remedial action alternatives.

Comment 149 : A Commentor wondered, are they going to cap around the Tank Farm, basically? And that's 80 percent reduction of rainfall? I thought the Tank Farms were leaking not just the piping and are the pipes leaking now. [PR-TT]

Response: In the development and evaluation of the proposed interim action, capping around the Tank Farm was not considered. Sealing the surface of the Tank Farm is a necessary component of the remedial action. In addition, rerouting of the drainage from the various buildings in the Tank Farm area may be necessary to reduce the infiltration. The evaluation, for the Tank Farm interim action, focused on a goal of reducing to infiltration in the Tank Farm by 80%. The remedial design will further evaluate the infiltration issue and determine the specifics for the implementation. Concerning the leakage issue, there is no evidence that the tanks have leaked or are leaking. The known releases are only from the transfer lines and valve boxes. Actions have been taken to correct the leaking lines and valve boxes and to prevent future releases.

Comment 150 : A Commentor wanted to emphasize the fact that they didn't want to see an interim action on the Tank Farms get to far -- I don't want it to get past the point of no return where you put so much time and so much money into this action that it becomes the final solution when it really shouldn't be the final solution. [MMS-TT]

Response: We agree with the Commentor. An interim action under CERCLA can not be inconsistent with the final action for the site or OU. The evaluation of alternatives for the Tank Farm RI/FS will begin with the continuation of the interim action for the Tank Farm and build upon the interim action.

C.2. Group 2: Soils Under Buildings and Structures

Comment 151 : A Commentor noted that several spills, in addition to CPP-80, included both RCRA listed and characteristic waste. The soils must be managed as listed waste, and possibly as characteristic waste. This is important so that people understand how much hazardous waste is proposed for disposal at the proposed ICDF. [C-W]

Response: The ICDF will be designed and constructed to be compliant with the requirements of a RCRA Subtitle C facility. Volume estimates for the INEEL CERCLA hazardous and mixed waste candidate materials (soils and debris) are presented in Appendix C of the FSS Report.

Comment 152 : A Commentor wanted to know, if the sites are inaccessible and poorly characterized how were the COCs in the sidebar determined? How are the Agencies sure risk even exists at those sites that have not been sampled? Those sites which have not been characterized and determined to present a risk to human health and the environment should be removed from this Proposed Plan and discussed in the future when COCs, risk, and fate and transport are better understood. [C-W]

Response: The analysis and evaluation conducted on the soils under building sites (Group 2) were based on what information was available. The general characteristics of the material (waste) released to the environment was known. In addition, approximate volume of material released was known. For the evaluation of risk and remedial actions, the COCs used were the constituents contained in the waste released. The risks were evaluated based on the mass (concentrations and volumes) of the COCs. As such, there was sufficient information available to evaluate the release site risk and remedial action alternatives.

Comment 153 : A Commentor quoted from the Proposed Plan that, "...source releases are not well defined" and wanted the Agencies to "stop this nonsense until they are well defined and appropriate

remedial alternatives can be proposed and debated!! Remove this site and preferred alternative from this Proposed Plan." [C-W]

Response: We disagree with the Commentor. The analysis and evaluation conducted on the soils under building sites (Group 2) were based on what information was available. The general characteristics of the material (waste) that released to the environment was known. In addition, an approximate volume of material released was known. For the evaluation of risk and remedial actions, the COCs used were the constituents contained in the waste released. The risks were evaluated based on the mass (concentrations and volumes) of the COCs. As such, there was sufficient information available to evaluate the release site risk and remedial action alternatives.

Comment 154 : A Commentor stated that he was "just curious, the soils under the building, that's sort of totally different from the Tank Farm situation. And then quantity-wise, I mean, it just seems like you're not going to excavate those because the Chem Plant is there to stay, it seems. And quantity-wise do we have any quantity of what those materials amount to? Are you going to look at stabilizing them, or what are you looking at?" [PR-TT]

Response: The Commentor is correct in that the soils under the buildings are being treated differently than the Tank Farm soils. The 4 sites within this group are relatively small sites located beneath currently operating facilities. The amount of contaminated soil for the 4 sites within this group is estimated to be approximately 1600 yds^3. Ultimate disposition (D&D) for the facilities above these sites has not been determined. Decisions concerning the D&D of these facilities may result from the analysis being conducted for the Idaho HLW & FD EIS and the RCRA/HWMA closure plans for Interim Status Units. In order for the soils within this group to be removed, the building would need to be removed. Should the facilities be left in place, an engineered containment structure (Cap) may be constructed over the site, if necessary, to prevent the contamination from leaching and migrating the SRPA. Currently, in-situ stabilization is not anticipated for these sites unless it is necessary prevent leaching and subsidence. If the buildings were removed, the contaminated soil would be removed and disposed.

Comment 155 : A Commentor made the following observations on Group 2: To even consider it seems premature. We're kind of putting the cart before the horse. We're making decisions now on how the soils are going to be dealt with when no decision has been made and how the building is going to be dealt with. It seems to me the logical thing to do is to decide what's to be done with the building, probably on a case-by-case basis. What are we going to do with 603? Are we going to tear it down? Cap it over? Take the pieces away, whatever? And then having made that decision, we'll have -- we can say, "What are we going to do about the soils?" [DK-TT]

Response: The Commentor is correct in that a decision concerning the disposition of the soils under the buildings are being made prior to the decision on the disposition of the facilities. The known scope of the FFA/CO for WAG 3 was evaluated within the OU 3-13 RI/ FS for a comprehensive evaluation. The sites within Group 2 are identified scope in the FFA/CO. Ultimate disposition (D&D) for the facilities above these sites has not been determined. Decisions concerning the D&D of these facilities may result from the analysis being conducted for the Idaho HLW & FD EIS and the RCRA/HWMA Closure Plans for Interim Status Units. Currently, there are several alternatives (removal [i.e., clean closure], risk based closure [partial removal], and landfill [capping]) being evaluated for various facility dispositions under tile Idaho HLW & FD EIS. In order for the soils within this group to be removed, the building would need to be removed. Should the facilities be left In place, an engineered containment structure (Cap) will be constructed over the site to prevent the contamination from leaching and migrating the SRPA. If the buildings were removed, the contaminated soil would be removed and disposed. The Agencies believe sufficient information is available to select the contingent remedy.

Comment 156 : A Commentor offered the following recommendation regarding Group 2 C Soils under Buildings and Structures. Again, characterization is incomplete. I suggest it be completed before being presented to the public. [U-W]

Response: For the Soils Under Buildings group, there is incomplete knowledge concerning the contaminants, both radionuclide and non-radionuclide, and their corresponding concentrations. Development of the source terms evaluated was based on process knowledge. This process knowledge involved the waste stream released along with an estimate of the volume. For two of the sites (CPP-87 and -89), sampling data was also used in the development of the source terms. Additional characterization activities will be conducted during the D&D of the various facilities. This additional information will be used in the planning of final D&D activities.

C.2.1. Group 2 Description

Comment 157 : A Commentor questioned, "please define the difference between hazardous and radioactive releases." [U-W]

Response: Hazardous releases are releases of waste containing non-radionuclide contaminants. Metal and organic contaminants are considered to be hazardous constituents. Radioactive releases are releases of waste containing radionuclide constituents. For many releases both hazardous and radioactive constituents are present in the waste material.

C.2.2. Group 2 Alternatives

Comment 158 : A Commentor questioned, "I guess I just want to stress for the scoping, again, to quantify -- I mean, the list goes to plutonium-239 and through the whole gamut, there, of the soil under the building group. I was a little confused there, but it does look -- since you're moving the stuff out of the wet area, so to speak, that you couldn't actually go down and excavate the soil. Is that being studied?" [PR-TT]

Response: The wet area, CPP-603 is divided into a wet side and a dry side. The spent nuclear fuel is being removed from the wet side. The site of concern is beneath the dry side of CPP-603. Removal of the spent nuclear fuel from the dry side is expected to be completed prior to 2035. The D&D of the CPP-603 facility is not part of OU 3-13. However, further analyses of cumulative impacts from the CPP-603 building will receive consideration by the HLW & FD EIS.

Comment 159 : A Commentor felt that it's not clear that even if the building is dismantled completely and taken away, that all buildings will be dealt with -- the soil will be dealt with in the same way. So, if I were doing it, I would just strike Group 2 from the plan entirely because, in fact, no decision has been made. You're saying that when some other decision was made, we're going to apply this decision we've made now. That doesn't make any sense. [DK-TT]

Response: The Commentor is correct in that decisions under the OU 3-13 project will be made prior to the decisions concerning the facility being made. The known scope of the FFA/CO for WAG 3 was evaluated within the OU 3-13 RI/FS for a comprehensive evaluation. The sites within Group 2 are identified scope in the FFA/CO. Ultimate disposition (D&D) for the facilities above these sites has not been determined. Decisions concerning the D&D of these facilities may result from the analysis being conducted for the Idaho HLW & FD EIS and RCRA/HWMA Closure Plans for Interim Status Units. Should the facilities be left in place, an engineered containment structure(Cap) will be constructed over

the site to prevent the contamination from leaching and migrating to the SRPA. If the buildings were removed, the contaminated soil would be removed and disposed.

Comment 160 : A Commentor felt that the alternative for Group 2 soils is the No Action Alternative because no action is going to be done as a result of this decision. I mean, if we accept the recommended alternative, what is going to happen? The answer is, absolutely nothing until some other things happen. And if we tear the building down, haul it away, it's not clear that digging up the soil is the right thing. Maybe entombing and capping it is the right thing. That's not clear. They're related items. You can't make a decision like that. So we're making decisions which could be wrong decisions. [DK-TT]

Response: It appears that we confused the Commentor. The preferred alternative is not a No Action Alternative, but a staged alternative. The first part of the alternative would consist of establishing and implementing the monitoring requirements and implementing the other controlling actions. The second part of the alternative would be the construction of the engineered containment structure (cap) over the contaminated site to prevent the contamination from leaching and migrating to the SRPA following the D&D of the facility, if the facility is closed in place. If the buildings were removed, the contaminated soil would be removed and disposed. Concerning whether it is the right thing to do to remove the contaminated soil if available, it is more cost-effective and risk reducing to remove and dispose of the contaminated soils. Ultimate disposition (D&D) for the facilities above these sites has not been determined. Decisions concerning the D&D of these facilities may result from the analysis being conducted for the Idaho HLW & FD EIS, and RCRA/HWMA Closure Plans for Interim Status Units. Based on the evaluations conducted, construction of an engineered containment structure (cap) appears to be the correct decision if the building is left in place following completion of the D&D. However, if new information became available, changes to the alternative could be considered and implemented as necessary.

Comment 161 : A Commentor wanted the heading for Group 2 Soils to clearly identify the contingent nature of the decision. [U-W]

Response: Alternative 2 is the selected remedy under this ROD. The selected D&D alternative for these facilities have not been selected at this time. If the facility were removed during the D&D activities, the soils would be excavated and disposed in an appropriate disposal facility. This contingency was discussed in the Proposed Plan (Alternative 3).

Comment 162 : A Commentor had a question regarding the Soils under Buildings and Structures. What is the anticipated cost of implementing Alternative 2 AND then Alternative 3, after D&D? Will money be available to cover later need for Alternative 3? Will it be WAG 3 money, or will it be D&D money? Or some other fund? [U-W]

Response: The selected remedy is an "either or," not a "both" selected remedy. Implementation of the remedial action would be initiated following the D&D activities. If Alternative 2 is implemented, the cost would be $17.9M. For Alternative 3, the cost would be $13.0M.

C.3. Group 3: Other Surface Soils

Comment 163 : A Commentor had a question regarding a statement in the Proposed Plan that states, “some sites (e.g., CPP-36 and -91) have contamination greater than 10 feet B.S. Are there more? If so, list them. If not, why vaguely say "some" when the specific number is actually known. [U-W]

Response: Yes, many of the sites have contamination below 10 feet. Both Sites CPP-36 and -91 were specifically pointed out as they have significant contamination present below the 10 feet depth. However, most of the sites do not have significant contamination below 10 feet. A description of the nature and extent of contamination (including depth of contamination) at these soil sites is included in Section 5 of this ROD.

C.3.1. Group 3 Description

Comment 164 : A Commentor noted that "non radionuclide contaminants" are included in the COCs. Please state whether these soils are contaminated with RCRA listed waste or exhibit a characteristic of hazardous waste. This is important to determine how much hazardous waste is being proposed for disposal in the ICDF. [C-W]

Response: The COCs were developed from a risk assessment standpoint. Some release sites may have concentrations of "non radionuclide contaminants" high enough to qualify as RCRA characteristic waste. In addition, some release sites have listed waste code issues. The sites with the listed waste code issues are presented in Appendix G of the FS Report. Also, Appendix C of the FSS Report contains information on the candidate materials for disposal in the ICDF, including "non radionuclide contaminants."

Comment 165 : A Commentor had a question regarding whether soils pass or fail TCL? Is lead greater than 400 p.m.? [C-W]

Response: Sampling analysis conducted under the CERCLA program generally analyzed for total constituent concentrations. This analysis is not the same as the Toxic Characteristic Leaching Procedure (TCL) sampling analysis conducted for hazardous waste characterization processes. There is a method to convert total metal analysis results to TCL results for initial characterization. Under this method, there are release sites at INTEC that are potentially RCRA characteristic. Future sampling analysis would be conducted for final waste characterization. None of the release sites under this ROD have concentrations of lead at or exceeding 400 mg./kg.

C.3.2. Group 3 Alternatives

Comment 166 : A Commentor had a question regarding Other Surface Soils (Group3). The preferred Alternative 4-A is to excavate contaminated surface soils to a depth of ten feet. A review of the RI/FS Appendix C borehole sample data for Strontium-90 and Cesium- 137 shows that DOE's arbitrary ten foot depth would leave most of the contamination in place because it goes down generally to thirty feet. Unfortunately, there is not sample data for all of the sites in this group (and there should be), but at least four sites need to go to around 15 feet and four sites need to go to about 30 feet in order to recover the bulk of the contamination. Stopping at ten feet is not acceptable and is not supported by the data. To cite an example, CPP-36 has 50,000 pCi/g of Sr-90 and 200,000 pCi/g of Cs- 137 at fifteen feet of depth. [INEL-95/0056] A fixed health base cleanup standard is needed and then require DOE keep digging until the samples show that the contaminates do not exceed the standard is needed. [CB-W]

Response: It is recognized that there is contamination at depths below 10 feet. The 10 feet excavation depth was selected based on the residential scenario, which assumed a basement excavated to 10 feet, for evaluation in the RI BRA Report. This assumption was also used in the development of cost estimates and evaluations for the FS Report. Using this information, an excavation to 10 feet will result in protection for potential surface receptors. The residential basement scenario is also protective of future industrial or commercial construction. However, some sites have large amount of contamination below 10 feet. During the remedial design, the actual approach and excavation depths, which may go below 10 feet, will be determined to ensure that the SRPA is protected from the contaminants. Although the

remedial design may call for excavation to depth greater than 10 feet, we believe that the volume estimates are reasonable for evaluation purposes.

Comment 167 : A Commentor felt, whether these wastes are disposed of at the DOE site, or whether they are disposed of at the private disposal site, both of those options we believe should be looked at and whatever option that is selected, that disposal site should not be over the Snake River aquifer. [SR-TB]

Response: Both disposal at an on-site and off-site facility were evaluated. In the case of the off-site disposal facility, a commercial disposal facility was used for the evaluation. Although the area evaluated for the on-site disposal site is over the SRPA, the facility would be designed, constructed, operated, and closed so as to not adversely impact the aquifer. In addition, disposal in the on-site facility was determined to be much more cost-effective, without presenting unacceptable risk to the aquifer versus off-site disposal.

Comment 168 : A Commentor offered, "In relation to looking at the cost of disposal for public versus private disposal, we received the explanation earlier that off-site disposal would be markedly more expensive than an on-site solution. Suggest look at what the actual costs of these other off-site options for disposal might be. Particularly, if you're looking at comparing a newly developed DOE on-site disposal facility, which would include all the engineering work, all the contractor work, all the coordination among contractors and among government Agencies, essentially that it be a fully loaded cost estimate, not simply the cost of disposal once the place was opened and ready to accept waste. That it really be a fully loaded cost, to consider all the development expenses including the government Agencies involved, if those costs then become paired against private sector options and also existing DOE facility options." [SR-TB]

Response: Both disposal at an on-site and off-site facility were evaluated. In the case of the off-site disposal facility, a commercial disposal facility was used for the evaluation. For the off-site disposal facility, the actual DOE cost of previous disposal activities, such as the disposal fee and transportation costs, along with other cost items were considered in the cost estimate. The on-site disposal cost estimate considered the cost of design, construction, operation, closure, and monitoring (i.e., fully loaded cost estimate) of the disposal cells for the ICDF. Following the development of the cost estimates, on-site and off-site were compared. The cost estimates, along with the assumptions, are contained in Appendix A of the FSS Report, which is contained in the Administrative Record. Generally, the disposal cost at other DOE facilities is comparable or higher than disposal at commercial disposal facilities. However, waste acceptance criteria allows the other DOE facilities to accept waste that is not acceptable at commercial disposal facilities.

Comment 169 : A Commentor recommended that the Agencies reject any alternative that would involve the disposal of cleanup materials on the site over the sole source aquifer. Propose using an off-site commercial company. [SR-TB]

Response: We thank the Commentor for the comment. Both disposal at an on-site and off-site facility were evaluated. In the case of the off-site disposal facility, a commercial disposal facility was used for the evaluation. Although the area evaluated for the on-site disposal site is over the SRPA, the facility would be designed, constructed, operated, and closed to not adversely impact the aquifer. In addition, disposal in the on-site facility was determined to be much more cost-effective without increased risk to the aquifer versus off-site disposal.

Comment 170 : A comment about the 10-foot basement scenario. "In the plan, again, there is a limit, in writing, of 10 feet. You've told us otherwise here orally, but what we go by is what is in writing and what we can cite, so there needs to be -- I think the whole plan needs to be written, rewritten, and resubmitted to show your true intent about what you're going to do with this stuff and that you're not going to stop at

10 feet just because it's 10 feet. You're only going to stop when you reach a level that won't continue to impact the perched water or the aquifer below whatever global limitations you've got there." [CB-TM]

Response: It is recognized that there is contamination at depths below 10 feet. The 10 feet excavation depth was selected based on the residential scenario, which assumed a basement excavated to 10 feet, for evaluation in the RI/BRA Report. This assumption was also used in the development of cost estimates and evaluations for the FS Report. Using this information, an excavation to 10 feet will result in protection for potential surface receptors. However, some sites have large amount of contamination below 10 feet. During the remedial design, the actual approach and excavation depths, which may go below 10 feet, will be determined to ensure that the SRPA is protected from the contaminants. Although the remedial design may call for excavation to depth greater than 10 feet, we believe that the volume estimates are reasonable for evaluation purposes.

Comment 171 : One Commentor recommended that we refine off-site waste disposal cost estimates based on input requested from the various commercial disposal service providers. Respondents should be provided with updated volume and waste type projections for all INEEL waste streams reasonably likely to require disposal, and be asked to identify closure, post-closure care, general and administrative overhead and other fees included in their estimates. Verify that full life-cycle costs (including closure, post-closure care and monitoring, general and administrative expenses. etc.) are included in cost estimates for on-site DOE disposal. This will allow meaningful comparison with "fully loaded" off-site disposal costs. To further promote "apples to apples" comparisons, costs for Chem Plant disposal alternative should explicitly present the cost of an on-site facility sized to handle the same 83,000 cubic yards of waste analyzed for off-site burial. I believe that these analytical refinements will reveal a much smaller differential between on-site and off-site disposal costs. [L-W]

Response: The cost estimates performed in the Feasibility Study do reflect actual costs from previous DOE disposal activities. These estimates are preliminary, order of magnitude estimates and will be refined as remedial design progresses. The estimates conform with Office of Management and Budget (OMB) Circular A-94 guidelines and the NCP for comparison of life-cycle alternative costs.

Comment 172 : A Commentor noted CPP-36 and -91 have contamination that reaches to the basalt, about 40-ft bgs. Thus the risk from this soil can be attributed to direct exposure only for that soil which is between 0-10 ft bgs. Is there another, viable, risk pathway for the soil below 10 ft bgs? If not, the proposed remedial action need not address the deeper soil contamination. [C-W]

Response: It is recognized that there is contamination at depths below 10 feet. The 10 feet excavation depth was selected based on the residential scenario, which assumed a basement excavated to 10 feet, for evaluation in the RI/BRA Report. This assumption was also used in the development of cost estimates and evaluations for the FS Report. Using this information, an excavation to 10 feet will result in protection for potential surface receptors. The residential basement scenario is also protective of future industrial or commercial construction. However, some sites have large amount of contamination below 10 feet. During the remedial design, the actual approach and excavation depths, which may go below 10 feet, will be determined to ensure that the SRPA is protected from the contaminants. Although the remedial design may call for excavation to depth greater than 10 feet, we believe that the volume estimates are reasonable for evaluation purposes.

Comment 173 : A Commentor asked, since soil will be excavated to a depth of 10 feet and covered with "clean" fill and no mention is made that this alternative will, or will not, be protective of groundwater. Contamination, at depth, seems to be a threat to groundwater the tank farms. Why is similar contamination. not a threat to groundwater at these sites? [C-W]

Response: It is recognized that there is contamination at depths below 10 feet. The 10 feet excavation depth was selected based on the residential scenario, which assumed a basement excavated to 10 feet, for evaluation in the RI/BRA Report. This assumption was also used in the development of cost estimates and evaluations for the FS Report. Using this information, an excavation to 10 feet will result in protection for potential surface receptors. However, some sites have contamination below 10 feet. Groundwater fate and transport modeling from the Group 3 sites indicated that groundwater risk from these sites is acceptable. However, during the remedial design, the actual excavation depths may go below 10 feet. Although the remedial design may call for excavation to depth greater than 10 feet, we believe that the volume estimates are reasonable for evaluation purposes.

Comment 174 : A Commentor wanted the Agencies to consider above ground containment. Basically, I want you to include in your impact statement and scoping studies the Nevada study that came out last year on the transportation of plutonium into the water supply. The actual individual doses of plutonium if inhaled, resuspended, pumped up, integrated, and inhaled. I think, if you study it correctly, you will see that containment above ground in barrels not only provides jobs for the INEEL, but it is the total best way to contain it. It seems to me you're always in these cleanup projects ignoring the fact that the material would require 240,000 years [10X half-life] for plutonium management. [PR-TT]

Response: Containment of the waste above ground is a possible option that was not studied. There are a number of factors that limit the cost effectiveness and risk effectiveness of above ground storage. As the waste being considered for the ICDF is a large volume with relatively low concentrations, a very large facility would need to be constructed. In addition, the waste would have to be packaged and monitored periodically. Both of these operation would increase the amount of exposure that workers would receive. In addition, there would be an increase in the amount of exposure to the public. With containment above ground, the containers would be required not to leak any material and this would require periodic repackaging. Based on these issues, containment in an above ground facility eliminated from detailed analysis in the feasibility study.

Concerning the material used in the EIS, relevant documents used in the development of the analysis and decision making will be included into the Administrative Record. Evaluation of the ICDF is being conducted as part of a CERCLA investigation and decision making process and with CERCLA being functionally equivalent to the NEPA process, no additional scoping or NEPA is required for the ICDF.

Regarding the time required for the risk from plutonium to become acceptable, the ICDF would be designed to protect the SRPA for both short and long-term impacts. In the case of surface receptors, the engineered containment structure (cap) would be designed and constructed to last for at least 1,000 years. Also, there would be long-term surveillance and monitoring to detect releases from the disposal cells. This would allow for corrective actions to be implemented to correct problems, if necessary.

Comment 175 : Another Commentor added that "not everybody would agree that things up above ground is a safer configuration. It's subject to fire, floods, personnel exposure doing inspections. So if you integrated exposure over time, it's going to be much greater than that which is buried, and they have no exposure pathways." [A-TT]

Response: We agree with the Commentor.

Comment 176 : A Commentor wondered, since at some sites, the contamination extends downward through 40 feet, why is only 10 feet going to be cleaned up? [U-W]

Response: The Commentor is correct in pointing out that there is contamination below 10 feet. An excavation depth of 10 feet was used for the residential basement scenario in the RI/BRA evaluations. In

developing and analyzing the alternatives for the FS, the 10 feet depth was used. This 10 feet depth is protective for surface receptors. During the remedial design, the actual approach and excavation depths, which may go below 10 feet, will be determined to ensure that the SRPA is protected from the contaminants. Although the remedial design may call for excavation to depth greater than 10 feet, we believe that the volume estimates are reasonable for evaluation purposes.

C.3.3. INEEL CERCLA Disposal Facility (ICDF)

Comment 177 : A Commentor wanted to know, if this disposal facility is built, radioactive, mixed and toxic wastes would likelv be directed there not only from INEEL but DOE facilities in other states as well. This concern is bolstered by my understanding that DOE is actively considering a regionalized disposal system, using two or three federal sites to be selected from a short list that includes INEEL. The contemplated disposal site would be very large, covering 54 acres with a capacity of more than 13 million cubic feet of waste. (By comparison, the eleven western states using the Richland, Washington commercial low-level radioactive waste disposal facility now ship about 100,000 cubic feet of waste per year). [L-W]

Response: We cannot emphasize enough that the ICDF is<u>only</u> for INEEL CERCLA cleanup waste disposal. These wastes already exist above the "sole source aquifer" and if not addressed will present a unacceptable risk if the INEEL land is developed for private use in the future. Waste acceptance criteria will be developed as part of the remedial design process. Only wastes which do not pose a threat of exceeding drinking water standards, or exceed a 1 in 10,000 excess carcinogenic risk in the underlying aquifer, whichever is more stringent, will be permitted to be disposed in the engineered landfill. WAG 3 CERCLA wastes that cannot be safety managed on INEEL will be disposed of in an off-site disposal facility in full compliance with state and federal laws and regulations. Generation of LLW in Western States is not relevant to CERCLA disposal at the INEEL INTEC. The referenced site in Richland Washington would not be suitable for the mixed LLW addressed in this ROD since it does not meet the rigorous design standards contemplated for the ICDF.

Comment 178 : A Commentor felt that the idea for an ICDF should be scrapped. That the Agencies, would site the facility above a sole source aquifer is ludicrous. Such a facility cannot be made "safe" for the many hundreds of years necessary for the radionuclides to decay. It cannot be made "safe" for the hazardous and polychlorinated biphenyl (PCB) wastes which will not decay and which will eventually leak and reach the aquifer. The double liners and leachate collection system merely delay the inevitable. [C-W]

Response: We disagree with the Commentor. The ICDF can be designed, constructed, operated, and closed while remaining protective of the SRPA. The ICDF would be designed to not adversely impact the SRPA. Waste materials (soils and debris) from INEEL CERCLA projects would be required to meet the acceptance criteria for ICDF. If treatment is necessary to meet the acceptance criteria, the waste would be treated prior to disposal. The engineered barrier (cap) will be designed to provide the long-term protection of both the surface receptors and the SRPA, even if the bottom liners were to fail.

Comment 179 : A Commentor noted the facility capacity is expected to be 510,000 yd^3 CERCLA is expected to use about 466,000 yd^3. What waste is expected to fill the remaining, seemingly excess, capacity? I trust that only CERCLA-related waste will be admitted to the facility. [C-W]

Response: For evaluation and analysis purposes, six disposal cells were considered. Both percolation ponds were included and evaluated as if retrofitted into two of the disposal cells. The remaining four disposal cells were all of the same size and shape. All six disposal cells were necessary to handle the potential candidate materials (soil and debris) and result in the excess capacity. The ICDF would be

constructed and operated one cell at a time. As the operating cell is approaching capacity, the next disposal cell would be constructed. Waste materials from only INEEL CERCLA projects would be acceptable for the ICDF, provided that the waste meets the acceptance criteria.

Comment 180 : Commentor noted the first paragraph gives an estimated volume of 82,000 yd^3 The third paragraph estimates a total volume of CERCLA waste at 466,000 yd^3. Subtracting, one finds that the Agencies plan on placing about 384,000 yd^3 of waste from other sites. Please provide details of what these other sites might be. [C-W]

Response: The volume estimate of 82,000 yd^3 is for the soils contained in Group 3 (Other Surface Soils). In the evaluation of the ICDF, other INEEL CERCLA wastes (soils and debris) were considered. All of the candidate waste materials are discussed in Appendix C of the FSS Report. These other candidate waste materials could potentially come from the other WAGs at the INEEL. Only waste materials from INEEL CERCLA remedial and removal actions would be acceptable for disposal in the ICDF, provided that the waste meets the acceptance criteria.

Comment 181 : A Commentor noted that protection of this highly productive resource [SRPA] is essential to the future of Idaho's agricultural economy, as well as being a major source of drinking water for hundreds of thousands of Idaho citizens. Surely a better alternative could be secured for disposition of radioactive and chemical waste produced at the Idaho National Engineering and Environmental Laboratory. [IFBF-W]

Response: There are contaminated soils, both dispersed and uncontained, throughout WAG 3 and other locations on the INEEL that present a risk to the SRPA since the contamination currently exists in an uncontrolled environment. Based on this, contaminated soils at WAG 3 would require some type of remedial action to reduce the impact on the SRPA. As a result, remedial action alternatives are required to address the risks. Several alternatives, including the ICDF, were considered for the management of the INEEL CERCLA waste (soil and debris). These alternatives considered both on-site and off-site disposal along with containment in place. For the ICDF alternative, the soils would be excavated and disposed of in a engineered disposal facility. The engineered facility, ICDF, would consist of RCRA compliant disposal cells, which include lined cells with leachate collection and significant groundwater monitoring systems designed to provide protection of the SRPA. Based on the evaluation of the alternatives, it was determined that the on-site disposal of the INEEL CERCLA waste at the ICDF would be the most cost effective. while being protective of the environment, with the SRPA in particular. The ICDF is to manage only INEEL CERCLA waste.

We share the Commentor's sentiments that the SRPA is a resource is of immense importance to the state's agricultural economy, as well as providing the sole source of drinking water to residents along the plain. We also wholeheartedly agree that activities at the INEEL must be protective of human health and the environment, and comply with all applicable environmental laws and regulations. The comment expresses concern regarding the level of protectiveness of current and proposed disposal practices for radioactive material at the INEEL. Stringent waste acceptance criteria will be developed as part of the remedial design process. Only wastes which do not pose a threat of exceeding Idaho drinking water in the underlying aquifer will be permitted to be disposed in the engineered landfill. WAG 3 CERCLA wastes that cannot be safely managed on INEEL will be disposed of in an off-site disposal facility in full compliance with state and federal laws and regulations.

Comment 182 : A Commentor recommended that when you open the 26-acre plutonium dump, low level as it may v be, it is better in the long run to simply contain this material in barrels, at this point they estimate 400 years, at which point you can rebarrel them. It is cheaper. It just takes so little inspection to keep this stuff above ground. What I think you-all are is in denial of the eventual end point. You are

svstematically looking for closure on these cleanup projects as opposed to admitting that we have to contain this material above ground. [PR-TT]

Response: Containment of the waste above ground is a possible option that was not studied. There are a number of factors that limit the cost effectiveness and risk effectiveness of storage above ground. As the waste being considered for the ICDF is a large volume with relatively low concentrations, a very large facility would need to be constructed. In addition. the waste would have to be packaged and monitored periodically. Both of these operations would increase the amount of exposure that workers would receive. In addition, there would be an increase in the amount of exposure to which the public could be exposed. With containment above ground the containers would be required not be leak any material and this would require periodic repackaging. Based on these issues, containment in an above ground faculty does not make since from a risk or economical standpoint. For disposal in an engineered disposal facility, the material would be contained and not require continued repackaging or inspection. However, there would be long-term surveillance and monitoring to detect releases from the disposal cells. This would allow for corrective actions to be implemented to correct problems, if necessary.

Comment 183 : A Commentor wanted assurance that there will not be waste brought in from outside of INEEL to go in under any circumstances. [DK-TT]

Response: The only wastes that will be candidates for the ICDF will be from INEEL CERCLA projects. In addition, the authorization for disposal at the ICDF from other WAGs would need to be in the WAGs respective RODs, which will be subject to same the community involvement activities as OU 3-13.

Comment 184 : A Commentor recommended that the ROD include much more detailed information about the ICDF. [CAB-W]

Response: The Proposed Plan contained only summary level information concerning the remedial action alternatives. In the FS and FSS Reports, the details concerning the alternatives were presented. For the ICDF, additional information is contained in this ROD dealing with the conceptual alternative, implementation, and other considerations. The remedial design will contain the detailed information concerning the design and construction of the ICDF.

Comment 185 : A Commentor recommended that the ROD outline the exact location and size of each of the six cells planned for the ICDF and describe how each will be constructed, used, and closed. [CAB-W]

Response: This ROD identifies the area adjacent to the current percolation ponds as the location selected for the ICDF. The exact location and design along with sizing will be developed during the remedial design activities. This ROD discusses the criteria that will be used to determine compliance with the requirements during the construction, operation, and closure activities for the ICDF.

Comment 186 : The INEEL CAB recommends that the ICDF be constructed, filled, and closed using the phased approach referred to in presentations to the Board. We would like to see the ICDF to be as small and manageable as possible yet we noted no description of the phased approach in the Proposed Plan. We recommend that the ROD include detailed information about how the phased approach will be implemented. [CAB-W]

Response: The use of a phased approach is included into this ROD. Under this ROD, the expected INEEL capacity needed will be constructed. Selection of disposal in the ICDF for non OU 3-13 soils and debris will be covered under other CERCLA decision documents. Tile remedial design will define the

actual design with a goal of minimizing the area used for the ICDF disposal cells. Also, this ROD discusses both the general approach and how the phased approach will be implemented for the ICDF.

Comment 187 : A Commentor wanted to know why is the area near INTEC selected as the proposed location, as opposed to another location on the INEE? What administrative and engineering controls would be utilized to prevent possible future contamination of the Snake River Aquifer, and how would you know if that contamination originated from the new disposal facility or existing sources of contamination underneath or near the INTEC. [MS-W]

Response: This ROD is dealing with contaminated soils and debris from INTEC. An evaluation was performed concerning the use of a centralized disposal facility for dealing with all INEEL CERCLA soils and debris. This evaluation is presented in the FSS Report. The largest volume of contaminated soil and debris are located at INTEC. Based on this, an area at INTEC was selected for the disposal facility. In addition, there was a desire to limit the location of the ICDF to areas that have already been contaminated from past practices at the INEEL. The disposal facility will be engineered to prevent unacceptable impacts on the SRPA. From the engineering (design) work, the waste acceptance criteria would be developed. Administrative controls would be implemented to ensure that the waste disposed in the facility would be within the acceptance criteria. A monitoring network will be developed for the disposal facility to monitor contaminant migration directly beneath the disposal facility. In addition, monitoring would be conducted upgradient of the disposal facility. This would allow for determining whether the contamination is from the disposal facility or from the INTEC area.

Comment 188 : A Commentor want to know why is the area near INTEC selected as the proposed location, as opposed to another location on the INEEL? What administrative and engineering controls would be utilized to prevent possible future contamination of the Snake River Aquifer, and how would you know if that contamination originated from the new disposal facility or existing sources of contamination underneath or near the INTEC. [MS-W]

Response: This ROD is dealing with contaminated soils and debris from INTEC. An evaluation was performed concerning the use of a centralized disposal facility for dealing with all INEEL CERCLA soils and debris. This evaluation is presented in the FSS Report. The largest amount of contaminated soil and debris are located at INTEC. Based on this, an area at INTEC was selected for the disposal facility. In addition, there was a desire to limit the location of the ICDF to areas that have already been contaminated from past practices at the INEEL. The disposal facility will be engineered to prevent unacceptable impacts on the SRPA, From the engineering (design) work, the waste acceptance criteria would be developed. Administrative controls would be implemented to ensure that the waste disposed in the facility would be within the acceptance criteria. A monitoring network will be developed for the disposal facility to monitor contaminant migration directly beneath the disposal facility. In addition, monitoring would be conducted upgradient of the disposal facility. This would allow for determining whether the contamination is from the disposal facility or from the INTEC area.

Comment 189 : A Commentor wanted the Agencies to describe the types of waste that you anticipate would be disposed in this cell, and what types would need to be sent to off site facilities. Also, what is your estimate of the hazard to workers as a result of operating this facility? What is the cost comparison for on site disposal versus off site disposal at a commercial facility or other off site facility; and finally. are you accepting waste from off the INEEL for disposal at this facility'? [NIS-W]

Response: Waste material generated as a result of [NEEL CERCLA projects are being considered as candidate material for disposal. This includes both contaminated soils and debris. Appendix C of the FSS Report (DOE. ID- 10619) discusses the waste considered for disposal. Within the candidate materials are wastes that preliminarily are categorized as hazardous. low-level radioactive, mixed low-level

radioactive waste. Only waste that meets the acceptance criteria would be disposed in the disposal cells. Materials not meeting the acceptance criteria would require other disposal facilities, generally off-site. Hazards to workers implementing the operation of the disposal facility would be controlled to be within the applicable radiation (DOE Orders) and non-radiation (OSHA) standards. In the evaluation of alternatives, both on-site and off-site disposal were considered as alternatives. The cost of off-site disposal was estimated to cost approximately 3 times as much ($477 million additional) for off-site disposal at a commercial disposal facility for all candidate materials. For the waste material considered in OU3-13, the cost of off-site was estimated to cost approximately 3 times as much ($154 million additional) for off-site disposal at a commercial disposal facility. Evaluation of the cost of disposal at an off-site DOE facility, such as the Nevada Test Site, was not conducted. However, a major cost component for off-site is disposal is the transportation costs associated with transporting the waste to the off-site disposal facility. As such, the cost of disposal at another DOE facility would be much greater than disposal in the new on-site disposal facility. **No waste** from off the INEEL will be considered for disposal in the ICDF.

Comment 190 : A Commentor wanted to express concern over the plans for a radioactive waste disposal site above the SRPA. I am totally opposed to this plan because of the potential environmental damage it could do and the health hazards it may generate. [BR-W]

Response: Protection of the SRPA is of major importance. The ICDF can be designed, constructed, operated, and closed while remaining protective of the SRPA. Limits will be place on materials that are acceptable for disposal in the ICDF. Waste materials (soils and debris) from INEEL CERCLA projects meeting the acceptance criteria would be candidate materials for disposal in the ICDF. If treatment is necessary to meet the acceptance criteria, the waste would be treated prior to disposal. For waste that cannot meet the acceptance criteria (with treatment), off-site disposal would be utilized.

Comment 191 : A Commentor wanted to know why can't the waste proposed to be sent to the ICDF be sent instead to the RWMC? Does it have to do, specifically, with (a) cost? Or (b) concentration? Or (c) specific contaminants contained (how could they be less dangerous at ICDF than at RWMC?) Or (d) RWMC capacity? Doesn't RWMC have capacity for more waste? [U-W]

Response: Some of the waste anticipated to be disposed of at the ICDF could be disposed at the RWMC. However, much of the waste volume considered for ICDF has RCRA issues (listed or potentially characteristic). The RWMC is not designed to meet RCRA Subtitle C standards, or permitted to accept listed hazardous waste. Also, the RWMC will be closing prior to completion of the remedial actions generating the waste considered for the ICDF. The RCRA issue is being dealt with for ICDF by the design being a facility meeting, or exceeding, the RCRA Subtitle C minimum technical requirements. The cost of packaging LLW without disposal at the RWMC is greater than the total cost of disposal at the ICDF. The waste acceptance criteria will be determined during remedial design. Once the design is completed, the waste acceptance criteria may be developed and fate and transport modeling will be conducted to ensure that ARARs are met and that the facility will not result in exceeding drinking water standards at the SRPA, or a 1 in 10,000 excess cancer risks, whichever is more stringent.

Comment 192 : A Commentor asked, if the ICDF (is presented here, a plan so vague and unprotective it can be most succinctly described as a crazy idea) isn't built, will the Group 3 waste (and other WAG 3 waste, and other INEEL waste) be sent to the RWMC? If not, why not, exactly? Wouldn't the cost of storage at RWMC be cheaper than transporting to a commercial off-site facility and paying their fee? [U-W]

Response: The ICDF has been selected as the remedial action for Group 3. If the ICDF had not been selected, some waste, including some WAG 3 wastes, could potentially be disposed of at the RWMC.

provided that the waste meets the acceptance criteria. Waste with RCRA issues (listed or characteristic) cannot be disposed of at the RWMC.

C.3.3.1 ICDF General Comments

Comment 193 : A Commentor felt that there remain major uncertainties related to the siting location of the ICDF and the waste acceptance criteria. [CB-W]

Response: The ICDF will be designed and constructed to be protective for the SRPA and surface receptors. Additionally the facility will be designed to meet, or exceed, the Minimum Technical Requirements (MTRs) for a RCRA Subtitle C hazardous waste landfill. Materials being disposed of in the ICDF will be required to meet the WAC, which will be developed to be protective of the SRPA for both short and long-term impacts. Part of the remedial design activities will involve the siting of the disposal cells in the selected ICDF area. The site selection activities will consider relevant technical, regulatory, and financial factors. Based on these criteria, the best location(s) will be selected for the disposal cells in the ICDF area, The waste acceptance criteria will be finalized following the remedial design and may result in limits of disposal activities and masses or may require pretreatment of selected wastes prior to disposal.

Comment 194 : A Commentor stated, "Obviously, one of the more important things within the current plan that is a departure from the draft is a commitment to construct the subtitle C RCRA compliant ICDF. That is a major step forward, and we're very encouraged by that." [CB-TM]

Response: An evaluation of whether the wastes are subject to RCRA Subtitle C was made in the FSS Report, which is part of the Administrative Record. It was determined that there was a significant amount of INEEL CERCLA soils and debris having contaminants other than and in addition to radionuclides. Management of the non-radionuclides is subject to the RCRA requirements. Based on this, it was decided that a facility that would be compliant with the RCRA Subtitle C requirements would be needed to manage and dispose of the soil and debris wastes. With this information and analysis, the construction of a disposal facility compliant with RCRA Subtitle C requirements became the preferred alternative.

Comment 195 : A Commentor noted that under the Plan's off-site disposal alternative, only about 2.2 million cubic feet of generally homogeneous soil wastes would require burial. Leveraging this much smaller burial need to justify building 13 million cubic feet of disposal capacity for an unspecified mix of heterogeneous wastes from multiple locations is particularly imprudent, given the high value groundwater resource placed at risk. [L-W]

Response: The 2.2 M ft^3 referred to by the Commentor relates to WAG 3 soils only. If no other soils except WAG 3 soils were disposed of at the ICDF, it would still be cost effective to do this consolidation. This conclusion is supported by information available in the Administrative Record. Consolidation improves our ability to retain administrative controls over one large area versus numerous smaller areas resulting in economies for small and large volumes.

Comment 196 : One Commentor recommended that we reject the currently preferred alternative of building a new disposal facility at Chem Plant or other location overlying the SRPA. A commercial radioactive waste disposal facility could not be licensed here, and the government should not adopt a lower standard for protection of this vulnerable, high-value natural resource. If necessary, excavated wastes can be stored pending identification of a permanent sound solution. [L-W]

Response: Based on our evaluation the most cost effective solution which is protective of the aquifer is Alternative 4a (ICDF), based on the design requirements and stringent waste acceptance criteria that will be applied for this action. Given the type of waste that will be accepted by the ICDF, we see no impediments to a privatized mixed low-level facility at this location in compliance with state and federal siting and design laws if in the future a new facility is needed for other waste disposal.

Comment 197 : A Commentor wanted to know exactly which other release sites at INEEL might be allowed to dispose of material at the ICDF, and what type of contaminants and media might be disposed from these other sites? [U-W]

Response: This ROD has selected an on-site disposal facility for WAG 3. Future Records of Decision may specify on-site disposal as the selected remedy and the ICDF will be expanded as necessary. The ICDF will be constructed to dispose of both soils and debris. Potential candidate materials along with waste type are found in Appendix C of the FSS Report.

C.3.3.2. ICDF Siting

Comment 198 : A Commentor remarked that dumping the waste on top of the ground and mounding the cover over it will result in the cap eroding over the long-term which again is unacceptable. DOE must designate another location for the ICDF that is not near a flood plain and preferably not over the aquifer. DOE's own study has identified at least two such sites where the Lemi Range meets the Snake River Plain [CB-W]

Response: Waste will not be placed into the ICDF by placing the waste on the ground and then mounding over the waste. The ICDF will consist of disposal cells where waste will be disposed and traceability of wastes will be maintained. Following filling of a disposal cell, the cell will be closed by constructing an engineered containment barrier (Cap) over the cell, which would be designed to control erosion, infiltration, and intrusion. The proposed location of the ICDF is not within the floodplain. A siting evaluation was conducted as part of this ROD to identify the best on-site location for the ICDF. This evaluation looked at siting criteria developed for solid waste, hazardous waste, PCB waste and LLW landfills. The two locations identified in a previous study, which are not over the SRPA on the INEEL, have other problems (near fault lines, on the side of a mountain, etc.), making them unsuitable. In addition to location, the ICDF will be designed, constructed, and operated to maintain protection of the SRPA.

Comment 199 : A Commentor was concerned that water sample data at the ICPP already showed massive migration of pollution into the groundwater and that the choice to locate it at the ICPP was misguided. [CB-W]

Response: There is a contaminated groundwater plume beneath the INTEC (ICPP), which was primarily a result of the use of an injection well, which introduced contaminants directly into the SRPA. Use of the injection well was discontinued in 1986 and the injection well was permanently closed using a pressured grouting technique in 1989. Restoring the aquifer to drinking water quality will be addressed by the Group 5 (Snake River Plain Aquifer) remedial alternative. The potential impact to the SRPA from the ICDF is dependent upon the design, construction, operation, and closure of the landfill. In addition, the ICDF will be restricted in both the types of contaminants and wastes that it can accept. As a result, we feel that construction of the ICDF at INTEC is an appropriate location.

Comment 200 : A Commentor stated that given the type of hydrogeologic environment, it would be impossible to meet the established federal requirements under the NRC 10 CFR, part 61, regulations governing commercial disposal of low-level radioactive waste on INEEL. [SR-TB]

Response: Unfortunately, we must disagree with the Commentor and apologize for the length of our response. However, this is a very important concern to the Agencies and deserves a detailed response. Under 10 CFR 61, a disposal facility can be constructed at INEEL over a sole source aquifer, provided it meets the criteria in the regulation, Although 10 CFR 61 is not considered an ARAR for this project, we have considered the substantive requirements in developing our siting evaluation. The relevant sections concerning siting criteria are contained in Subpart D (10 CFR 61.50), under which there are 11 criteria that must be satisfied. The criteria and how the ICDF will meet the criteria are discussed below.

Criteria 1: "...site suitability is given to isolation of waste, a matter having long-term impacts, and to disposal site features that ensure that the long-term performance objectives ... are met ..." As the ICDF will be designed, constructed, operated, and closed to not adversely impact the environment (SRPA and surface receptors) this criterion is satisfied. Both short and long-term impacts are being considered.

Criteria 2: "site shall be capable of being characterized, modeled, analyzed, and monitored." In conducting the RI/FS, the site was characterized, modeled, and analyzed. Additional characterization, modeling, and analysis will be conducted during the remedial design and development of the waste acceptance criteria. Monitoring of the site is a part of the operation and long-term management of the site.

Criteria 3: "... site should be selected so that projected population growth and future developments are not likely to affect the ability to meet the performance objectives ..." The proposed location for the ICDF is not currently near a residential or non-governmental industrial population and is located in an area of existing contamination (i.e., CPP-95).

Criteria 4: "Areas must be avoided having known natural resources which, if exploited, would result in failure to meet the performance objectives ..." The area of the ICDF will be controlled and restricted. In addition, the impacts on the aquifer will be minimized to not adversely impact the aquifer. There are no known natural resources that, if exploited, would impact the ability of the ICDF to meet this performance objectives.

Criteria 5: "... site must generally be well drained and free of areas of flooding or frequent ponding. Waste disposal shall not take place in a 100-year floodplain ..." The proposed area is not located within the 100-year floodplain. Also, the proposed area is not subject to flooding or ponding of water. In addition, the facility will be designed, constructed, operated, and closed, to minimize and mitigate the future impacts of potential flooding and ponding.

Criteria 6: "Upstream drainage areas must be minimized to decrease the amount of runoff which could erode or inundate waste disposal units." The proposed location is not near an upstream drainage area. In addition, the facility will be designed, constructed, operated, and closed, to minimize and mitigate the erosion and inundation of the disposal cells.

Criteria 7: "... site must provide sufficient depth to the water table that ground water intrusion, perennial or otherwise, into the waste will not occur." The depth of groundwater in the proposed area is approximately 460 feet below ground surface. Further, the location chosen is not inundated with perched water so no ground water intrusion into the waste fill will occur.

Criteria 8: "... hydrogeologic unit used for disposal shall not discharge groundwater to the surface within the disposal site." The proposed area currently has a discharge of groundwater near the proposed ICDF area (INTEC percolation ponds). However, as part of this ROD, these discharges will be discontinued prior to start of ICDF land filling operations. An alternate disposal system for the percolation ponds will be constructed, which will not impact the ICDF or perched water areas. In

addition, the facility will be designed, constructed, operated, and closed, to prevent the discharge of groundwater to the surface within the disposal site area.

Criteria 9: " Areas must be avoided where tectonic processes such as faulting, folding, seismic activity, or vulcanism may occur with such frequency and extent to significantly affect the ability to meet the performance objectives ..." The proposed location for the ICDF is not near faults, folds, or other seismic and , vulcanism areas that would occur with sufficient frequency or extent to impact the ability of the ICDF to meet the performance objectives.

Criteria 10: " Areas must be avoided where surface geological processes such as mass wasting, erosion, slumping, landsliding, or weathering occurs with such frequency and extent to significantly affect the ability to meet the performance objectives ..." The proposed area for the ICDF is a relatively flat area which is not subject to mass wasting, slumping, or landslides. For the ICDF, only the engineered containment structure (cap) is proposed to be above ground level and subject erosion or weathering. The facility would be designed, constructed, operated, and closed, to minimize and mitigate the effects of erosion and weathering to allow the ICDF to meet the performance objectives.

Criteria 11: "site must not be located where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives ... or significantly mask the environmental monitoring program." Activities at the INTEC facility will not impact the ability of the ICDF to meet its performance objectives. In fact, the location of the ICDF facilitates the cleanup and consolidation of contaminated soils and debris within the INTEC facility thus promoting continued use of INTEC.

Based on the above discussion, the Agencies believe that the ICDF will be able to meet the requirements of 10 CFR 61 and will provide the same level of restriction and protection as a commercial facility would be required to demonstrate. The ICDF design, construction, operation, to include stringent WAC, and its closure will cost-effectively reduce the footprint of contaminated soils at INEEL; freeing up much of the land for future unrestricted development.

Comment 201 : A Commentor stated that the INEEL CERCLA disposal facility at the Chem Plant is recognizably within the 100-year flood plain and will be located below the surface so that the wastes will be at an elevation that is going to be vulnerable to flooding even within the 100-year scenario. [CB-TM]

Response: The engineered containment barriers (Caps) for the ICDF will be designed to control erosion against floodwaters. Also, the proposed location is not within the 100-year floodplain. Further, the facility will be lined and capped to isolate wastes and remain protective of the SRPA for both short and long-term impacts.

Comment 202 : A Commentor stated that he objected to the ICDF because of the potential for future erosion over the long term. Also, as the 100-year flood assumes 7,260 cubic feet per second in the Big Lost River and the 500-year flood assumes 9,680 cubic feet per second, which is 34 percent more, the idea of putting -- of locating, of siting the ICDF in that region made no sense at all. [CB-TM]

Response: In deciding where to most cost-effectively site the ICDF, the Agencies performed a siting evaluation which is summarized in the ROD. The majority of the wastes we anticipate disposing of in the ICDF are relatively short-lived radionuclides, like Cs-137 and Sr-90 contaminated soil and debris. The concentrations of these contaminants will decrease by over five orders of magnitude (~1/200,000) within approximately 500 years from the date of disposal. The engineered containment barriers will be designed to control erosion, infiltration, and intrusion. In addition, we will evaluate historic high water elevations and potential future climatic events in our design assumptions to minimize eventual landfill leachate generation.

Comment 203 : A Commentor stated that the logical thing, from their point of view, was to site the ICDF off the aquifer but on the INEEL real estate. He identified sites at the base of the Lemhi Range where the Lemhi kind of terminates at the Snake River plain, which is off of the aquifer and not In a flood plain. So I think there are other locations for that particular facility that need to be included. [CB-TM]

Response: We share the Commentor's concerns about the need to protect the valuable groundwater resource of the SRPA. This is the reason that we have elected to require that the aquifer be restored to drinking water standards within a timeframe that it may be needed for future consumption. The evaluation of on Aquifer and off-Aquifer location for the facility was evaluated as was off-site commercial disposal. A primary reason that the ICDF is the selected alternative is the limitations we are placing on waste acceptable for disposal within this facility. The design and construction of the ICDF will further ensure that the landfill is conservatively designed so that leachate to the underlying sole source aquifer will never exceed drinking water standards. In addition, consolidation improves our ability to retain administrative controls over one large area versus numerous smaller areas. Concerning the Commentor's suggested location, there are several faults that surround the INEEL. In addition there are recharge zones for the SRPA that are not directly over the SRPA. Selection of the location for the ICDF considered a number of site selection criteria, including proximity to existing identified faults. This automatically ruled out locations near existing faults. Additional analysis concerning this issue was conducted for the new Three Mile Island Dry Storage Area.

Comment 204 : A Commentor remarked that the Proposed Plan called for construction of a new radioactive waste disposal facility overlying the SRPA, constructed near unlined radioactive liquid percolation ponds, which have already caused extensive contamination at the proposed location. [HC-W]

Response: Regarding the construction and location of the ICDF, an evaluation was conducted to determine the cost effectiveness of developing a centralized (consolidation) disposal facility for management of the INEEL CERCLA waste. This facility is to manage INEEL only CERCLA waste. There are contaminated soils, both dispersed and uncontained, throughout WAG 3 and other locations on the INEEL that present a risk to the SRPA due to less restrictive pathway in the current configuration. Based on this, contaminated soils at WAG 3 would require some type of remedial action to reduce an impact to the SRPA. As a result, remedial action alternatives, including the ICDF were developed and evaluated. For the ICDF alternative, the soils would be excavated and disposed of in a engineered disposal facility. The engineered facility, ICDF, would consist of RCRA compliant disposal cells, which include lined cells with leachate collection and significant groundwater monitoring systems designed to provide protection of the SRPA.

In the evaluation of the ICDF, the location that was selected is within the contaminated footprint of WAG 3. This has the effect of reducing, rather than expanding the overall contaminated footprint of the INEEL. The current percolation ponds at WAG 3 will be shut down. This will result in more protection to the underlying aquifer and will reduce public and environmental risk. Further, aquifer protection will be provided with required long term disposal cell, soil and groundwater monitoring which will signal any containment system failures and allow for additional remedies and,or corrective actions to be implemented to address the problem, if necessary.

Comment 205 : A Commentor stated that the SRPA is one of Idaho's crown jewels. This hugely productive "sole source" drinking water supply is also essential to the future of Idaho's agricultural economy. Experience has proven that the porous sand and gravel soils and fractured basalt geology overlying this world class water resource are insufficient protection against migrating chemical and radioactive contamination. Relying on man-made materials of potential unproven longevity to make up for unsuitable site conditions, as the Plan recommends, invites future environmental and economic problems. [HC-W]

Response: We share the Commentor's sentiment that the SRPA is one of Idaho's "crown jewels" and understand that this resource is of immense importance to the state's agricultural economy, as well as providing the sole source of drinking water to residents along the plain. We also wholeheartedly agree that activities at the INEEL must be protective of human health and the environment, and comply with all applicable environmental laws and regulations. The Commentor expresses concern regarding the level of protectiveness of current and proposed disposal practices for radioactive material at the INEEL Stringent waste acceptance criteria will be developed as part of the remedial design process. Only wastes which do not pose a threat of exceeding Idaho drinking water standards in the underlying aquifer will be permitted to be disposed in the engineered landfill. WAG 3 CERCLA wastes that cannot be safely managed on INEEL will be disposed of in an off-site disposal facility in full compliance with state and federal laws and regulations. The materials of construction for the ICDF will in large part be naturally occurring materials (e.g., clays, sands, and gravels).

Comment 206 : A Commentor asked the DOE to work with the Environmental Protection Agency and the State of Idaho to revise the Proposed Plan by steering away from the development of radioactive waste disposal facilities over the SRPA. The Plan and all future INEEL cleanup actions should reflect off-aquifer disposal as the preferred alternative for final disposition of contaminated materials excavated at the site. [HC-W]

Response: Only wastes which do not pose a threat of exceeding drinking water standards in the underlying aquifer will be permitted to be disposed in the engineered landfill. The WAG 3 CERCLA wastes that cannot be safely managed on INEEL will, as the Commentor requests, be disposed of in an off-site disposal facility in full compliance with state and federal laws and regulations.

Comment 207 : A Commentor felt that the "off-aquifer" disposal alternatives both within and outside INEEL's boundaries have not received sufficient study. [L-W]

Response: We share the Commentor's concerns about the need to protect the valuable groundwater resource of the SRPA. The ICDF is actually a significant reduction in the footprint of contaminated soil at INEEL INTEC facility, which already presents an unacceptable risk to the aquifer if no further action is taken. The on-Aquifer and off-Aquifer locations for the proposed facility were evaluated as was off-site commercial disposal. A primary reason that the ICDF is the selected alternative is the limitation we are placing on waste acceptable for disposal within this facility. Unlike typical commercial disposal facilities which take a huge variety of waste types from many different generators, the ICDF is limited to only INEEL CERCLA waste streams which could be managed in place and be protective to the aquifer. A primary reason for consolidation is the efficiency and economy of scale presented through consolidation. Based on our projections substantial monies may be saved to further other necessary remedial actions at INEEL. Further, the design and construction of the ICDF will ensure that the landfill be conservatively managed so that leachate to the underlying sole source aquifer will never exceed drinking water standards. In addition, consolidation improves our ability to retain administrative controls over one large area versus numerous smaller areas.

Comment 208 : A Commentor was concerned with siting the ICDF, and quoted EPA guidance concerning not siting hazardous waste facilities in sensitive locations. [L-W]

Response: The sensitivity of a location is dependent upon many factors. The design, construction and operation of the ICDF will not pose an unacceptable threat to the "sole source aquifer." Stringent waste acceptance criteria will further ensure that this requirement be met.

Comment 209 : A Commentor referenced the Joint EPA-Nuclear Regulatory Commission siting guidelines for mixed waste disposal stating that hydrogeology is considered vulnerable when groundwater

travel time along a 100-foot flow path from the edge of engineered containment structure is less than 100 years. [L-W]

Response: Based on the groundwater modeling we performed in the RI/FS, and the types of contaminants (e.g., Cs-137) which will be disposed of at the ICDF, it may take thousands of years for selected contaminants to migrate to the SRPA, assuming no hydraulic barriers are in place. Further, the travel times to the underlying SRPA are significantly increased in an engineered structure like the ICDF, which will be designed to impede transport of contaminants.

Comment 210 : A Commentor stated that, "The underlying eastern SRPA, formally designated a sole source aquifer by EPA in 1991, provides water used at the site and is an important economic resource for southeastern and south central Idaho. More than 3,000 people draw water from wells located within a 3-mile radius of the site. According to the Plan, regional groundwater now velocities 5 ft./day, and generally flows even more rapidly beneath the Chem Plant." [L-W]

Response: INTEC is located in the central portion of the INEEL with the nearest site boundary approximately 8 miles away. Groundwater extracted at the INEEL is carefully monitored to ensure that the workers are not being exposed to unacceptable levels of contamination from the consumption of SRPA groundwater. In addition, there are no nonworker populations (such as towns or other communities) within 3 miles of INTEC. The extent of contamination at INEEL emanating from WAG 3 has been mapped and measured for over 30 years. Sensitive studies of C1-36 have shown the downdgradient extent of the plume, which is measurable up to 8 miles from the INEEL border. No off-INEEL drinking water users, or potential users will be exposed to contaminant levels above drinking water standards. The action being taken under this ROD is to restore the aquifer underlying INEEL to drinking water standards, within a reasonable timeframe (i.e., 100 years).

Comment 211 : A Commentor stated that unforeseen releases would increase waste constituent concentrations in the area, resulting in drinking water standards being exceeded and further adverse effects from overlying perched water zones. The Commentor further stated that this circumstance could conflict with the NRC site suitability requirement that "disposal facility must not be located where nearby facilities could ... significantly mask environmental monitoring program." 10 CFR 61.50(a)(11) [L-W]

Response: The criteria referenced actually states: "The disposal site must not be located where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives ... or significantly mask the environmental monitoring program." The ICDF would be designed, constructed, operated, and closed, to not adversely impact the aquifer (SRPA) and surface receptors. For environmental monitoring, the monitoring system would be designed, constructed, operated, and maintained to determine the impacts on the aquifer from the ICDF. The actual design of both the disposal cells and monitoring network will be developed during the remedial design phase of the project.

Comment 212 : One Commentor recommended that we determine whether a technically suitable disposal location exists at the INEEL that is not underlain by the aquifer. If a suitable area exists, conduct health and environmental risk assessments and otherwise develop and evaluate this alternative on-site strategy. [L-W]

Response: Based on the waste that will be accepted; in addition to the design, construction, and operation of the ICDF; the Agencies are confidant that the planned location is protective of human health, the environment. The Agencies are committed to keeping the public informed during the design and construction phase through the issuance of fact sheets and holding workshops, as appropriate.

Comment 213 : A Commentor remarked that pumping and treating the existing contaminated groundwater and perched water zones are challenging, and expensive and this difficulty performing corrective action should serve as a limitation in selecting a site above the SRPA. [L-W]

Response: We agree that cleanup of past releases to groundwater in the perched zones and SRPA are challenging and expensive. We appreciate that high cost of remediation to address the environmental decisions of the past. We must note, however, that the major source of groundwater contamination at the INTEC is from direct injection of hazardous and radioactive substances into the SRPA at the former injection well, not migration of contaminants from the shallow subsurface to the aquifer. However, given the potential difficulty in cleaning up the SRPA, the Agencies will consider the potential impacts of the ICDF on groundwater when selecting the site location and developing the final design. At a minimum, the Agencies plan to develop the ICDF to be protective and minimize potential exposures to either humans or the environment, including groundwater, for at least 1,000 years. The principal contaminants expected to be disposed in the ICDF include Cs-137 and Sr-90, which have relatively short half lives and will substantially decay before 1,000 years.

Comment 214 : A Commentor suggested that the desire to concentrate waste over an already contaminated portion of environmentally vulnerable, economically vital sole source" aquifer is compounded by Department's actions to accelerate waste receipt at the existing, Radioactive Management Complex Subsurface Disposal Area waste management program strategic plan. [L-W]

Response: We cannot emphasize enough that the ICDF is <u>only</u> for INEEL CERCLA cleanup waste disposal. These wastes already exist above the "sole source aquifer" and if not addressed will present a unacceptable risk if the INEEL land is developed for private use in the future. Stringent waste acceptance criteria will be developed as part of the remedial design process. Only wastes that do not pose a threat of exceeding drinking water standards in the underlying aquifer will be permitted to be disposed in the engineered landfill. WAG 3 CERCLA wastes that cannot be safely managed on INEEL will be disposed of in an off-site disposal facility in full compliance with state and federal laws and regulations.

Comment 215 : The INEEL CAB recommended that use of clean areas to dispose of wastes be minimized to the extent possible. The Board restated its support in the past for using already contaminated areas as disposal sites for LLW. Use of clean areas is much less desirable. [CAB-W]

Response: Construction of the ICDF will occur in the area to the west of the existing INTEC percolation ponds. A siting study was completed resulting in the selected location for the ICDF area. Site CPP-95 is the contaminated area associated with releases from the main stack at INTEC. The area defined as the AOC will not be suitable for free release or unrestricted use for 100 years. This will require the area to be institutionally controlled with access and use restrictions and radiological surveillance. While the area selected for the ICDF does not encompass the entire existing percolation ponds area, the selected ICDF area is in a previously contaminated area requiring continued access restrictions.

Comment 216 : A Commentor asked that the WAG 3 AOC be shown on a map. [U-W]

Response: A map showing the WAG 3 OU 3-13 AOC is included in this ROD. The boundary extends south of the existlng percolation ponds. The entire proposed ICDF area is located within the OU 3-13 AOC.

C-3.3.3. ICDF Design

Comment 217 : A Commentor noted that since the radioactive waste will be extremely hazardous for tens of thousands of years, a conservative risk assessment would consider a 500-year flood rates at 9,680 cubic feet per second (34% greater flow rate than 100 year), as opposed to a 100 year. Further, a 500-year flood plus failure of Mackay Dam (built in 1917) would result in estimated flows of 9,700 + 54,000 cubic feet per second respectively. [CB-W]

Response: We agree with the Commentor concerning the need to consider a 500-year flood event during remedial design. The majority of the waste we anticipate disposing of in the ICDF will contain Cs-137 and Sr-90 contaminated soil and debris with half lives which through radioactive decay, will result in acceptable risk-based concentrations well within 500 years. The Agencies plan to consider a 500-year flood event when designing the engineered cover. However, the Agencies are not using the 500-year flood event as an ICDF siting criterion. The engineered containment barriers will be designed to control erosion, infiltration, and intrusion. With a flood, erosion of the containment structure is an issue along with infiltration. Both of these issues will be considered and factored into the design of the ICDF. In addition, we will evaluate historic high water elevations and potential future climatic events in our design assumptions.

Comment 218 : A Commentor stated that the ICPP as a whole is about as flat as a tabletop. He referred to a US Geological Survey (USGS) report released in 1998, acknowledging that the northern half of the ICPP would be flooded in a peak 100-year flood. USGS estimated that the ICPP would be under several feet of moving water and the Big Lost flow rate at 7,260 cubic feet per second. The detailed report map shows the northern half of the ICPP would be under as much as four feet of water. [CB-W]

Response: The proposed ICDF location is beyond the southern boundary of INTEC, and is not within the 100-year floodplain, as identified by USGS. Further, The engineered containment barriers (Caps) for the (ICDF will be designed to control erosion. Concerning the four feet of water, the USGS report shows a depth of 4 feet of moving water encompasses the bottom of the existing drainage system (ditches) located in the northern part of INTEC, not flowing across the facility unrestricted.

Comment 219 : A Commentor expressed concern that given the value of the SRPA, the lack of natural protection offered by in situ soils and hydrologic conditions and the dangers of relying on manmade systems for waste isolation, the proposed Chem Plant on-site disposal facility is unsuitable. [L-W]

Response: The construction of the ICDF is partially dependent upon the natural protection offered by INEEL soils. During remedial design, it may be determined that the existing soils will need to be supplemented to achieve the design objectives. If this is the case, the supplement actions will be implement to meet the design objectives. This design requirement applies equally to commercial and government facilities. The issue is not whether contaminants exist above the sole source aquifer, it is whether the contaminants exist in an environment in which they may pose an unacceptable risk to human health and the environment.

Comment 220 : A Commentor discussed that the porous, coarse-grained soil deposits and shallow, permeable bedrock beneath the Chem Plant offer limited ability to attenuate contaminant s and impede downward infiltration. Under such unfavorable natural conditions, the man-made liner system for the proposed disposal site would offer the only waste isolation barrier. Failure to successful join the multiple panels comprising the liners, heavy equipment damage, degradation of liner materials by waste constituents or the simple passage of time could lead to unforeseen releases. Once in the fractured basalt, contaminant dispersion monitoring and corrective action would be difficult and expensive. [L-W]

Response: The operation of the ICDF is not dependent upon the natural protection offered by INEEL soils. Design requirements and construction procedures address the operational concerns mentioned by the Commentor. The WAC provide further assurance that the aquifer will remain protected. Commercial landfills are located above fractured basalt. Siting criteria for the ICDF (which is limited in terms of what wastes may be accepted) is not the same as that of a commercial facility, which accepts many forms of wastes.

Comment 221 : A Commentor asked about the design life for the ICDF liner and for the cover. [SRA-W]

Response: Both the liner (bottom of disposal cells) and cover (engineered barrier; cap) materials for the ICDF will have design life requirements. The design life of the liner materials are grouped into two categories. The first category is the materials used for the leachate collection during the operational phase of the individual disposal cells. These leachate collection materials are the same as those used in the construction of RCRA Subtitle C facilities and have design lives of 30 years or more. The operational phase of the individual disposal cells is expected to be approximately 10 years. Proper cover design should minimize infiltration, thereby preventing the need for long term operation of the leachate collection system. The second liner category is the materials used for the material beneath the leachate collection system and on top of the basalt. For materials beneath the leachate collection system, natural, native, or natural analog materials will be used. These materials would have design lives of geological timescale (>1,000 years). These material will have sufficient design life to control the contaminant migrations until the level of contamination present do not present a risk to the environment. In the case of the engineered barriers (covers), the material of construction would be similar to the materials used beneath the leachate collection system. As design spccifications are part of the remedial design process, these issues will be further evaluated during the remedial design.

Comment 222 : A Commentor stated that the concept of the ICDF is flawed and unacceptable. It does not afford sufficient protection to the Snake River Aquifer since it will eventually leak (refer to the recent discovery at Envirocare of 2500 gallons of leachate between the liners). The Commentor asked, how will INEEL manage/dispose of leachate from this facility? Bonneville county was not allowed to construct a municipal landfill over the aquifer, why should DEQ allow construction of a hazardous/PCB waste landfill over the same aquifer? DEQ should be consistent in their application of requirements to protect the aquifer. Will this landfill accept only PCB waste between 50 and 500 ppm PCBs, or will it accept >500 ppm PCBs? [C-W]

Response: We disagree with the Commentor. Currently, there are several municipal landfills sited over the SRPA. The ICDF will be designed, constructed, operated, and closed to remain protective of human health and the environment, including the SRPA, for at least 1,000 years. The Agencies goal is to protect the aquifer. Problems at Envirocare are not relevant to the ICDF design, operation, or closure. Leachate generated during the operation of the ICDF will be managed and treated at the SSST. The treated effluent may be used for dust suppression during operations. The ICDF will be designed to minimize the generation of leachate after closure. This is the reason for the actions identified in the ROD. Concerning PCB wastes, the ICDF will be limited to less than 500 mg, kg (ppm) non-liquid PCBs. Wastes containing free liquids will not be disposed in the ICDF.

Comment 223 : The INEEL CAB recommended that the ICDF be designed to avold the effect of the probable maximum flood. The contaminants that would be disposed at the ICDF have radionuclides with very long half lives. Design to avoid the impacts of a 100-year flood may not offer sufficient protection. [CAB-W]

Response: When evaluating the "probable maximum flood", it is necessary to know the frequency of the event. Most of the contaminated materials (soil and debris) to be disposed of in the ICDF will remain unacceptable from a human health perspective for less than 500 years. The major effect on a landfill similar to the ICDF would be the effect of errosion of the engineered containment structure (cap). Groundwater generally is not greatly impacted (short-term increase in contaminant migration along with a decrease in contaminant concentrations). The engineered containment structure would be designed to deal with the effects of at least a 500-year flood. This will provide adequate protection for the ICDF from flooding effects along with protection of the SRPA.

Comment 224 : The INEEL CAB recommended that the ICDF final design be fully compliant with the Resource Conservation and Recovery Act (RCRA) substantive requirements. DOE may need to dispose of waste containing RCRA-listed contaminants at the ICDF. The design should accommodate that possibility to avoid expensive retrofitting in the future. [CAB-W]

Response: The ICDF will be designed to meet the design requirements for a RCRA Subtitle C hazardous waste disposal facility. Meeting the RCRA Subtitle C requirements allows for RCRA waste (listed and treated characteristic) to be disposed of in the facility. In addition, hazardous waste materials (hazardous, mixed, and LLW) from other INEEL CERCLA remedial and removal actions would be candidate materials for disposal in the ICDF. This will eliminate retrofitting the ICDF to meet RCRA requirements in the future.

Comment 225 : A Commentor asked, "Regarding the ICDF: How exactly will the design of the proposed ICDF prevent future percolation of contaminants into the groundwater?" [U-W]

Response: The ICDF will be designed to meet the RCRA Subtitle C minimum technical requirements and PCB Chemical Waste Landfill design requirements. Our Waste Acceptance Criteria will assume that contaminants will eventually leach out of the waste in the ICDF and migrate toward the SRPA. Therefore, we will limit our waste acceptance to wastes with contaminant levels that, even if the long-term leachate collection and management system were to fail, would not cause an MCL or unacceptable risk level exceedence in the SRPA, based on modeling.

C.3.3.4. ICDF Waste Acceptance Criteria

Comment 226 : A Commentor remarked that the ICDF Engineering Design and Waste Acceptance Criteria (WAC) must be developed with public involvement through a free and open discussion. Only un-containerized wastes that can be compacted during placement should be allowed so as to minimize subsidence caused by container decomposition. Biodegradable, VOC, collapsible, soluble, TRU, or Greater than Class C Low-level, and Alpha-LLW must also be excluded from the ICDF dump and sent off-site. Prior to completing the ICDF Title II Design, workshops should be convened for stakeholders to comment on the proposal. Waste acceptance criteria maximum contaminate concentration levels must be determined from waste sampling prior to being mixed with any stabilizing materials. In other words, "dilution is not the solution to pollution." [CB-W}

Response: Only INEEL CERCLA waste that is non-containerized, compactable, and non-biodegradable are being considered for disposal in the ICDF without the need for pretreatment. Containerized and biodegradable wastes may require pretreatment and treatment, if necessary, to meet the waste acceptance criteria for disposal in the ICDF. In addition, no TRU waste or waste having concentrations of TRU constituents exceeding 10 nCi/g are being considered as candidate waste for disposal in the ICDF. Also, the waste acceptance criteria. along with the design, will be developed to ensure that the SRPA is protected from potential contamination from the ICDF. Further, the Agencies will keep the Community informed as to the progress arid content of the remedial design through a series of Fact Sheets. In

addition, presentations and discussions with the INEEL CAB and or Focus Groups will be held during the development of the design and construction of the ICDF. Concerning the last point, stabilization is a treatment technology used to reduce the leaching potential of a waste. It will not change the how wastes will be managed in the ICDF. Prohibited wastes, like TRU and Alpha LLWs will not be diluted so as to meet the waste acceptance criteria for the ICDF.

Comment 227 : A Commentor stated, "The volumes and contamination levels for the soil dump aren't clear. It is inappropriate to ask the public to sign-off on the soil dump before its waste acceptance criteria are known. Will the public have an opportunity to help develop and comment on the soil dump design and WAC?" [SRA-W]

Response: Under this ROD, soils and debris from CERCLA cleanup activities could be accepted into the INEEL CERCLA Disposal Facility. For the evaluation of remedial alternatives for Group 3 (Other Surface Soils), a volume of 82,000 yds^3 was considered. The volumes from the various release sites can be found in Appendix A of the FS Report. Information on the maximum contaminant concentrations for the various release sites can be found in Section 5 of the RI/BRA Report. The actual chemical-specific waste acceptance criteria will be developed during the remedial design. However, general criteria have been identified in the ROD. The most important criterion is that the ICDF will only accept material such that the ICDF will not adversely impact the SRPA or surface receptors, over the long term. Others include: only CERCLA wastes; only non-liquid wastes; and no High Level, TRU or Alpha LLW, will be acceptable. During the remedial design activities, we will develop and issue Fact Sheets on the various cleanup activities under this ROD. In addition, we will be available to discuss the various remedial design and remedial action activities with interested public groups as appropriate.

Comment 228 : A Commentor was concerned about being asked to comment on the ICDF when they didn't know what the waste acceptance criteria were. [MMS-W-W]

Response: For the Other Surface Soils group, a conceptual ICDF was evaluated as a remedial alternative. In evaluating the ICDF, candidate material for disposal in the ICDF were identified and evaluated (see Appendix C of the FSS Report, which is contained in the Administrative Record). The actual waste acceptance criteria will be developed during the remedial design. However, the waste acceptance criteria will limit the material acceptable for disposal such that the ICDF will not adversely impact the SRPA or surface receptors,

Comment 229 : A Commentor asked about, Page 28, Alternative 4A, Preferred Alternative. 4th paragraph, of the Proposed Plan and wanted a definition on what wastes are "suitable for disposal" at this disposal facility. [C-W]

Response: Only waste materials from INEEL CERCLA remedial and removal actions which are primarily mixed LLW would be acceptable for disposal in the ICDF, provided that the waste meets the acceptance criteria. The in-AOC waste would be required to meet the acceptance criteria for the ICDF. Waste materials (soils and debris) that do not have the potential to adversely impact the SRPA from contaminants leaching of the waste would be candidate materials for disposal (suitable for disposal). Further, wastes would be required to meet the requirements of Phase IV LDRs, as appropriate. Pre-treatment of wastes, as necessarv to meet the acceptance criteria (stabilization for subsidence or leachine control), would be performed prior to disposal.

Comment 230 : One Commentor questioned the quantities, concentrations and size of the proposed ICDF? Also, will the facility serve as a retrievable storage area? Is there any plutonium going into the ICDF? So are you going to follow the l00 nCi/g, how many billions of

particles? The thing on the situation was legally, you could take less than 100 nCi transuranics from the Tank Farm, putting in this official RCRA endorsed low-level dump; right? [PR-TT]

Response: The proposed ICDF, which would be a permanent disposal site, designed, constructed and monitored in accordance with applicable hazardous waste minimum technology design requirements, is expected to encompass less than 100 acres upon closure including a buffer zone. The maximum allowable radionuclide concentrations will be determined in the RD/RAWP. However, no contaminants will be placed in the ICDF, which would exceed the design capabilities of the facility and threaten the underlying SRPA. For TRU contaminants, which include Pu-239, concentrations above 10 nCi/g (alpha low level) will not be accepted.

Comment 231 : A Commentor questioned whether tank farm soils, if excavated would go to the ICDF? [PR-TT]

Response: Our Group 1 interim action does not envision the excavation and disposal of tank farm soils. The ICDF will not accept TRU wastes above 10 nCi/g nor will it receive HLW. Stabilization of ICPP soils would only be to the extent necessary to prevent future leaching and subsidence. There are LLW soils and debris currently stored at INTEC (Sites CPP-92, -96, -98, and -99) that originated from within the Tank Farm area. This soil and debris is candidate material for the ICDF, provided the material meets the ICDF acceptance criteria. For soils and debris within the WAG 3 AOC that have triggered placement, the material is subject to Hazardous Waste Determinations and LDRs. For the soils remaining in the Tank Farm, OU 3-14 will evaluate the risks and potential remedial actions.

Comment 232 : A Commentor stated, “This, to me, is the whole problem with piece mealing the whole situation. And even in the big picture, if every radionuclide leaked that was there, it would meet federal standards because the aquifer is so large. And the big picture is that's why they view INEEL as the perfect place to have a 200-acre plutonium dump that they talk about is their event goal.” [PR-TT]

Response: Protection of the SRPA is one of the primary objectives of the OU 3-13 project. As there is already contamination in the SRPA that will require remediation, the ICDF will not be allowed to adversely impact the aquifer. Additional impacts would only make restoration of the aquifer harder and more costly. Based on this, the maximum concentrations of leachate from the ICDF will be limited to control impacts on the aquifer so that the aquifer is not contaminated above drinking water standards from the ICDF. From the big picture standpoint, the impacts from the ICDF are considered in the overall (cumulative) impacts for WAG 3.

Comment 233 : A Commentor stated, “Literally, our water supply is large, but the medical view of radiation is to -- the less human-added exposure the better, and with zero being the safest limit. And we have a chance to contain all this material, and yet you're going through calculations you know will allow you to rebury it. That's my problem with the whole cleanup. You actually let it leak and it still meets your standards. That's why mixing it with cement is acceptable to you and putting it over the water supply is acceptable to you.” [PR-TT]

Response: The ICDF is for the consolidation of existing contaminated soils into a facility designed, constructed, operated, and closed to control and minimize the leakage (leachate) from the material disposed in the cells. The level of radiation that we are designing to be protective of human health is less than 1/20th the dose typically received by the general public in the nearby communities. The disposal Cells will prevent the uncontrolled leakage of contamination to the SRPA. Stabilization of INTEC soils will be performed to the extent necessary to prevent future leaching and subsidence.

Comment 234 : A Commentor noted that the Agencies were looking at a 1000 years institutional life and compared this to concerns at Pit 9, with Plutonium concentrations above 100 nCi. [PR-TT]

Response: The 1,000 years for the minimum design life of the engineered containment structure (cap) is not related to the acceptable plutonium concentrations for the ICDF. The 1,000 year value is the time that containment would be necessary to deal with most of the contaminants through radioactive decay. For plutonium and other long-lived radionuclides, concentrations would be limited and other necessary controls and/or actions implemented to limit the concentrations in the leachate to protect the SRPA for adverse impacts. The protection on the SRPA would not end at 1,000 years. In addition, the ICDF would be limited to accepting TRU constituents at levels below 10 nCi/g.

Comment 235 : A Commentor stated "I just want to make this for the record that this is a permanent solution forever. That there will be a cap or a liner at the bottom and it will be properly capped and contaminated soils will be placed there, initially, in the old percolation ponds. And we believe that will be safe for a thousand-plus years. Other things will go in some of the soil including concrete from breaking up buildings, contaminated equipment, and contaminated structures broken up into bite-size pieces. The volume will be contaminated soil, but, in particular, if the choice is to tear buildings down, then certainly the debris from those buildings. some or all of It is candidate to go in there. Some cannot go there because of too-high levels of radioactivity to some other place. So the ICDF is a generalized disposal facility. It is a centralized facility for other clean up areas, TAN in particular, and anything else that does produce soils or debris will go there. They will not have their own separate repositories. That largely is due to economic arguments." [DK-TT]

Response: The Commentor is correct. The ICDF would be closed with the construction of an engineered containment structure (cap). The actual location of the disposal cells, within the ICDF area, will be determined during remedial design based on technical, regulatory, and financial factors. Wastes that could be accepted at the ICDF include both soil and debris. The acceptance criteria would also limit the concentrations of contaminants to protect the SRPA along with potential surface receptors. The ICDF may be used by other WAGs. Disposal of soil and debris at the ICDF from the other WAGs would only occur if this remedial option is selected through the CERCLA process by the other WAGs.

Comment 236 : The INEEL CAB recommended that the ICDF waste acceptance criteria be sufficiently restrictive to protect the aquifer. The criteria should be constructed using a long-term point of view with an appropriately designed public involvement process. INEEL waste generated by the cleanup program that does not meet the criteria should be disposed of off-site. [CAB-W]

Response: The waste acceptance criteria for the ICDF will be primarily developed to protect the aquifer from unacceptable levels of contamination. Peak contaminant concentrations impacting the aquifer will be evaluated regardless of when the peak occurs in time. This will provide the aquifer with long-term protection from the impacts of the ICDF. During the development of the waste acceptance criteria, fact sheets and other documents will be developed to inform the public. Any INEEL CERCLA waste not meeting the acceptance criteria will be disposed of at other disposal facilities including off-site disposal, if necessary.

C.4. Group 4: Perched Water

Comment 237 : The INEEL CAB recommended that DOE conduct further study of methods for replacing the percolation ponds and that the ROD provide much more detailed information on this issue. [CAB-W]

Response: In the evaluation of alternatives for the INTEC perched water, a replacement facility (new percolation ponds) was evaluated. Additional alternatives for replacement of the existing percolation ponds were evaluated and the information is contained in the Administrative Record. A new set of percolation ponds will be constructed to deal with the existing service waste discharges. If necessary, these ponds will be operated under this ROD until a new wastewater land application program (WLAP) permit to operate is obtained. Upgrading or additional capacity would be conducted under a separate project in support of INTEC facility operations. As recommended the ROD contains more details concerning the timing issue and the implementation of the replacement facility for the existing percolation ponds.

Comment 238 : A Commentor remarked that for Group 4, the perched water, 24 percent of the recharge was from the Big Lost River. Therefore, it seemed that the chances of doing something with the Big Lost River are pretty high because it was a quarter of the recharge. The Proposed Plan only stated that dealing with the Lost River, which is in Phase 2 was just a probability? [DK-TT]

Response: We agree that additional actions may be necessary to reduce the infiltration of water at INTEC to de-water the area of the perched water. Removing the existing Percolation ponds represents over 2/3rds of the recharge. Modeling shows that this may in itself be sufficient. If not, based on monitoring results, Additional infiltration controls will be implemented which will reduce the river recharge in the stretch affecting the perched water and thus eliminate the river as a source of recharge.

C.4.1. Group 4 Description

Comment 239 : A Commentor questioned the consistency of Page 32 Perched Water, Alternative 1 of the Proposed Plan. "It first states that "controls will remain in place until 2095." Then it backpedals and states that perched water monitoring will only take place for 20 years after the ponds are taken out of service." ... "What if perched water is still present 20 years after the ponds are taken out of service?" [C-W]

Response: For this non-selected alternative (Alternative 1: No Action with Monitoring), the percolation ponds were assumed to remain in service until all operations at INTEC had been completed. Treatment of the waste at INTEC would be completed by 2035 and a period of 10 years would be required to complete the facility disposition activities. This would result in the percolation ponds being removed from service in 2045. In the computer modeling, a period of approximately 14 years would be required for the perched water to drainout (change to an unsaturated zone). Perched Water monitoring would continue for 20 years following the removal of the percolation ponds from service. Although the monitoring period would end before 2095, the access (institutional) controls would remain in effect until at least 2095. Should the perched water not drainout as expected, the monitoring would be extended. This extended monitoring would continue for a period after the drainout has occurred.

Comment 240 : A Commentor stated that there was no mention that most of the contamination is the perched water was believed to have come from the tank farm nor was there mention that the perched water was contaminated with RCRA listed waste. [C-W]

Response: The Commentor is correct. Waste containing listed waste constituents were spilled in the Tank Farm soils. Some contaminants have migrated from these soils downward to the perched water bodies and this water may contain RCRA-listed waste constituents.

Comment 241 : A Commentor stated that at Pages 34 and 35, of the Proposed Plan, short-term and long-term effectiveness, no mention was made of the contaminants already present in the basalt and

interbeds and their impact on the perched, and deep, aquifers. The Commentor further asked, "What K_d studies have been done to support your answer?" [C-W]

Response: The Commentor is correct in stating that there is known contamination present in both the basalt and interbed materials at INTEC (ICPP). The computer modeling that was conducted for the RI BRA, FS, and FSS Reports did not consider the source term present in either the basalt or interbed materials. Instead the source terms modeled for most release sites considered the contamination remaining in the surface soils. For release sites where the constituent characteristics and volume of the liquid released to the surface soils were known or estimated, the source terms for these sites considered the released contaminant masses. In addition, these liquid release sites are the largest releases at INTEC. Although this does result in an uncertainty in the source term mass and subsequent modeling calculations, it should not significantly alter the results obtained from the modeling. Additional analysis will be conducted under OU 3-14 on source terms in the Tank Farm area and this analysis may be able to semi-quantitatively evaluate the impact of the source ten-ns contained in the basalt and interbed materials. For the computer modeling, default retardation factors (K_j), which are generally conservative, were used. The K_d values used in the modeling are presented in Appendix F, section F-5, of the RI/BRA Report. Studies to refine the transport mechanisms and rates will be conducted under the OU 3-14 project.

C.4.2. Group 4 Alternatives

Comment 242 : A Commentor stated that the perched water preferred Alternative 2 alone did not meet regulatory requirements unless combined with Alternative 3 (pump and treat). Even so it would partially meet the requirements with the following exception that the existing ICPP percolation ponds will be taken out of service and replaced with new "like for like" percolation ponds not over the existing perched water. The Commentor felt that the contamination of the perched water currently was largely the result of using unlined percolation ponds to dispose of process waste. [CB-W]

Response: If the Perched water was capable of sustainable drinking water at the future residential use hypothetical time frame, the Commentor would be correct that the Ground Water Protection Standards would not be met without implementing Alternative 3. However, the Perched water is not a sustainable source of drinking water. It largely exists because of DOE operations which discharge more water into the soil than can naturally drain, thus resulting in a perched water zone. The perched water does serve to conduct leachate migrating from surface sources to the SRPA. This is why removal of the existing percolation ponds is an important phase of the remedial action.

Also, while it is true that disposal of radiological and hazardous waste occurred in the past at levels which impacted the aquifer, these impacts are what led to the INEEL facility being listed on the National Priority List (NPL) with cleanup being performed under the FFA/CO. Current waste management operations are covered under state and federal programs, which are outside the scope of this action but are designed to protect health and the environment.

Comment 243 : A Cornmentor remarked that the Plan discounted the Perched Water as "No risk because perched water is not capable of sustaining a pumping rate needed for future domestic water supplies; therefore, it is not a source of potable water." Yet in ICPP Plan Alternative 3 (not the preferred alternative). DOE acknowledges a perched water pump treat rate of 46 million gallons over 25 years. Applying simple arithmetic that works out to a daily pumping rate of 5.041 gallons per day, which is likely adequate to sustain over ten households? [CB-W]

Response: We are sorry for the confusion on this issue. The Perched Water is primarily sustained by tile pumping and disposing of approximately 2 MGD in the existing Percolation Ponds. If the Percolation Ponds are removed from the vicinity of the perched water, the perched water would dissipate within less

than twenty years. In the evaluation of Alternative 3 for the Perched Water, the rate of withdrawl from the perched water varied over time (starting high and reducing) to account for the reduction in the available perched water. Also, the amount of contaminant mass removed by Alternative 3 is insignificant compared to the amount of contamination present. Our use of the 100-year future residential scenario and commitment to replace or relocate the Percolation Ponds will result in the availability of the SRPA for future drinking water consumption. The Perched Water is not capable of providing a sustainable drinking water supply, if DOE's use of the Percolation Ponds is ended. Based on the evaluation of alternatives, we concluded that Alternative 2 (Institutional Controls with Aquifer Recharge Control), which includes removing the existing percolation ponds from service, best satisfied the evaluation criteria.

Comment 244 : A Commentor stated that at Page 33, Perched Water (Group 4) - Alternative 3 of the Proposed Plan, "... regarding removal and treatment of 46 million gallons of perched water. I recognize that very few alternatives are available for dealing with contaminated perched water, however, a back of the envelope calculation shows that in order to remove 100% of the Sr-90 estimated to have been released to the environment (19,400 Ci) would require that the average concentration of perched water removed be 100 million pCi/L. Therefore, to remove only 1% of the Sr-90, the average concentration will have to be 1 million pCi/L, which at best could decrease the predicted future risk by 1%. Although several wells have had measured concentrations in the hundreds of thousands of pCi/L, the average concentration is much lower and none have approached 1 million pCi/L. Therefore, this alternative cannot possibly provide any measurable risk reduction, regardless of the cost. The alternative should not be given credibility by including it as an alternative. By quantifying the risk reduction, the ineffectiveness of this alternative could have been quantitatively shown and eliminated." [JM-W]

Response: Alternative 3 was included for Group 4 (Perched Water) to present a range of alternatives and to include at least two viable alternatives. Alternative 3 is a more aggressive approach to the remediation of the Perched Water than Alternative 2. We also feel that Alternative 3 would result in an insignificant risk reduction beyond the results obtained by implementing Alternative 2.

Comment 245 : A Commentor questioned the technical and administrative implementability the Perched Water (Group 4), Alternative 3, given the discontinuous nature of the perched water at INTEC. [JM-W]

Response: Alternative 3 was included for Group 4 (Perched Water) to present a range of alternatives and to include at least two viable alternatives. Alternative 3 is a more aggressive approach to the remediation of the Perched Water than Alternative 2. We believe that Alternative 3 is an implementable alternative, but would only result in a minor risk reduction if implemented.

Comment 246 : A Commentor pointed out that on Page 35, Perched Water (Group 4) - Table 6 and sidebar, of the Proposed Plan, under Alternative 2 the Net Present Value is given as $35.6M but in the sidebar it is given as $20.0 M? [JM-W]

Response: We are aware of the typographical error, but unfortunately were unable to correct it before the release of the Proposed Plan. The correct NPV cost for Table 6 is $20.0M.

Comment 247 : A Commentor pointed out that on Page 33, Alternative 2, the last sentence refers to the OU 3-14 RI/FS studying the effects of the Big Lost River and Sewage Treatment Plant (STP) on the perched water in addition to the tank farm. He stated, "If a strong connection exists between the tank farm and the perched water, then the perched water site should be removed from this Proposed Plan and included in the OU 3-14 Plan and ROD." [C-W]

Response: We are sorry for the confusion. Under the OU 3-13 project, the impacts of the Big Lost River (BLR) and Sewage Treatment Plant (STP) would be investigated and evaluated for impacts on the perched water during the perched water remedial action implementation. The computer modeling conducted for OU 3-13 showed a linkage between the various sources of water (percolation ponds, BLR, STP,etc.) infiltrating the subsurface and the perched water bodies. Operable unit 3-14 will use the existing information from OU 3-13, including removal of infiltrating water source to evaluate localized SRPA contamination within the INTEC fence line.

Comment 248 : A Commentor pointed out that on page 36. 1st partial paragraph. Phase 2 of the Proposed Plan addresses diverting or lining the Big Lost river and/or taking action on the STP perched water, rather than evaluating under OU3-14. [C-W]

Response: The scope of OU 3-14 has changed since the project was initially discussed. Under the OU 3-13 project, the success of removal of the Percolation Ponds will be assessed against the expected dewatering of the Perched Water. If the goals are not achieved, Additional infiltration controls will be implemented which will include lining of the BLR. It is not expected that relocation of the STP is necessary given its small contribution to recharge.

C.5. Group 5: Snake River Plain Aquifer

Comment 249 : A Commentor was concerned that the percolating ponds will still be running and that contaminants in them were flooding or going into the aquifers. [JJ-TM]

Response: We share the Commentor's concern regarding the percolation ponds and their affect on the migration of contaminants based on their present location. This is why this action will require the shutdown of the ponds at their current location and relocation.

Comment 250 : A Commentor stated their belief that the Proposed Plan needed to take a fundamentally different view on how to protect the SRPA. The policy towards protecting the aquifer should be the overriding alternative looked at and other alternatives should flow out of that. [SR-TB]

Response: We agree with the Commentor in that protection of the SRPA is a primary objective in the restoration of the INEEL. Also, with the SRPA, a sole source aquifer, protection of the aquifer is a primary concern for remedial actions. The remedial alternatives that were developed and evaluated considered the impacts on the SRPA. With this in mind, remedial alternatives that do not adverselv impact the SRPA are viable alternatives for consideration.

Comment 251 : A Commentor stated that in addition to serving drinking water needs, the SRPA provides vast quantities of water for Idaho agriculture and stated that competing demands for water on Idaho and other western water sources will certainly intensify over the proposed 100-year cleanup timeframe. [L-W]

Response: We agree with the Commentor that water is a very valuable commodity. Most of the water extracted from the SRPA at the INEEL is returned to the aquifer. Under this ROD, the SRPA area associated with INTEC operations outside of the INTEC fence will be restored to drinking water standards. This will make the aquifer useable after 2095 for other activities.

Comment 252 : A Commentor asked, “How widespread is the contamination in the plume? Is there going to be an attempt to retrieve and contain this contamination, or is it just going to be monitored and assumed to be below federal standards?” [PR-TT]

Response: Our evaluation and modeling of the contaminant plume in the SRPA extends approximately 8 miles beyond the INEEL site boundary, however, contaminant concentrations above drinking water standards do not extend beyond the INEEL site boundaries, nor are they expected to in the future. We will implement a contingent action to insure that the aquifer is acceptable for drinking water consumption within 100 years. As necessary we will retrieve contaminants to insure this goal of aquifer restoration is met. Monitoring of the SRPA will be performed until the Agencies determine that there is no longer a risk of MCLs being exceeded after 2095. This will be evaluated in the 5-year reviews.

Comment 253 : A Commentor questioned where the drinking water standards were to be met in the SRPA. [DK-TT]

Response: Following the year 2095 restoration timeframe, the SRPA will be restored (remediation of the WAG 3 groundwater plume) to drinking water standards in the INTEC operations impacted porlion of the SRPA outside the current INTEC fence line.

C.5.1. Group 5 Description

Comment 254 : A Commentor stated that there was insufficient information presented on I-129 distributions to select a remedy for the aquifer. The model predicts possible concentrations, which are greater than the drinking water standard, yet no data exists to support the theory that the HI interbed exceeds the drinking water standard. The Commentor further stated that it was absurd to propose a remedy that costs $39.8M (NPV) or $56.2 (1997 dollars) based on a model prediction. The Agencies should first sample the HI interbed near the injection well and then determine if there really is a problem. Further, the Proposed Plan does not state whether any reasonable or workable treatment alternatives were evaluated besides pumping and treating with ion exchange, which currently will not work cost effectively. The Proposed Plan does not mention whether a Technical Impracticability waiver was considered. The Commentor stated, "I would rather see my tax dollars going to a TI waiver than this absurd and excessively costly pump and treat remedy." [A-W]

Response: The information presented in the Proposed Plan is only a summary of the information contained in the RI/BRA, FS, and FSS Reports, which can be found in the Administrative Record. Contained in these documents are the details concerning contaminant concentrations and distributions (vertical and horizontal). The Commentor is correct in that the model predicts that there are concentrations greater than the drinking water standards, but it should be pointed out that actual samples collected and analyzed by the United States Geological Survey (USGS) exceed the drinking water standards. In the model, the long-term location of the I-129 is predicted to be found in the HI interbed. Part of the remedial action under Alternative 2B is to sample the SRPA at various depths to determine if there is significant 1-129 contamination in the H1 interbed and other vertical and horizontal locations. The Commentor is not correct in that the active remediation of the aquifer will cost S56.2M (1997 dollars). This cost estimate includes the long-term monitoring of the SRPA that will be required regardless of whether the HI interbed is extensively contaminated or not. The active remediation portion of the cost estimate amounts to $28.2M which includes the installation of extraction wells, treatment facility, treatability studies, and associated costs. Under OU 3-13, remediation of the SRPA within the INTEC fenceline, including the area near the injection well, was not evaluated or analyzed. A final evaluation along with decision on the SRPA, including the area near the injection well, will be conducted under the Tank Farm RI/FS (OU 3-14). In addition, other alternatives including treatments will be evaluated and analyzed for the SRPA in the OU 3-14 RI, FS. It is true that the only treatment options discussed in the Proposed Plan was the pump and treat technology. However, it should be pointed out that other technologies were considered and eliminated from further consideration in the beginning of the FS Report. During the development of the FS and FSS Report. discussions concerning a Technical Impracticability (TI) waiver were held. Ion exchange is not the only physical chemical treatment option

available. Given the small flow rates expected, evaporation of the pumped water and management of the residual sludges on-site is also a viable option. We will perform treatability studies prior to implementing the contingent remedy. If it is determined that the remedy cannot be implemented. a TI walver for the INTEC SRPA groundwater
plume, will be pursued.

Comment 255 : A Commentor stated that of the 39 aquifer well sampling results (from 1995) presented in the RI/ FS, only 4 wells had concentrations greater than the detection limit. Also, none of them were statistically above the legal MCL of 1 pCi/L. [JM-W]

Response: The Commentor is not correct. Data obtained in 1995 for I-129 is not useable in that the detection limit was not low enough to determine if I-129 exceeded a concentration of l pCi/L. For evaluation and the decision process, the USGS analytical data for I-129 from 1990-1991 were used. In the USGS data, 10 wells exceeded a concentration of 1 pCi/L for I-129. It should be noted that these are open interval monitoring wells. In the computer modeling, the aquifer was modeled as discrete layers. As such, mixing during sampling was not taken into account to determine risk levels.

Comment 256 : A Commentor stated that because the interbed sediment permeabilities are relatively low, a receptor would not pump water from the interbed. Therefore, if the I-129 is in fact trapped in time low permeability sediments, no receptor will drink the water. If the natural water filter exists and is operating as simulated in the computer model, it is good for the Snake River Plain water quality. [JM-W]

Response: It is recognized that removal of water from the interbed area would be problematic. If high levels of contamination occur in the interbed, remediation may be required. However, extraction of contaminated water from the highly contaminated zone would need to be at a sustainable rate of at least 0.5 gpm, for future use.

Comment 257 : A Commentor stated that if the I-129 is not trapped in the sediments, then the model hypotheses are incorrect. If I-129 is not trapped in the interbed, and the a computer model would predict that I-129 concentrations are significantly lower than the current models predicted peak concentrations. Under this scenario, I-129 concentrations would probably not be predicted to be above the MCL of 1 pCi/L in year 2095. [JM-W]

Response: If high levels of I-129 are not found in the interbed, or other low permeability material, the contingency would not need to be implemented as the aquifer would be restored to drinking water standards (MCLs) prior to 2095 by natural attenuation.

Comment 258 : A Commentor stated that the predicted I-129 peak concentrations in year 2095 corresponded to a 2 in 100,000 risk level (see Table 1, page 18 of the Proposed Plan) which is significantly below the risk based action level of 1 in 10,000. The 2 in 100,000 risk level is a very conservative estimate because it assumes the future receptor will pump from the relatively low permeability (high I-129 concentration) interbed rather than the high permeability (low I-129 concentration) basalt. Therefore, this contingent remediation plan is not risk based but rather MCL based on water that, in all probability, would not be pumped from the aquifer. [JM-W]

Response: An acceptable risk level of 1 in 10,000 includes all the contaminants of concern (total carcinogenic risk). In addition to carcinogenic risk, state and federal drinking water standards (MCLs) must be achieved so that the water can be consumed. Both of these standards must be met. The SRPA is required to be restored to the drinking water standards (MCLs) by 2095.

Comment 259 : A Commentor stated that based on the information presented in the supporting reports. I-129 does not appear to be a groundwater COC and the contingent remediation proposed for Group 5 SRPA is not needed. [JM-W]

Response: The SRPA is required to be restored to the drinking water standards (maximum contaminant levels: MCLs) by 2095. The MCL for radionuclides like I-129 is 4 mRem/yr is the standard for total (beta) and (gamma) emitting radionuclides. The major contaminants in the SRPA are considered as COCs and include I-129 and Sr-90.

Comment 260 : A Commentor stated that at Page 15 of the Proposed Plan, under "Snake River Plain Aquifer", mercury is listed as a COC, both prior to and after 2095. Based on the mercury modeling results comparison with the Field data (shown in the Chapter 7 of Appendix F in the RI) the RI model significantly over predicts the mercury concentrations. Of the 36 wells presented, sampling results for only three wells showed mercury concentrations above the detection limit (0.1 ug/L). Of the three, only one is clearly above 0.1 ug/L (based on the reporting uncertainty). The RI/FS model shows concentrations as high as 8 ug/L, but there is no data to support this, indicating that the model significantly over predicts current mercury concentrations. [JM-W]

Response: The computer modeling predictions, when compared against the measured values generally are under-predictions not over predictions. The highest levels of mercury predicted occur in the vicinity of the injection well. There are no sampling locations near the closed injection well to measure the concentrations against and compare against the predictions.

Comment 261 : A Commentor stated that at Page 15, under "Snake River Plain Aquifer," of the Proposed Plan, chromium is listed as a COC prior to 2095. As discussed in the RI, chromium is a TRA contaminant which modeling shows could mingle with the INTEC contaminant plumes downgradient from INTEC. Therefore, chromium is not an INTEC contaminant of concern and should not be listed as such. [JM-W]

Response: The Commentor is correct. Chromium is a COC for the TRA groundwater plume. Chromium was included and shown in the OU 3-13 evaluation for completeness (cumulative impacts) of aquifer risk. Post 2095 chromium is not a concern at INTEC. As such, restoration of the aquifer is not needed for chromium.

Comment 262 : A Commentor remarked that RCRA listed waste entered the aquifer through injection well discharges. [C-W]

Response: RCRA hazardous constituents are known to have been injected down the well. The issue that hazardous wastes were injected is not determined in the remedial investigation. If further information results in changed information, the changed information will be evaluated and appropriate changes will be made to the remedies.

Comment 263 : A Commentor asked how far downgradient will production wells be protected and what contaminant(s) are these wells threatened by? [C-W]

Response: Restoration of the SRPA, under this ROD, will deal with the contaminated groundwater outside of the INTEC fenceline as an interim action. The area in the SRPA exceeding either the safe drinking water standards (MCLs) or risk based concentrations from INTEC releases will be remediated to acceptable levels. Currently, the area of concern in the SRPA extends from INTEC to north of CFA. For this contaminated area, the COCs are generally Sr-90 and I-129.

C.5.2. Group 5 Alternatives

Comment 264 : A Commentor stated that the Snake River Plain Aquifer (Group 5) should be remediated with a pump and treat (Alternative 3) for the same reasons the perched water should be removed and treated. [CB-W]

Response: The preferred remedy for the SRPA that was presented in the Proposed Plan is protective and will result in extraction and above-ground treatment, as necessary, to achieve aquifer usability within 100 years. There are some significant differences between the preferred Alternative 2B and Alternative 3. In the case of Alternative 2B, contamination would be removed, if necessary, from the areas within the SRPA which would not be restored to drinking water standards or risk-based levels without active remediation. For Alternative 3, contamination would be removed, if necessary, across the entire contaminated region of the SRPA. The timeframe for both alternatives to restore the SRPA is the same (year 2095). For the SRPA, Alternative 2B is the most cost-effective alternative, while reducing the risk to acceptable levels, evaluated. Based on this we concluded that Alternative 2B (Institutional Controls with Monitoring and Contingent Remediation) best satisfied the evaluation criteria.

Comment 265 : A Commentor questioned the Proposed Plan's conclusion that treatment of contaminated groundwater is not cost-effective if the assumption were tested against future water value projections. [L-W]

Response: The selected alternatives for the perched groundwater and SRPA will meet RAO's and insure that the SRPA is protected for future generations. The question of cost-effectiveness relates to the time versus cost for additional measures to remove contaminants from the SRPA and perched groundwater.

Comment 266 : A Commentor stated that Alternative 2B for the SRPA includes provisions for pumping groundwater from a low permeability layer. However, pumping water from low permeability layers when those layers are surrounded by higher permeability layers is not feasible. The Commentor recommended that the Agencies select Alternative 2A. [CC-W]

Response: Alternative 2B does have a contingent active remediation component for the portion of the SRPA sufficiently contaminated that active remediation may be necessary to restore the aquifer to drinking water standard at the end of the restoration timeframe (i.e., 2095). Based on the groundwater modeling that was conducted in support of both the RI/BRA and FS Reports, the long-term contamination in the aquifer is in the low permeability zone surrounded by higher permeability zones. This does present a challenge in the extraction of the contaminated porewater. Removal of the contaminated porewater will not be easy. However, the trigger level (monitoring criteria) has a concentration value 11 pCi/L in 2000) with a specified rate of extraction of at least 0.5 gpm continuous. Extraction of 0.5 gpm from the low perrneability zone within a well is not highly probable. As a result, water for the high permeability zones will be bled into the extraction area of the monitoring well to allow for an extraction rate of 0.5 gpm. The mixed water would then be used to demonstrate whether active remediation would be required. The purpose of the aquifer restoration is not to restore it to*pristine conditions*, but to restore the aquifer to acceptable levels (drinking water standards, MCLs). With the bleeding of the high permeability zones water into the low permeability zone water, it is feasible to extract 0.5 gpm to determined compliance with the monitoring levels.

Comment 267 : A Commentor asked how long monitoring will be maintained? [SRA-W]

Response: Monitoring of the SRPA will be performed until the Agencies determine that there is no longer a risk that the MCLs will be exceeded after 2095. This will be evaluated during the 5-year reviews.

Comment 268 : A Commentor stated that it didn't look as if there was an implementable treatment technology if the groundwater has to be cleaned and asked what efforts were going forward throughout the DOE complex to address this lack? [SRA-W]

Response: No treatability studies have been conducted to determine the cost and performance data for treating low level I-129 contaminated groundwater. If extraction and treatment is necessary, via ion exchange, we will perform these necessary studies to determine a cost-effective solution to treating the groundwater. If we choose to go forward with evaporation and residuals management, this approach should not present a technical impracticability concern, especially given the small flow rates anticipated.

Comment 269 : A Commentor asked several questions concerning the preferred alternative and I-129 cleanup. A concern was that the peak I-129 concentrations in the aquifer are predicted (in the computer model) to still be relatively high in year 2095, trapped in interbed sediments (a natural water filter) with permeabilities far lower than the surrounding basalt aquifer. The Proposed Plan does not say whether or not the interbed will be the sole focus of this monitoring plan. [JM-W]

Response: Modeling predicted that the long-term levels of I-129 above the MCL would be found in the sedimentary interbed in the aquifer, because this material impedes the flow of contaminated groundwater relative to flow in the bedrock fractures. Monitoring wells will be sampled during construction to determine the zone or zones of highest contaminant concentrations. The zone or zones with the highest concentrations will be monitored long-term to determine remedy effectiveness. It should be noted that a sustainable extraction rate of at least 0.5 gpm will be used for determining if the contamination exceeds the action levels.

Comment 270 : A Commentor asked the Agencies to not put this I-129 based aquifer contingent remediation plan into a record of decision (ROD) that could force: (1) current decision makers to spend money drilling wells and placing well screens in the aquifer in low permeability zones that will be useless for monitoring contaminant migration from the INTEC facility. Monitoring wells should be screened at depths that will likely be used by future residents so that useful data can be collected to support computer model calibration and reliable predictions of future contaminant concentrations; and (2) future decision makers to spend money on very likely ineffective and unnecessary treatability studies and possibly an I-129 remediation project. [JM-W]

Response: Monitoring under this ROD is to determine remedy effectiveness, not investigative information for future uses. Future users may screen their well within any water bearing zone in the SRPA. The monitoring will be conducted in the highest contamination zone(s) whether the contamination occurs in the basalt or interbed layers at a sustainable extraction rate of at least 0.5 gpm, which could be used by a future resident. The treatability studies and subsequent aquifer remediation only will be implemented if the concentrations in the highest zone exceed the action levels at a sustainable extraction rate of at least 0.5 gpm and the extent of the hot spot is sufficient in areal extent to warrant removal.

Comment 271 : A Commentor requested that the Agencies put into the ROD that monitoring of I-129 is needed to confirm that it is not a COC. The Commentor believed that the detection of relatively high I-129 concentrations in the aquifer will negate the hypotheses upon which the current computer model is based and require that the I-129 source and its transport in the subsurface be reevaluated in light of the new information. The Commentor stated that new predictions will have to be made at that time to estimated the I-129 concentrations expected after year 2095 and that Aquifer remediation decisions should be based on the results of this future analysis. [JM-W]

Response: The Commentor is discussing I-129 as a COC in source areas at OU 3-13. The source of-the I-129 in the aquifer is that it was disposed of directly into the aquifer using the injection well. Impacts of the I-129 from surface and subsurface releases are not significantly adding to the I-129 plume and long-term aquifer impacts. Refinement of the aquifer COCs within the INTEC fence line from source areas like the Tank Farm soils and associated risks will be conducted under OU 3-14.

Comment 272 : The INEEL CAB recommended that the DOE continue its efforts to find viable and effective remediation alternatives before implementing "pump and treat" strategies for the aquifer contamination. [CAB-W]

Response: Pump and treat is an effective technology for ground water cleanup in this case, where the COC's are highly soluble and attenuate only slightly on the aquifer sediments, which is the case for I-129. Pump and treat technologies are less effective when working with non-aqueous wastes or highly attenuated constituents like
Cs- 137.

Comment 273 : The INEEL CAB Board stated that it understood that extraction of groundwater (from the zone of influence in the SRPA) will take place only if contaminant levels are found to exceed trigger levels. But they doubted that the "pump and treat" approach would be effective under the circumstances that exist at WAG 3, and encouraged the Agencies to continue their efforts to identify other viable alternatives. The costs associated with pump and treat strategies jeopardize other valuable programs. [CAB-W]

Response: Modeling predicts that the long-term levels of I-129 above the MCL will be found in the sedimentary interbed in the aquifer, because this material impedes the flow of contaminated groundwater relative to flow in the bedrock fractures. The zone or zones with the highest concentrations will be monitored long-term to determine if remedial action is warranted. If so, then a pump and treat approach will be taken to remove sufficient contaminated groundwater to achieve aquifer restoration by the year 2095. It should be noted that only zones capable of sustaining an extraction rate of at least 0.5 gpm will be pumped as these are the zones that could be used in the future for providing drinking water. As I-129 is highly soluble in groundwater and attenuates only slightly on the aquifer sediments, extraction of ground water will also result in the removal of the I-129 hot spots. We appreciate the concerns that the CAB has regarding other uses of pump and treat technologies. It is correct that they are less effective when working with non-aqueous wastes or with highly attenuating constituents (e.g., Cs-137).

C.6. Group 6: Buried Gas Cylinders

Comment 274 : A Commentor asked that the mechanisms will cause "over- pressurization" in the buried cylinders be explained as the cylinders are buried and experience very small changes in temperature. Further the Commentor asked that if "over-pressurization" cannot occur, the Agencies needed to identify the imminent safety hazard associated with this site. [C-W]

Response: We apologize for our poor choice of words. Over-pressurization is not the best term we could have used to describe the problems at these sites. Corrosion of the cylinders will result in the cylinders not being able to maintain or handle the internal pressure. As a result. the cylinders will then leak their contents into the environment. In the case of Site CPP-84, the cylinders are currently buried, but have been uncovered by past flooding conditions. Site CPP-94 cylinders are not completely buried. The major safety hazard associated with these sites is the unintentional disturbance and possible acute impacts.

Comment 275 : A Commentor stated that regarding the Buried Gas Cylinder Sites, the description in no way confirmed any potential for release of contaminant that pose a risk to human or ecological species health and questioned why is this site in this Proposed Plan? [U-W]

Response: The typical CERCLA risk from these sites is following the release of the cylinders contents. As these sites represent a "threat of release" to the environment, these sites were added to the FFA/CO. Currently, there are no existing INEEL programs, other than CERCLA, for dealing with these cylinders. The major safety pathway for the cylinders is from disturbing the cylinders without adequate safety controls. The disturbance, intentional or accidental, will be an acute hazard. These cylinders are not likely to explode or over-pressurize, but these are possible scenarios. Neither scenario is considered an imminent event.

C.6.1. Group 6 Description

Comment 276 : A Commentor asked the Agencies to note that the acetylene cylinders may contain liquid acetone used to dissolve the acetylene gas and stated that based on the site description, the site is not well characterized and risk to human health and the environment had not been determined. The Commentor suggested that this be done prior to conducting a remedial action. [C-W]

Response: We, unfortunately must disagree with the Commentor. The analysis and evaluation conducted on the Buried Gas Cylinder sites (Group 6) was based on the information available to us. The general characteristics of the material (waste) contained in the cylinders is known. The risks from these sites is not a traditional CERCLA risk (chronic exposure), but more like that risk posed by unexploded ordnance (acute risk). This acute risk will occur from disturbing the buried gas cylinders. Further characterization involves the removal of the cylinders and proper disposal, which requires characterization, which is what the remedial action calls for.

Comment 277 : A Commentor asked the Agencies to note that if HF is in the cylinders then it is a RCRA listed waste. [C-W]

Response: The Commentor is correct that HF can be a listed hazardous. waste. Treatment will be utilized to render the HF nonhazardous in compliance with ARARs.

C.6.2. Group 6 Alternatives

Comment 278 : A Commentor stated that at Page 40, Alternative 2, of the Proposed Plan it states that the alternative will also include initial site characterization and questioned why characterization was being performed after the ROD rather than during the RI/FS. [C-W]

Response: The analysis and evaluation conducted on the Buried Gas Cylinder sites (Group 6) was based on the information available to us. The general characteristics of the material (waste) contained in the cylinders is known. The risks from these sites is not a traditional CERCLA risk (chronic exposure), but more like that risk posed by unexploded ordnance (acute risk). This acute risk will occur from disturbing the buried gas cylinders. Further characterization involves the removal of the cylinders and proper disposal, which requires characterization, which is what the remedial action calls for. The sites have been sufficiently characterized to develop remedial action alternatives. The characterization activities described under the alternative are necessary to implement the remedy, not characterize the site for risk assessment purposes.

Comment 279 : A Commentor remarked that there was no doubt in his my mind that Alternative 2, dig it up and do the right thing, is still the only thing that should be done. [DK-TT]

Response: We thank the Commentor. The best and most cost effective alternative for Group 6 is the preferred alternative (Alternative 2: removal, treatment and disposal).

C.7. Group 7: SFE-20 Hot Waste Tank System

Comment 280 : A Commentor stated that the Proposed Plan had a conflicting statement concerning when SFE-20 Hot Waste Tank System was taken out of service. [C-W]

Response: We are sorry for the confusion. The tank system was removed from service in 1976. The 1977 date shown in the Proposed Plan was a typographical error.

C.7.1. Group 7 Description

Comment 281 : A Commentor questioned the risk basis for taking action on the SFE-20 Hot Waste Tank System since there was no exposure pathway as the tank is contained within a vault, and the "risk of release" is certainly small. [C-W]

Response: The SFE-20 Hot Waste Tank System is listed as a release site on the FFA/CO. The tank contents represent a threat of release to the environment, which is within the purview of CERCLA. The tank contents will eventually leak out of the tank and into the tank vault. During the 1984 investigation, there was evidence that water had infiltrated into the vault, which shows that water which leaked into the vault could also leak out of the vault. Soils beneath the SFE-20 Hot Waste Tank System are considered part of the release site and will be dealt with as part of the remedial action. Further, detailed, characterization of the tank contents is the first activity in the selected remedy (Alternative 4:Removal, Treatment, and Disposal). Based on the available information and analysis conducted, there is sufficient information to select a remedy under CERCLA for this site.

Comment 282 : A Commentor stated that the SFE-20 tank had not been shown to be a release site, or that of an imminent release. The Commentor thought that the tank held hazardous waste and should have been placed on the RCRA Part A application or addressed under the D&D program. [C-W]

Response: The SFE-20 tank and associated structure are a source term that threatens the environment, the SRPA in particular. Since the tank was abandoned prior to the effective date of RCRA application to mixed wastes, the SFE-20 Hot Waste Tank System is listed as a release site on the FFA/CO. The tank contents will eventually leak out of the tank and into the tank vault. Based on the available information and analysis conducted, there is sufficient information to select a remedy under CERCLA for this site. The tank contents are not known to have listed waste constituents, but there may be characteristic concentrations of other hazardous constituents.

C.7.2. Group 7 Alternatives

Comment 283 : A Commentor stated, "Once again, DOE fails to correctly classify the waste in SFE-20 tank in a blatant attempt to circumvent regulatory requirements. The RI/FS sample data of the tank, (see table below) shows clearly that the tank contents (liquid and sludge) as well as the tank concrete vault contents meet the definition of mixed transuranic (TRU) waste, and by regulatory definition, it must go to a deep geologic repository. Grouting (mixing with cement) as proposed by DOE, is a thoroughly discredited disposal method B tried and failed at Hanford." [CB-W]

Response: Preliminary information supports that concentrations of TRU may be high enough to require disposal of the Tank's contents at WIPP. However, due to the radiological hazards and access restrictions, we have not completed characterization of this tank, which will be required even if we elected to leave the tank in place. Under evaluation of alternatives, we concluded that Alternative 4

(Removal, Treatment, and Disposal), which includes characterization activities, best satisfies the evaluation criteria. The Tank and tank contents will be disposed of in compliance with ARARs.

Comment 284 : One Commentor strongly disagreed with our recommendation to remove VES-SFE-20 in its entirety. Several reasons were given which are answered separately herein. [TW-W]

Response: The Commentor expresses concern over the accuracy of our cost estimates and the consistency of our decisions. We appreciate the time and effort taken by the Commentor in supporting his position and have responded directly to each of the specific concerns stated.

Comment 285 : A Commentor stated that the concept of clean closure VES-SFE-20 did not make sense for the simple reason that it is only a few yards from CPP-603, which may very well be left in place. "Why spend $4.6M to totally remove VES-SFE-20 when a much larger facility is being left in place? The contamination levels in VES-SFE-20 are minor compared to CPP-603, and any groundwater effects from the VES-SFE-20 facility will be negligible, especially is the liquids are removed. Grouting and leaving the VES-SFE-20 building will provide more than adequate protection and permanence." [TW-W]

Response: Preliminary information supports that concentrations of TRU may be high enough to require disposal of the Tank's contents at WIPP. Due to the radiological hazards and access controls, we have not completed characterization of this tank, which will be required even if we elected to leave the tank in place. Successful grouting will also require perpetual long term monitoring and maintenance. For the SFE-20 Hot Waste Tank System, complete removal, treatment, and disposal is the most cost effective and risk reducing option evaluated. In addition, it is significantly less costly to completely remove the facility and waste than to close the facility in place with continued institutional controls and monitoring. Based on this we concluded that Alternative 4 (Removal, Treatment, and Disposal), best satisfied the evaluation criteria.

Comment 286 : A Commentor stated that the capital costs did not make sense for Group 7, questioning how could the Agencies show capital costs of $5M for Alternative 2, which is essentially filling with grout and covering with dirt, and $4.8M for Alternative 3, which consists of removing the tank liquid contents and then filling with grout? It seemed to the Commentor that Alternative 2 should be less than Alternative 3 since it did not include the costs for removal of the liquids. [TW-W]

Response: In the case of Alternative 2, the facility will be filled with grout and an engineered containment structure (cap), consisting of multiple layers constructed over the area. This engineered containment structure will be designed and constructed for long-term (+1,000 year) protection. Although a small earthen barrier would be relatively cheap, it would not be an ARAR-compliant engineered barrier designed to protect against future releases to the underlying aquifer. The difference in cost between the alternatives is due to cap design and construction. For Alternative 3, the liquid will be removed prior to grouting and no engineered containment structure be required. However, both of these alternatives will still require long-term institutional controls and surveillance and maintenance activities.

Comment 287 : A Commentor asked why the cost for Alternative 4, which includes removal of the liquid and then total removal of the entire building, ($4.6M) is less than Alternative 3, which does not involve removal of the building? The Commentor further asked if Alternative 4 included any costs for handling/burial of the contaminated materials? [TW-W]

Response: A cost estimate breakdown is provided in Appendix A of the FSS Report. This document is referenced in the Proposed Plan and available for inspection as part of the Administrative Record. The costs for removal and disposal of the facility and associated structures for the SFE-20 Hot Waste Tank System were include in the cost estimate for Alternative 4. Alternative 4 involves the complete removal

and treatment of the SFE-20 Hot Waste Tank System, so no long-term surveillance and monitoring will be required. For Alternative 3, with waste being left in place, long-term surveillance and monitoring is required.

Comment 288 : Concerning Page 43, Alternative 4, of the Proposed Plan, a Commentor asked what types of treatment will the debris (steel and concrete) be subject to and if the treatment would be conducted on site? [C-W]

Response: Treatment may be necessary to meet the ICDF acceptance criteria for the emptied tank and structure. The treatment (stabilization, solidification, or sizing), if necessary, will be conducted within the WAG 3 AOC, which is on-site.

Comment 289 : A Commentor asked, "What are the levels of alpha contamination in this waste; the debris? Will these alpha levels be acceptable at the ICDF; at Envirocare? The Commentor went on to say that if the tank was left in the Proposed Plan, then the Agencies needed to be much more specific about what will be done with the waste. [C-W]

Response: Sampling of the sludge in the tank has shown TRU constituent concentrations exceeding 90 nCi/g. The concentrations of the contaminants in the debris are considerably lower. Some debris materials from this site may be acceptable for disposal at ICDF. The concentration of contaminants for this material are probably higher that the acceptance criteria for Envirocare without treatment (very high (gamma) radiation field). The ICDF will accept < 10nCi/g TRU wastes. Depending upon the contaminant levels, in the removed wastes, pre-treatment may be required prior to disposal either on or off-site.

Comment 290 : A Commentor was supportive of the proposal to dig up, dispose of the tank, dispose of the contents of the tank and the sludge and asked what the time schedule was on that [DK-TT]

Response: Concerning the time schedule for implementation of the alternative, we have not developed our scope of work for implementing the preferred alternatives identified in the Proposed Plan, instead concentrating on preparing the ROD and this Responsiveness Summary. However, a rough guess would suggest completion of the alternative by the year 2008.

Comment 291 : One Commentor liked the removal option because it's was kind of a prototype or a pilot of what can be done with the Tank Farm. [DK-TT]

Response: The decision of the waste within the tanks at the Tank Farm will be evaluated by the Idaho HLW & FD EIS. The actual closure activities will be conducted in compliance with an approved HWMA/RCRA closure plan for the tank and associated system. The information gained from the Group 7 remediation will be used during the closure of the Tank Farm tanks where possible. The disposition of the soils within the Tank Farrn area will be determined under the Tank Farm RI/FS (OU 3-14).

D. OTHER ISSUES

D.1. Tank Farm

Comment 292 : A Commentor was concerned that an environmental impact statement be prepared on the Tank Farm, as it is the major contamination source on all of INEEL. [DK-TT]

Response: It is recognized that the largest amount of contamination at INTEC occurs in the Tank Farm area. The ultimate disposition of the waste in the INTEC Tank Farm tanks is being evaluated in the Idaho HLW & FD EIS. In addition, this EIS is evaluating the disposition of the tanks within the INTEC Tank Farm. Evaluation of the soils surrounding the INTEC Tank Farm is being further investigated and evaluated under the OU 3-14 RI/FS project. With CERCLA being functionally equivalent to NEPA, the RI/FS will meet the needs of an EIS under NEPA and no EIS process will be conducted for the Tank Farm soils. Several remedial action alternatives for dealing with the soil will be evaluated under the OU 3-14 RI/FS. Concerning the schedule, the INTEC Tank Farm is an active facility and implementation of the Final action will need to be conducted following the closure activities. Prior to the final disposition of the INTEC Tank Farm area, actions may be taken to reduce the impacts on human health and the environment. These actions will be continued until the final actions are completed on the INTEC Tank Farm area.

D.2. Decontamination, Decommissioning, and Dismantlement

Comment 293 : A Commentor inquired if implosion-in-place was a likely alternative for some of the more contaminated buildings at the Chem Plant and though that although, residual risk "belongs" to D&D rather then ER, it was appropriate to discuss it in the Proposed Plan. [SRA-W]

Response: Evaluation of alternatives for the disposition of facilities at INTEC is not part of the OU 3-13 project. The disposition of certain INTEC facilities is, however, being evaluated under the Idaho HLW & FD EIS. Implosion or grouting in place is an alternative being evaluated. The intent of the OU 3-13 project is to reduce the risk to the environment at INTEC to acceptable levels. The residual risk from the INTEC facilities closed in place will need to be factored into the cumulative risk and the cumulative risk will need to be maintained at an acceptable level.

Comment 294 : A Commentor asked what the schedule was for transfer to EM-60 of facilities whose missions have ended (e.g., ICPP 601)? [SRA-W]

Response: When the mission for a facility at INEEL has ended and no future mission is identified, the facility ownership is transferred to the EM-60 organization for facility deactivation, as the Commentor stated. Following the deactivation activities, ownership of the facility is transferred to the EM-40 organization for final disposition (dismantlement). Occasionally, the EM-60 conducts activities on a facility to include the final disposition. For example, the CPP-601 facility is currently under EM-60 ownership.

Comment 295 : A Commentor was concerned that the Agencies stated that the selected alternative [for Group 2 soils] is consistent with expected D&D activities. Since when is this a requirement of CERCLA? Do the Agencies expect these D&D activities to be conducted as part of CERCLA? If so, what are the decision documents the public should expect to review, prior to these activities? [C-W]

Response: Closure of the facilities at INTEC will be designed and implemented to remain protective of human health and environment, in particular the SRPA. As the remediation of the SRPA is being conducted under CERCLA, impact to the aquifer need to be coordinated with the CERCLA Program. Aspect or parts of INTEC facility closures may end up being within future CERCLA projects. If activities for INTEC facility closures are conducted under CERCLA, the appropriate documents will be developed and public participation activities will be conducted.

D.3. Pit 9

Comment 296 : A Commentor was concerned that risk calculations were not performed to compare the risks between below ground disposal and above ground storage. As an example, the Pit 9 ROD, was cited where the Agencies admitted in writing that they had never done them. [PR-TT]

Response: Issues dealing with Pit 9 are not within the scope of this project. However, concerning storage of waste above ground, the waste being considered for the ICDF is a large volume with relatively low concentrations. The wastes would need to be containerized resulting in a very large facility to store them. For example, the Group 3 soils alone would represent over 300,000 55-gal drums or over 17,000- 8ft x 4ft x 4ft boxes. In addition, the waste will have to monitored periodically. Both of these operation will increase the amount of exposure that workers will receive. In addition, there will be an increase in the amount of exposure that the public could be exposed to. With containment above ground the containers will be required not to leak any material and this will require periodic repackaging. Based on these issues, containment in an above ground facility does not make since from either a risk or economical standpoint.

Comment 297 : A Commentor questioned the Agencies' assertion that storage above ground is more dangerous than disposal below and compared the issue to work at Pit 9. [PR-TT]

Response: Issues dealing with Pit 9 are not within the scope of this project. Wastes stored above ground has to be packaged and monitored periodically. Both of these operation will increase the amount of exposure that workers will receive and potentially the public. For disposal below ground, in an engineered facility, there is only one probable exposure route (contaminated groundwater ingestion). The disposal cells at ICDF will be designed, constructed, operated, and closed with protection of the SRPA as a primary objective.

D.4. Other Disposal Facilities

Comment 298 : A Commentor was concerned that previous "cleanup" actions were just consolidation of mixed LLW into old waste percolation ponds and covering it over. The unlined Warm Waste Percolation Pond at the INEEL Test Reactor Area. Test Area North, and Argonne-West are examples of this practice. The Commentor further stated that the RCRA Subtitle C landfills have double liners, leachate detection/collection systems, and impermeable caps. Further, the Commentor stated that the Nuclear Regulatory Commission restrictions prohibit citing radioactive waste disposal dumps on 100 year flood plains. [NRC 10 CFR ss 61.50] [CB-W]

Response: Much of what the Commentor says we support. However, the Commentor is incorrect concerning the classification of wastes disposed of in the Warm Waste Pond that was used to consolidate non-RCRA radioactive waste. The Commentor may be confusing the Warm Waste Pond with the Chemical Waste Pond, which did receive RCRA wastes and will be closed in accordance with the applicable RCRA closure requirements. On another point, no remedial action has been taken at the ANL-W pond, and the pond is subject to RCRA closure. outside the scope of this action, so we are uncertain as to what the Commentor was referring to. Concerning tile Test Area North (TAN), RCRA hazardous waste disposal did occur into an old injection well, directly into the aquifer. Remediation, under the OU 1-07B ROD, is underway to restore the aquifer to drinking water quality. Lastly, the Nuclear Regulatory Commission (NRC) regulations are not ARARs for DOE projects, but construction of new disposal sites are subject to tile 100 year floodplain criteria, and this is an ICDF design requirement.

D.4.1. Radioactive Waste Management Complex (RWMC)

Comment 299 : A Commentor asked that the Agencies consider the issue of using the existing radioactive waste management complex, which does currently dispose of low-level radioactive waste in a facility on site. The Commentor supported closing the RWMC facility as soon as possible. [SR-TB]

Response: The operation and management of the RWMC is outside the scope of this project. Further, the RWMC does not have sufficient capacity to dispose of the soil and debris considered for the ICDF. In addition, the RWMC is over SRPA and not an engineered facility designed to accept and dispose of waste with both radionuclide and non-radionuclide constituents, as the ICDF will be. Since a considerable amount to the waste proposed for the ICDF contains both radionuclide and non-radionuclide constituents, the RWMC facility would be unsuitable for the disposal of MLLW.

D.5. Idaho High Level Waste and Facilities Disposition Environmental Impact Statement (Idaho HLW & FD EIS)

Comment 300 : A Commentor stated that it was their understanding that the HLW stabilization EIS will "cover" decontamination and decommissioning of the ICPP buildings and asked if it will include a timeline? And if yes, how will it relate to 2045, when, according to the plan, operations will end at the Chem Plant? [SRA-W]

Response: The Idaho HLW & FD EIS will evaluate various scenarios for the disposition of INTEC facilities dealing with the generation, treatment, storage, and disposal of HLW. In the evaluation of the disposition alternatives, the expected implementation time frames are also evaluated in the Idaho HLW & FD EIS. As the HLW at INTEC is required to be "road ready" by 2035, it was assumed that all treatment of the H LW was completed by 2035. A period of 10 years was assumed to be needed for the disposition of the necessary INTEC facilities, which results in the year 2045. Depending on the decisions made for the Idaho HLW & FD EIS, the timeframes for the disposition of INTEC facilities could change.

Comment 301 : A Commentor stated that it was appropriate that at least a brief discussion of the alternatives for HLW stabilization appear in the Proposed Plan. [SRA-W]

Response: Discussion of alternatives being considered under the Idaho HLW & FD EIS are outside the scope and not evaluated in the OU 3-13 - RI/FS. As such, no discussion of the Idaho HLW & FD EIS alternatives is included in the Proposed Plan or ROD.

Comment 302 : A Commentor asked, "Will the EIS deal with the New Waste Calciner? Where does the Calciner fit in?" [DK-TT]

Response: Treatment of the liquid waste at INTEC contained in the Tank Farm is not within the scope of this project, but is covered under the state HWMA/RCRA program and the Governor's Agreement. High level wastes have previously been treated with the New Waste Calcining Facility (NWCF). The Idaho HLW & FD EIS is currently evaluating alternatives to deal with the liquid waste in the High Level Waste Tank Farm.

Comment 303 : The INEEL CAB inquired whether under the preferred alternative for contaminated perched water under WAG 3, the existing percolation ponds will be removed from service, and replaced with "like for like" replacement ponds or service water discharge to the Big Lost River. The INEEL CAB recommended that additional feasibilitv studies be conducted before determining how to proceed with replacement. [CAB-W]

Response: The current discharges to the existing percolation ponds are contributing to the migration of contamination through the vadose zone. In evaluating alternatives to deal with this impact, the OU 3-13 FS and FSS Reports considered eliminating the existing percolation ponds and replacing them with a similar facility. The major emphasis of the ROD is to eliminate the current discharge contributing to the perched ground water and mobilizing contaminants into the SRPA. A new set of percolation ponds is the simplest and fastest way to cease the discharge and minimize the impacts on the SRPA. We also support the concept of looking at alternatives to like-for-like replacement. We hope that ways can be found to reduce water usage at INTEC, prior to the construction of the replacement ponds. However, we cannot stop the use of the existing ponds without establishing a known and reliable alternative to managing the 2 MGD wastewater.

Comment 304 : The INEEL CAB stated that in order to fairly assess the feasibility of replacements to the percolation ponds, the Agencies should more fully characterize the wastewater that currently goes into the percolation ponds and develop estimates of volumes and chemical composition for wastewater that will need to be managed once the existing ponds are taken out of service. The INEEL CAB recommend that recycling of water be maximized and encourage the treatment of residual wastewater to reduce risks. (CAB-W]

Response: We agree that there are gaps in the data characterizing the discharges of service waste at INTEC to the percolation ponds. To resolve this issue, a sampling program has been initiated to collect the necessary samples and adequately characterize the waste. This information will be used determine treatment requirements on the discharge. Resulting from these sampling and analysis activities will be the chemical (radionuclide and nonradionuclide) composition and estimated volumes of service waste discharged. An evaluation of potential disposal methods was conducted and is in the Administrative Record. The result of this evaluation was the decision to select replacement percolation ponds for dealing with the service wastewater. The criteria for discharge into the new replacement percolation ponds will limit the impacts of contamination on the environment.

D.6. Unconfirmed Information at INTEC

Comment 305 : A former ICPP workers recalled stacking sandbags six feet high around the plant during a spring flood about ten years ago. [CB-W]

Response: The Commentor is evidently referring to a flood threat near the INTEC "about 10 years ago." While no flooding threat has occurred at tile facility in the last 10 years, it will seem that the events referred to by the Commentor are the flood threats during 1983-1984, or 1957-1958. As a result of these flood threats, DOE took action to mitigate the flooding potential. Following the 1957-1958 flood threat, the diversion dam near the RWMC was constructed. After the 1983-1984 flood threat, the diversion dam was raised. However, we are unaware of any actual flooding at INTEC approximately 10 years ago.

D.7. Mobility of Plutonium

Comment 306 : A Commentor inquired about tile Nevada study on Plutonium migration and it's binding with clay. In the Nevada study, the Pu was bound to the clay and submicron particles floating in sediment in the water and was mobile, which is proof that it should not be buried. [PR-TT]

Response: We recognize that plutonium can migrate in the environment through soils and basalt. There are several mechanisms (ionic and colloidal) that control the migration of plutonium. Evaluation of the plutonium migration at INEEL uses conservative parameters. Also. the ICDF will be designed to minimize the generation of leachate, and restricted in the concentrations of hazardous substances like

plutonium that it can receive, thus prevent the migration of contaminants like plutonium to the SRPA at concentrations that present an unacceptable risk.

D.8. Nuclear Energy

Comment 307 : A Commentor wanted the Agencies to get on with this reduction of risk to our unborn generations to follow. Stop promoting this risky energy source and military deterrent around the world. [RK-W]

Response: Cleanup activities at INEEL, including both the environmental restoration and waste management programs, are intended to reduce the risk to human health and the environment. There are current ongoing projects to reduce the risk from waste in storage and previous contamination. Implementation of this ROD will quantify and reduce the risk from various areas at INTEC to acceptable levels. The CERCLA actions are aimed at cleanup from past operations and do not promote energy or power generation from any source. Since part of the DOE's mission is the research and development of nuclear energy sources the cleanup activities must consider these kind of missions as part of cleanup responsibilities.

Comment 308 : A Commentor stated, "While I don't oppose foreign countries sending us the spent nuclear waste from peaceful use of the atom. It is only because it is the lesser of two evils. Let this waste be used by a mad man to build a nuclear bomb or try safe containment, that the INEEL has not been able to do." [RK-W]

Response: Some spent nuclear fuel from foreign nations is being received at INEEL for temporary storage. This foreign spent nuclear fuel will eventually be packaged for final disposition in an approved disposal facility. While there has been contamination as a result of operations (accidental and past waste management practices) at INTEC, the storage of spent nuclear fuel at the INEEL has been and will continue to be safe.

Comment 309 : A Commentor wanted help in getting the permanent repository for high-grade nuclear waste open. [RK-W]

Response: We believe that the Commentor is referring to the High Level Waste Repository. There are currently two permanent repositories being considered by the Department of Energy. The first repository will deal with TRU waste (waste containing transuranic constituents concentrations of 100 nCi/g or greater). This facility is referred to as the WIPP and is located near Carlsbad, New Mexico. The second repository will deal with commercial and DOE produced spent nuclear fuel and DOE produced HLW. The proposed facility is referred to as Yucca Mountain and is located in western Nevada. Progress is being made to open both of these facilities to accept the appropriate waste materials. The DOE is responsible for both repositories and is attempting to open both repositories as soon as possible.

D.9. Research and Development

Comment 3 10 : A Commentor wanted support for more research to support alternative renewable energy sources (i.e., solar voltaics, superconductivity at lower temps). [RK-W]

Response: It is recognized that research and development of technologies is needed for the future. There are efforts to bring new missions to the INEEL. The technologies that the Commentor is referred to may end up among the technologies undergoing further and future research and development at the INEEL.

D. 10. Idaho Space Port

Comment 311 : A Conimentor wanted DOE to aggressively pursue the Idaho Space Port location at INEEL. [RK-W]

Response: The INEEL is supporting the State of Idaho in pursuing a Space Port located at the INEEL. There are several other states also trying to secure the Space Port. Selection of the location of the Space Port will be determined in the future. The Space Port is a privatized venture and not specifically under the authority of the DOE.

D.11. INTEC Operations

Comment 312 : A Commentor believed that a systematic review of operations, including SNF and HEU throughout history and a mass balance review is required to understand the status of the INTEC facility with adequate rigor to undertake the cleanup safety. If necessary, the DOE should prepare a classified appendix to cover these issues. "If possible, any classified information should be reviewed to determine whether the restrictions on public access (including UNCI) continue to be required. DOE headquarters committed to releasing a public document on HEU inventories, comparable to "Plutonium: The First 50 Years: in 1997." [SRA2-W]

Response: There is adequate historical information available concerning historical operations and activities at INTEC. We agree with the Commentor that there is a lack understanding by the public concerning the operations at INTEC. Generally, the uranium extracted during the reprocessing operations was sent to the Savannah River Site (SRS). At SRS, the uranium was generally used in SRS nuclear reactors to produce both tritium (H-3) and plutonium. As part of the INEEL cleanup activities, there is an ongoing program to identify and remove/reduce unstable nuclear material from INEEL facility. For example, a recent project at INTEC removed uranium from the ROVER facility located in CPP-640. Mass balances have been historically maintained during operations at INTEC, including waste management activities. In both the Spent Nuclear Fuel (SNF) EIS and Idaho HLW & FD EIS, mass balances are taken into account when evaluating the waste volumes, treatment, disposal, and other criteria. Also, the CERCLA project considers mass balances. No appendix is planned to be developed (classified or unclassified) containing information on SNF and Highly Enriched Uranium (HEU). Currently, there is no report developed on HEU inventories. However, DOE is in the process of developing a report.

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Appendix B

Idaho National Engineering and Environmental Laboratory Administrative Record File Index for the Comprehensive RI/FS of Operable Unit 3-13
08/10/99

Appendix B

Notice to Reviewer

Appendix B— The administrative record for this ROD is being updated. The final index to the Administrative Record File will be sent under separate cover prior to ROD signature.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE COMPREHENSIVE RI/FS OF
OPERABLE UNIT 3-13
09/22/99

FILE NUMBER

AR1.1 BACKGROUND

- Document #: *3533
  Title: Contaminants of Concern in the Test Area North Groundwater
  Author: Zimmerle, J.R.
  Recipient: N/A
  Date: 01/08/92

- Document #: *3534
  Title: Summary of RCRA Facility Investigation Activities at TAN
  Author: Zimmerle, J.R.
  Recipient: N/A
  Date: 01/08/92

- Document #: *5169
  Title: Assessment of the groundwater pathway from the leaching of surficial and buried contamination
  Author: N/A
  Recipient: N/A
  Date: 07/29/92

*** This document can be found in Administrative Record binder Operable Unit 1-07A, Vol. I**

- Document #: 10986
  Title: Response to Notice of Deficiency (NOD) for Closure Plan Submittal Received from the EPA/State
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 11/15/89

- Document #: 14143
  Title: Background Concentrations of Selected Metals and Radionuclides in the Big Lost River Alluvium at the Idaho Chemical Processing Plant
  Author: WINCO
  Recipient: Not specified
  Date: 02/28/94

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: 18017
  Title: Disposal of Drill Cuttings from Monitoring Well (MW)-18
  Author: Jenkins, T.W.
  Recipient: Orlean, H.; Reno, S.L.
  Date: 10/23/95

- Document #: 2549
  Title: USGS Comments on Closure plan for CPP-63 Hexone spill by CPP-710
  Author: Mann, L.J.
  Recipient: Feigner, K.D.
  Date: 08/27/87

- Document #: 2558
  Title: USGS Comments on Ground-water monitoring plan, ICPP Injection Well
  Author: Mann, L.J.
  Recipient: Pierre, W.
  Date: 05/27/87

- Document #: 2559
  Title: USGS Comments on Closure plan, ICPP Injection Well
  Author: Mann, L.J.
  Recipient: Pierre, W.
  Date: 05/27/87

- Document #: 2560
  Title: USGS Comments on Closure plan for the Hexone spill west of CPP-660
  Author: Mann, L.J.
  Recipient: Pierre, W.
  Date: 06/01/87

- Document #: 2801
  Title: USGS Comments on Closure plan for CPP-55, Mercury contaminated area (South of ICPP T-15)
  Author: Mann, L.J.
  Recipient: Pierre, W.
  Date: 04/29/87

- Document #: 3077
  Title: Closure Plan for CPP-64 (Hexone Spill West of CPP-660)
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 07 19 90

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: 3090
  Title: Closure Plan for Land Disposal Unit CPP-48 -Excess Chemical French Drain
  Author: Not specified
  Recipient: Not specified
  Date: 06/10/91

- Document #: 4962
  Title: Flooding Potential at the Idaho Chemical Processing Plant
  Author: Niccum, M.R.
  Recipient: Not specified
  Date: 04/01/73

- Document #: 610
  Title: Final Closure Report for CPP-55, Mercury Contaminated Area
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 12/03/90

- Document #: 611
  Title: Final Closure Plan for CPP-39, Hydrofluoric Acid Storage Tank
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 12/05/90

- Document #: 6111
  Title: Revision of Closure Plan for Land Disposal Unit (LDU) CPP-63, Hexone Leak Near Building CPP-710
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 08/22/89

- Document #: 6533
  Title: WINCOComments on EPA Region X Review of Summary Assessments CPP-41, CPP-43, CPP-70, CPP-71, CPP-76, and CPP-77
  Author: Matule, A.J.
  Recipient: Weiler, F.H..
  Date: 11/07/89

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: 6589
  Title: HLWTFR Project Using Devises to Locate Underground Utilities
  Author: Earle, O.K.
  Recipient: Williamson, D.J.
  Date: 10/13/91

- Document #: 6594
  Title: Disposition of Radioactively Contaminated Soil
  Author: Earle, O.K.
  Recipient: Williamson, D.J.
  Date: 12/18/91

- Document #: 6596
  Title: Sites Within OU 3-07
  Author: Mascarenas, C.S.
  Recipient: Williams, J.L.
  Date: 10/29/91

- Document #: 6614
  Title: Evaluation of a Unidirectional Gamma Detector for Operable Unit 3-07
  Author: Doornbos, M.H.
  Recipient: Mascarenas, C.S.
  Date: 10/22/92

- Document #: 6622
  Title: Report on Preliminary Review of Impact on Tank Farm due to Characterization Activities
  Author: Malik, L.E.
  Recipient: McGee, W.D.
  Date: 06/08/92

- Document #: 10707
  Title: Inclusion of Documents into the Administrative Record
  Author: Jenkins, T.W.
  Recipient: Ellis, D.L.
  Date: 09/20/99

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: 6623
  Title: Portable Pipe Mapper (PPM) Field Test at the Idaho Chemical Process Plant (ICPP)
  Author: Motazed, B.
  Recipient: Not specified
  Date: 01/01/92

- Document #: 6625
  Title: Idaho Chemical Processing Plant (ICPP) Waste Area Group Assessment
  Author: Not specified
  Recipient: Not specified
  Date: 01/04/91

- Document #: 6626
  Title: Meeting -Injection Well
  Author: Valentine, J.
  Recipient: Not specified
  Date: 05/08/86

- Document #: 6628
  Title: Final Report for CPP-421
  Author: Hanson, N.W.
  Recipient: Poland, D.J.
  Date: 09/14/88

- Document #: RC-10-98
  Title: Multi-Agency Radiation Survey and Site Investigation Manual (MARISSIM) Investigation for CPP-709 Radionuclides
  Author: Chambers, R.
  Recipient: Rodman, G.R.
  Date: 09/21/98

- Document #: RDG-03-97
  Title: Waste Area Group (WAG) 3 Core Samples
  Author: Greenwell, R.D.
  Recipient: Connolly, J.M.
  Date: 03/20/97

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: RDG-03-99
  Title: Soil Restoration Department Management Assessment of Waste Area Group (WAG) 3, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Radiological Management Area (RMA) and Storage Yard
  Author: Greenwell, R.D.
  Recipient: Distribution
  Date: 04/14/99

- Document #: RFM-41-89
  Title: ICPP Injection Well Abandonment Report
  Author: Mozes, R.F.
  Recipient: Shadley, D.E.
  Date: 12/11/89

- Document #: RHM-33-84
  Title: CPP-601 Process Cells A, B, C, D, & L D&D Final Report
  Author: Meservey, R.H.
  Recipient: Brehm, J.
  Date: 10/26/84

- Document #: SGS-127-91
  Title: Information Request
  Author: Bergeman, N.L.
  Recipient: Hinman, M.B.
  Date: 04/25/91

- Document #: SGS-289-91
  Title: Tank Closure Notification
  Author: Evans, T.A.
  Recipient: Lyle, J.L.
  Date: 07/31/91

- Document #: SGS-334-91
  Title: Tank Closure Notification
  Author: Evans, T.A.
  Recipient: Lyle, J.L.
  Date: 08/22/91

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: SGS-353-91
  Title: Tank Closure Notification
  Author: Evans, T.A.
  Recipient: Lyle, J.L.
  Date: 09/10/91

- Document #: SMB-05-94
  Title: Idaho Department of Health and Welfare (IDHW) Request for Idaho Chemical Processing Plant (ICPP) Stack Emissions Data
  Author: Burns, S.M.
  Recipient: Koch, D.
  Date: 07/15/94

- Document #: TAI-05-84
  Title: Radiological Controls for the Decontamination of Low Level Waste Project Equipment
  Author: Ikenberry, T.A.
  Recipient: Bingham, G.E.; Cukurs, M.; Beesley, L.M.
  Date: 07/19/84

- Document #: 6634
  Title: Waste Transfer Line Gasket Leak -Operating Occurrence Report
  Author: Lohse, G.E.
  Recipient: Kennedy, K.K.
  Date: 01/16/76

- Document #: 6660
  Title: Maps for CPP-14
  Author: WINCO
  Recipient: Not specified
  Date: 05/01/90

- Document #: 903-1188
  Title: ICPP Geophysical Survey
  Author: Retzlaff, R.
  Recipient: Williams, J.L.
  Date: 08/17/92

- Document #: 965
  Title: Transmittal of Closure Plan for CPP-59, Kerosene Spill
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 11/06/90

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: ACI-110
  Title: Buried Waste Line Register for National Reactor Testing Station (NRTS) Part IV CPP
  Author: Paige, B.E.
  Recipient: Not specified
  Date: 06/01/72

- Document #: 6648
  Title: Project Initiation Request -Demoliton of Abandoned Sewage Plant -CPP-703 & CPP-715
  Author: Soderberg, J.D.
  Recipient: Not specified
  Date: 02/04/83

- Document #: 6650
  Title: Characteristics of the ICPP Sanitary Waste Collection Systems
  Author: WINCO
  Recipient: Not specified
  Date: 09/01/80

- Document #: 6722
  Title: Transmittal of the Closure Plan for LDU CPP-34 (Soil Storage Area in the NE Corner of the ICPP)
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 06/19/90

- Document #: 7756
  Title: Hazardous Waste Streams at CPP
  Author: Wallace, M.T.
  Recipient: Winder, T.
  Date: 01/15/86

- Document #: 8472
  Title: Revised Closure Plan Approach for Land Disposal Units (LDU' s)
  Author: Solecki, J.E.
  Recipient: Gearheard, M.F.
  Date: 01/15/86

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: 6632
  Title: ICPP Tank Farm Contaminated Soil Investigation
  Author: Not specified
  Recipient: Not specified
  Date: 01/04/91

- Document #: 6638
  Title: Report on Perforation and Cementing for Abandonment of the ICPP Injection Well MAH-FE-PL-304
  Author: Fenix and Scisson and MK -Environmental Services
  Recipient: Not specified10/01/89
  Date: 10/01/89

- Document #: NEJ-28-91
  Title: Final Report on Robotic Geophysical Survey
  Author: Josten, N.E.
  Recipient: Urbanski, C.J.
  Date: 12/02/91

- Document #: KLF-150-97
  Title: Listing codes Applicable to Disposition of Investigation Derived Waste Originating From ICPP
  Author: Falconer, K.L.
  Recipient: Hovinga, J.E.
  Date: 07/08/97

- Document #: KLF-159-95
  Title: WAG 3 Investigation-Derived Waste Aquifer Well Purge Water
  Author: Raunig, D.E.
  Recipient: Green, L.A.
  Date: 05/15/95

- Document #: NEB-3-86
  Title: Sources of Information for CERCLA Study
  Author: Nebeker, R.L.
  Recipient: Pointer, T.F.
  Date: 02/02/86

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: MK-83-E-1792
  Title: Disposition of Stockpiled Low Level Contaminated Soil Excavated During the Low Level Waste Project Phase I at ICPP -M-K Project S-2258, ICWA 83-49
  Author: Hicks, F.E.
  Recipient: Bingham, G.E.
  Date: 11/28/83

- Document #: KXJ-9-92
  Title: State of Idaho, Request for Information
  Author: Jones, K.L.
  Recipient: Distribution
  Date: 01/14/92

- Document #: JFE-13-84
  Title: Location of Contaminated Dirt Burial
  Author: Erben, J.F.
  Recipient: Distribution
  Date: 04/16/84

- Document #: DLS-31-85
  Title: Summary of RALA D&D Status
  Author: Smith, D.L.
  Recipient: Meservey, R.H.
  Date: 08/09/85

- Document #: DWR-01-93
  Title: Evaluation of Records for Waste Generated at the Idaho Chemical Processing Plant (ICPP) and Disposed at the Radioactive Waste Management Complex (RWMC) During the Period of 1960-1983
  Author: Rhodes, D.W.
  Recipient: Nitschke, R.L.
  Date: 01/08/93

- Document #: CJU-05-92
  Title: Subsurface Imaging Results for the High Level Waste Tank Farm Replacement (HLWTFR) Project
  Author: Urbanski, C.J.
  Recipient: Distribution
  Date: 02/19/92

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: BING-106-83
  Title: Disposition of Stockpiled Soil
  Author: Bingham, G.E.
  Recipient: Hicks, F.E.
  Date: 12/08/83

- Document #: AMU-161-90
  Title: CPP-59 Closure Plan Submittal
  Author: Umek, A.M.
  Recipient: Lyle, J.L.
  Date: 11/08/90

- Document #: DDN-01-85
  Title: Identification of Radioactive Mixed Waste Streams at the Idaho Chemical Processing Plant
  Author: Nishimoto, D.D.
  Recipient: Falconer, K.L.
  Date: 04/11/85

- Document #: SGS-464-91
  Title: Tank Closure Notification
  Author: Evans, T.A.
  Recipient: Sato, W.N.
  Date: 11/06/91

- Document #: WINCO-1021
  Title: Radiological Characterization and Decision Analysis for the SFE-20 Waste Tank and Vault
  Author: Moser, C.L.; Schmidt, D.A.
  Recipient: Not specified
  Date: 09/01/84

- Document #: WINCO-1032
  Title: RALA Off-Gas Cell and Storage Tank (CPP-631 and VES-702) Decontamination and Decommissioning Plan
  Author: Moser, C.L.
  Recipient: Not specified
  Date: 07/01/85

FILE NUMBER

AR1.1 BACKGROUND (continued)

- Document #: WIN-86-0034-CPP
  Title: Unusual Occurrence Report -Inadvertent Transfer Resulting in Loss of Waste Solution
  Author: Lee, J.L.
  Recipient: Green, M.J.
  Date: 10/24/86

- Document #: WIN-86-0032-CPP
  Title: Unusual Occurrence Report –WL-212 Contaminated Liquid Spill
  Author: Lee, J.L.
  Recipient: Moffitt, W.C.
  Date: 10/24/86

- Document #: WINCO-1123, Revision 1
  Title: The Radiological Safety Analysis Computer Program (RSAC-5) User's Manual
  Author: Wenzel, D.R.
  Recipient: Not specified
  Date: 02/01/94

- Document #: DJK-09-96-A
  Title: Transition of Radiologically Contaminated Surplus Facilities from EM-60 to EM-40
  Author: Kenoyer, D.J.
  Recipient: Moriarty, T.P.
  Date: 11/13/96

- Document #: DOE/ID-10392, Rev. 0
  Title: Well Fitness Evaluation for the Idaho National Engineering Laboratory. Vol. I
  Author: Sehlke, G.; Davis, D.E.; Tullock, W.W.; Williams, J.A.
  Recipient: Not specified
  Date: 06/01/93

- Document #: DOE/ID-10392, Rev. 0
  Title: Well Fitness Evaluation for the Idaho National Engineering Laboratory. Vol. II
  Author: sehlk, G.; Davis, D.E.; Tullock, W.W.; Williams, J.A.
  Recipient: Not specified
  Date: 06/01/93

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: DOE/ID-10392, Rev. O
  Title: Well Fitness Evaluation for the Idaho National Engineering Laboratory, Vol. III
  Author: Sehlke, G.; Daivs, D.E.; Tullock, W.W.; Williams, J.A.
  Recipient: Not specified
  Date: 06/01/93

- Document #: ERD-210-91
  Title: Closure Plan for CPP-33, Contaminated Soil in Tank Farm Area Near WL-102, NE of CPP-604
  Author: Burns, T.F.
  Recipient: Not specified
  Date: 06/04/91

- Document #: DOE/ID-10402, Rev. 3
  Title: Comprehensive Well Survey for the Idaho National Engineering Laboratory, Vol. II
  Author: Not specified
  Recipient: Not specified
  Date: 05/01/94

- Document #: 893-1195.950
  Title: Report on Surface Geophysical Surveys at the Idaho Chemical Processing Plant
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 09/04/91

- Document #: ERD-229-91
  Title: Closure Plan for CPP-48, Excess Chemical Dump Tank (French Drain South of CPP-633)
  Author: Burns, T.F.
  Recipient: Gearheard, M.
  Date: 06/31/91

- Document #: ERD-075-91
  Title: Notification of Modification of Part A Permit for the INEL
  Author: Burns, T.F.
  Recipient: Donavan, R.P.
  Date: 03/14/91

FILE NUMBER

AR1.1 **BACKGROUND** (continued)

- Document #: ERD-105-91
  Title: Characterization Data and Other Information Regarding COCA Units CPP-39, -51, -54, -59, and -64
  Author: Burns, T.F.
  Recipient: Ledger, J.D.
  Date: 03/28/91

- Document #: ERD-102-91
  Title: Document Review -Closure Plan for Land Disposal Unit CPP-40 at the Idaho Chemical Processing Plant, Idaho national Engineering Laboratory
  Author: Ford, J.S.
  Recipient: Mann, S.A.
  Date: 07/16/91

AR1.3 **PRELIMINARY ASSESSMENT (PA) REPORT**

- Document #: 6637
  Title: Site Assessment Documentation Packages for CPP-13, CPP-15, CPP-27, CPP-29, CPP-35, CPP-36, CPP-58 E, and CPP-58 W
  Author: Culp, B.
  Recipient: Not specified
  Date: 03/31/92

AR1.4 **SITE INVESTIGATION (SI) REPORT**

- Document #: 6630
  Title: COCA Unit Discovery at the ICPP
  Author: Nygard, D.
  Recipient: Weiler, H.
  Date: 11/06/89

AR1.7 **INITIAL ASSESSMENTS**

- Document #: 5403
  Title: CPP-39, CPP HF Storage Tank (YDB-105) and Dry Well, OU 3-13
  Author: N/A
  Recipient: N/A
  Date: 07/08/87

FILE NUMBER

AR1.7 **INITIAL ASSESSMENTS (continued)**

- Document #: 5412
  Title: CPP-48, French Drain South of CPP-633, OU 3-13
  Author: N/A
  Recipient: N/A
  Date: 10/15/86

- Document #: 6645
  Title: CPP-13, Pressurization of the Solid Storage Cyclone NE of CPP-633
  Author: N/A
  Recipient: N/A
  Date: 07/07/87

- Document #: 6674
  Title: CPP-8, CPP-603 Basin Filter System Line Failure
  Author: N/A
  Recipient: N/A
  Date: 10/07/86

- Document #: 6675
  Title: CPP-9, Soil Contamination Near the NE Corner of CPP-603 South Basin
  Author: N/A
  Recipient: N/A
  Date: 10/07/86

- Document #: 6676
  Title: CPP-10, CPP-603 Plastic Pipeline Break
  Author: N/A
  Recipient: N/A
  Date: 10/07/86

- Document #: 6677
  Title: CPP-11, CPP-603 Sludge and Water Release
  Author: N/A
  Recipient: N/A
  Date: 10/07/86

- Document #: 6678
  Title: CPP-12, Contamination Paint Chips and Pad South of CPP-603
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

FILE NUMBER

AR1.7 **INITIAL ASSESSMENTS (continued)**

- Document #: 6679
  Title: CPP-13, Pressurization of the Solid Storage Cyclone NE of CPP-633
  Author: Poland, D.J.
  Recipient: N/A
  Date: 07/08/87

- Document #: 6680
  Title: CPP-15, Solvent Burner East of CPP-605
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

- Document #: 6681
  Title: CPP-16, Contaminated Soil from Leak in Line from WM-181 to PEW
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

- Document #: 6682
  Title: CPP-17, Soil Storage Area Near Peach Bottom Fuel Storage Area
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

- Document #: 6683
  Title: CPP-18, Gas Storage Building
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

- Document #: 6684
  Title: CPP-19, CPP-603, CPP-604 Line Leak
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

- Document #: 6685
  Title: CPP-20, CPP-604 Radioactive Waste Unloading Area
  Author: Poland, D.J.
  Recipient: N/A
  Date: 07/08/87

FILE NUMBER

AR1.7 **INITIAL ASSESSMENTS (continued)**

- Document #: 6673
  Title: CPP-7, Soil Contamination Northwest of CPP-642 (East of CPP-603)
  Author: Poland, D.J.
  Recipient: N/A
  Date: 10/07/86

AR1.9 **NEW SITE IDENTIFICATION/INCLUSION**

- Document #: 16760
  Title: New Site Identification - Tank Farm Soil Stockpiles - CPP-97
  Author: DOE; EPA; IDHW
  Recipient: Not specified
  Date: 10/16/98

- Document #: 16807
  Title: New Site Identification - Tank Farm Shoring Boxes - CPP-98
  Author: DOE; EPA; IDHW
  Recipient: Not specified
  Date: 11/03/98

- Document #: 16808
  Title: New Site Identification - Boxed Soil - CPP-99
  Author: DOE; EPA; IDHW
  Recipient: Not specified
  Date: 12/15/98

- Document #: 12899
  Title: New Site Identification -Buried Cylinders East -CPP-94
  Author: DOE
  Recipient: Not specified
  Date: 02/20/97

- Document #: 14345
  Title: New Site Identification -Simulated Calcine Trench NU-1.95 -CPP-93
  Author: DOE
  Recipient: Not specified
  Date: 01/25/95

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FILE NUMBER

AR1.9 NEW SITE IDENTIFICATION/INCLUSION (continued)

- Document #: DOE/ID-10705
  Title: Evaluation and Site Selection For A New Service Waste Disposal Facility For The Idaho Nuclear Technology and Engineering Center
  Author: Not specified
  Recipient: Not specified
  Date: 09/01/99

AR2.3 EE/CA APPROVAL MEMEORANDUM

- Document #: 10315
  Title: Approval Memorandum for the Idaho Chemical Processing Plant Radionuclide-Contaminated Soils Removal Action
  Author: N/A
  Recipient: DOE, EPA IDHW
  Date: 02/01/97

AR2.4 EE/CA

- Document #: DOE/ID-10568, Rev. 0
  Title: Engineering Evaluation/Cost Analysis for Radionuclide-Contaminated Soils Removal Action at the Idaho Chemical Processing Plant
  Author: Francis, C.S; Hall, M.; Heidkamp, H.A.; Heilman, D.; Henderson, L.; Nicklaus, D.M.; Sorman, K.L.; Wells, R.P.
  Recipient: Not specified
  Date: 02/01/97

- Document #: OPE-ER-29-97
  Title: Transmittal of the Emgineering Evalustion/Cost Analysis for Radionuclide-Contaminated Soils Removal Action at the Idaho Chemical Processing Plant
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 02/28/97

- Document #: DOE/ID-10568, Rev. 1
  Title: Engineeing Evaluation Cost Analysis for Radionuclide-Contaminated Soils Removal Action at the Idaho Chemical Processing Plant
  Author: Francis, C.S; Hall, M.; Heidkamp, H.A.; Heilman, D.; Henderson, L.; Nicklaus, D.M.; Sorman, K.L.; Wells, R.P.
  Recipient: Not specified
  Date: 06/01/97

FILE NUMBER

AR2.4 **EE/CA (continued)**

- Document #: OPE-ER-102-97
  Title: Transmittal of the Engineering Evaluation/Cost Analysis for Radionuclide-Contaminated Soils Removal Action at the Idaho Chemical Processing Plant
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/24/97

- Document #: 10543*
  Title: Idaho Chemical Processing Plant Windblown Area, Section 9, of the Engineering Evaluation/Cost Analysis for Operable Unit 10-06 Engineering Laboratory, Volume I, INEL-95/0259, Rev. 0
  Author: Jessmore, P.J.; Rood, S.M.; Haney, T.J.; Paarmann, M.L.; VanHorn, R.L.; Harris, G.A.; Stepan, I.E.; Burns, S.M.
  Recipient: Not specified
  Date: 06/01/95

*** The entire document may be found in Administrative Record OU 10-06, Volume I.**

AR2.5 **ACTION MEMORANDUM**

- Document #: DOE/ID-10588
  Title: Action Memorandum for the Idaho ChemicalProcessing Plant Radionuclide-Contaminated Soils Removal Action
  Author: Not specified
  Recipient: Not specified
  Date: 05/01/97

- Document #: 5280
  Title: Action Memorandum -Removal Action -Idaho Chemical Processing Plant
  Author: Earle, O.K.
  Recipient: Williams, A.C.
  Date: 05/28/93

- Document #: 5281
  Title: Action Memorandum -Removal Action -Idaho Chemical Processing Plant
  Author: Earle, O.K.
  Recipient: Williams, A.C
  Date: 05/28/93

FILE NUMBER

AR2.5 **ACTION MEMORANDUM (continued)**

- Document #: OKE-64-93
  Title: Action Memorandum For Time-Critical Removal Actions Planned for FY- 93 at the Idaho Chemical Processing Plant for Inclusion Into the Administrative Record File
  Author: Earle, O.K.
  Recipient: Williams, A.C.
  Date: 05/28/93

AR2.7 **HEALTH AND SAFETY PLAN**

- Document #: INEL/EXT-97-00132, Rev. 1
  Title: Health and Safety Plan for ICPP Radionuclide-Contaminated Soils Removal Action
  Author: Arrowood, J.; Gurney, L.; Steed, K.; Haight, R.
  Recipient: Not specified
  Date: 05/01/97

AR2.8 **WORK PLAN**

- Document #: DOE/EXT-97-00116, Rev. 0
  Title: Removal Action Plan for the Idaho Chemical Processing Plant Radionuclide-Contaminated Soils Removal Action
  Author: Cram, A.
  Recipient: Not specified
  Date: 06/01/97

AR3.1 **SAMPLING AND ANALYSIS PLAN**

- Document #: 18021
  Title: Sampling and Analysis Plan for the ICPP Percolation Ponds 1 and 2
  Author: Wastren Remediation, Inc.
  Recipient: Not specified
  Date: 03/24/93

- Document #: 14084
  Title: Sampling and Analysis Plan for Boxed Soils from Solid Waste Management Unit CPP-58 and Basement Exit Excavations CPP- 604/605 at the Idaho Chemical Processing Plant
  Author: Golder Associates Inc.
  Recipient: Not specified
  Date: 07/01/93

FILE NUMBER

AR3.1 **SAMPLING AND ANALYSIS PLAN (continued)**

- Document #: 93MSE/ID-225
  Title: Transmittal of WAG 3/WAG 10 Sampling and Analysis Plan
  Author: Barry, G.A.
  Recipient: Burns, S.M.
  Date: 08/02/93

- Document #: 6744
  Title: Sampling and Analysis Plan for WAG 3/WAG 10 Radionuclide-Contaminated Soils Treatability Study
  Author: Barry, G.A.; Doornbos, M.H.
  Recipient: Not specified
  Date: 08/01/93

- Document #: AM/ERWM-RPO-173-92
  Title: Transmittal of the Closure Addendum for the Draft Sampling and Analysis Plans (SAP) for Operable Units (OU) 3-07 and -08 (Tank Farm I & II, respectively), and WAG 3 Quality Assurance Project Plan (QAPjP)
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 07/31/92

- Document #: AM/ERWM-RPO-154-92
  Title: Transmittal of the Modifications to Operable Unit (OU) 3-07, the Tank Farm Sampling and Analysis Plan (SAP) at the Idaho Chemical Process Plant (ICPP) Waste Area Group 3 (WAG 3)
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 07/10/92

- Document #: 893-1195.320
  Title: Report for the Idaho Chemical Processing Plant (ICPP) Drilling and Sampling Program at Land Disposal Unit CPP-59
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 01/01/91

- Document #: 893-1195.330
  Title: Report for the Idaho Chemical Processing Plant (ICPP) Drilling and Sampling Program at Land Disposal Unit CPP-64
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 01/01/91

FILE NUMBER

AR3.1 **SAMPLING AND ANALYSIS PLAN (continued)**

- Document #: 893-1195.360
  Title: Report for the Idaho Chemical Processing Plant (ICPP) Drilling and Sampling Program at Land Disposal Unit CPP-54
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 01/01/91

- Document #: INEL-95/0064
  Title: Report of 1993/94 Tank Farm Dirlling and Sampling Investigation at the Idaho Chemical Processing Plant
  Author: Not specified
  Recipient: Not specified
  Date: 02/01/95

- Document #: 893-1195.530
  Title: Report of the Idaho Chemical Processing Plant Drilling and Sampling Program at the HLLW Tank Farm and LDU CPP-33
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 12/19/91

- Document #: 903-1171
  Title: Report of the Idaho Chemical Processing Plant Sampling and Analysis Program at Service Waste Percolation Pond No. 2
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 04/15/92

- Document #: ERD1-098-92
  Title: Transmittal of the Sampling and Analysis Plan(SAP) for Operable Unit (OU) 3-08 at the Idaho Chemical Processing Plant (ICPP) Waste Area Group 3 (WAG 3)
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 04/07/92

- Document #: INEEL/EXT-97-00677, Rev. 0
  Title: Limited Scope and Hazard Characterization Plan for Soil Disturbance CERCLA Radiological Characterization at ICPP -CPP-701 Petroleum Contaminated Soil
  Author: Jones, R.K.; Willis, B.J.
  Recipient: Not specified
  Date: 06/01/97

FILE NUMBER

AR3.1 **SAMPLING AND ANALYSIS PLAN (continued)**

- Document #: INEL-95/0137, Rev. 0
  Title: Sampling and Analysis Plan for the Waste Area Group 3 Remedial Investigation/Feasibility Study Work Plan (FINAL)
  Author: Meyer, T.J.
  Recipient: Not specified
  Date: 08/01/95

AR3.2 **SAMPLING AND ANALYSIS DATA/CHAIN OF CUSTODY FORMS (COC)**

- Document #: RM-06-93-A
  Title: Validation of Organochlorine Herbicide Data from the Fourth Quarter 1992 Groundwater Sampling Effort at the Westinghouse Idaho Chemical Processing Plant: Sample Delivery Groups
  Author: Marty, R.C.
  Recipient: Williams, J.L.
  Date: 02/24/93

- Document #: RPW-44-94
  Title: Transmittal of Limiations and Validation Report (L&V) Idaho Chemical Processing Plant (ICPP), Operable Unit 3-07, Radiochemical Analysis, Sample Delivery Group #3PG10301BG
  Author: Wells, R.P.
  Recipient: Holder, K.D.
  Date: 04/12/94

- Document #: 6629
  Title: Final Report for 2nd PECR
  Author: Hunter, B.R.
  Recipient: Stalke, A.K.
  Date: 07/27/87

- Document #: OPE-ER-052-95
  Title: Transmittal of the Validated Data for Perched Water Sampling December 1994 and January 1995
  Author: Green, L.A.
  Recipient: Pierre, W.; Nygard, D.
  Date: 03/23/95

FILE NUMBER

AR3.2 SAMPLING AND ANALYSIS DATA/CHAIN OF CUSTODY FORMS (COC) (continued)

- Document #: INEL/EXT-97-00341, Rev. 0
  Title: Limited Scope and Hazard Characterization Plan for Soil Disturbance CERCLA Radiological Characterization at ICPP
  Author: Jones, R.K.
  Recipient: Not specified
  Date: 03/01/97

- Document #: DLF-01-89
  Title: Review of Documents (QA/QC Samples)
  Author: Forsberg, D.L.
  Recipient: Minkin, S.C.
  Date: 09/27/89

- Document #: OPE-ER-254-97
  Title: Transmittal of the Validated Analytical Sampling Data for Idaho Chemical Processing Plant (ICPP) Radionuclide-Contaminated Soils Non-Time Critical Removal Action at the Idaho Chemical Processing Plant
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 11/25/97

- Document #: ERD-011-91
  Title: Submittal of Summary Analytical Data for Investigations at the ICPP (CPP-51, CPP-54, CPP-59, and CPP-64)
  Author: Solecki, J.E.
  Recipient: Humphrey, D.L.
  Date: 01/11/91

- Document #: ERD-036-91
  Title: Submittal of Summary Analytical Data for Investigations at the ICPP (CPP-39, CPP-34, and CPP-55)
  Author: Solecki, J.E.
  Recipient: Humphrey, D.L.
  Date: 02/27/91

FILE NUMBER

AR3.3 **WORK PLAN**

- Document #: INEL-95/0056, Rev. 0
  Title: Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (FINAL), Vol. I, through 8. References
  Author: N/A
  Recipient: N/A
  Date: 08/01/95

- Document #: INEL-95/0056, Rev. 0
  Title: Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (FINAL), Vol. I, Appendices
  Author: N/A
  Recipient: N/A
  Date: 08/01/95

- Document #: INEL-95/0056, Rev. 0
  Title: Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (FINAL), Vol. II, Attachment 5
  Author: N/A
  Recipient: N/A
  Date: 08/01/95

- Document #: INEL-95/0056, Rev. 0
  Title: Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (FINAL), Vol. II, Attachment 6
  Author: N/A
  Recipient: N/A
  Date: 08/01/95
- Document #: 6658
  Title: Technical Work Plan for the Idaho Chemical Processing Plant, Sampling And Analysis Program at Solid Waste Management Unit CPP-14, Vol. I, Rev. 1
  Author: Golder Associates, Inc.
  Recipient: N/A
  Date: 01/11/91

- Document #: 6659
  Title: Technical Work Plan for the Idaho Chemical Processing Plant, Quality Assurance Project Plan for Drilling and Sampling Activities at Solid Waste Management Unit CPP-14, Vol. II, Rev. 1
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 01/11/91

FILE NUMBER

AR3.3 **WORK PLAN (continued)**

- Document #: 6636
  Title: Technical Work Plan for the Idaho Chemical Processing Plant, Sampling And Analysis Program at Solid Waste Management Unit CPP-14, Vol. I, Rev. 2
  Author: Golder Associates, Inc.
  Recipient: N/A
  Date: 12/61/91

- Document #: 893-1195.310
  Title: Report for the Idaho Chemical Processing Plant, Drilling and Sampling Program at Land Disposal Unit CPP-39
  Author: Golder Associates, Inc.
  Recipient: Ledger, J.D.
  Date: 01/01/91

- Document #: OPER-ER-099-94
  Title: Transmittal of the Draft Finaly Technical Work Plan for the WAG 3 and WAG 10 Radionuclide-Contaminated Soils Treatability Study
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 04/26/94

- Document #: OPER-ER-127-95
  Title: Transmittal of the Draft Final Waste Area Group 3 Remedial Investigation/Feasibility Study Work Plan
  Author: Green, L.A.
  Recipient: Pierre, W.; Nygard, D.
  Date: 07/05/95

- Document #: 893-1195.450, Vol. I
  Title: Technical Work Plan for the Idaho Chemical Processing Plant Drilling and Sampling Program at the ICPP Tank Farm (CPP-33)
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 07/25/90

- Document #: 893-1195.450, Vol. II
  Title: Quality Assurance Project Plan for Drilling and Sampling Activities at the ICPP Tank Farm (CPP-33)
  Author: Golder Associates, Inc.
  Recipient: Not specified
  Date: 07/25/90

FILE NUMBER

AR3.3 WORK PLAN (continued)

- Document #: INEEL/EXT-98-01097, Rev. 0
  Title: Treatibility Study Work Plan for the Segmented Gate System Technology Deployment
  Author: Wells, R.P
  Recipient: Not specified
  Date: 04/01/99

AR3.4 RI REPORTS

- Document #: OPE-ER-122-96
  Title: Transmittal of the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEL--Part A, RI/BRA Report (Draft)
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/05/96

AR3.8 RISK ASSESSMENT

- Document #: OPE-ER-117-95
  Title: Transmittal of the Draft WAG 3 Screening Level Ecological Risk Assessment
  Author: Green, L.A.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/19/95

AR3.9 QUALITY ASSURANCE PROJECT PLAN

- Document #: QAPjP-E-035, Revision 0
  Title: Quality Assurance Project Plan for Characterization Activities at WAG 3
  Author: WINCO
  Recipient: Not specified
  Date: 07/21/92

- Document #: INEL-95/0086, Rev. 4 (formerly EGG-WM-10076)
  Title: Quality assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, and 10
  Author: Baumer, A.R.; Flynn, S.C.; Watkins, C.S.
  Recipient: Not specified
  Date: 03/01/95

FILE NUMBER

AR3.9 QUALITY ASSURANCE PROJECT PLAN (continued)

- Document #: DOE/ID-10587, Rev. 5 (formerly INEL-95/0086)
  Title: Quality assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, and 10 and Inactive Sites
  Author: Baumer, A.R.; Flynn, S.C.; Thompson, R.G.; Watkins, C.S.
  Recipient: Not specified
  Date: 12/01/97

AR3.10 SCOPE OF WORK

- Document #: 5791
  Title: Final Scope of Work for the Waste Area Group 3 Comprehensive Remedial Investigation Feasibility Study
  Author: WINCO
  Recipient: N/A
  Date: 10/14/94

- Document #: OPE-ER-283-94
  Title: Transmittal of the Final Scope Of Work for the Waste Area Group 3 Comprehensive Remedial Investigation Feasibility Study
  Author: Green, L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 10/21/94

- Document #: RPO-001-92
  Title: Transmittal of Scope of Work (SOW) for Track 2 Preliminary Scoping Study at Operable Unit (OU) 3-08
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 01/10/92

- Document #: OPE-ER-035-93
  Title: Transmittal of the Draft Scope of Work (SOW) for Operable Unit 3-08A (ICPP North Area RI/FS)
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 11/15/93

- Document #: 6590
  Title: Review of Draft Scope of Work for Operable Unit-7, Tank Farm
  Author: Mejia, C.
  Recipient: Williamson, D.; Fourr, B.; Williams, J.; Gombert, D.
  Date: 10/18/91

FILE NUMBER

AR3.10 SCOPE OF WORK (continued)

- Document #: 6591
  Title: Review of Draft Scope of Work for Operable Unit-7, Tank Farm
  Author: Mejia, C.
  Recipient: Williamson, D.; Fourr, B.; Williams, J.; Gombert, D.
  Date: 10/18/91

- Document #: 6592
  Title: Review of Draft Scope of Work for Operable Unit-7, Tank Farm
  Author: Mejia, C.
  Recipient: Williamson, D.; Fourr, B.; Williams, J.; Gombert, D.
  Date: 10/18/91

- Document #: OPE-ER-047-94
  Title: Transmittal of Draft Final Scope of Work for Operable Unit 3-08A (ICPP North Area RI/FS)
  Author: Lyle, J.L.
  Recipient: Pierre, W.; Nygard, D.
  Date: 02/18/94

AR3.11 FIELD SAMPLING

- Document #: DOE/ID-10579, Rev. 0
  Title: Field Sampling Plan for the Idaho Chemical Processing Plant Radionuclide-Contaminated Soils Removal Action
  Author: Wells, R.P.
  Recipient: Not specified
  Date: 05/01/97

- Document #: OPE-ER-91-97
  Title: Transmittal of the Field Sampling Plan for the Idaho Chemical Processing Plant Radionuclide-Contaminated Soils Removal Action andthe Removal Action Plan for the ICPP Radionuclide-Contaminated Soils Removal Action
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/12/97

FILE NUMBER

AR3.11 FIELD SAMPLING (continued)

- Document #: INEEL/EXT-97-00805
  Title: Field Sampling Plan for the D&D of the CPP-631 RaLa Building, and CPP-709 and CPP-734 Monitoring Stations at the Idaho Chemical Processing Plant
  Author: Jones, R.W.
  Recipient: Not specified
  Date: 08/01/97

AR3.12 RI/FS REPORTS

- Document #: OPE-ER-106-97
  Title: Transmittal of the Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL
  Author: Jines, A.T.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/27/97

- Document #: OPE-ER-127-97
  Title: Transmittal of the Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/14/97

- Document #: DOE/ID-10534
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL--Part A, RI/BRA Report (Final), Binder 1
  Author: Rodriguez, R.R.; Schafer, A.L.; McCarthy, J.; Martian, P.; Burns, D.E.; Raunig, D.E.; Burch, N.A.; VanHorn, R.L.
  Recipient: Not specified
  Date: 11/01/92

- Document #: DOE/ID-10534
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL--Part A, RI/BRA Report (Final), Binder 2
  Author: Rodriguez, R.R.; Schafer, A.L.; McCarthy, J.; Martian, P.; Burns, D.E.; Raunig, D.E.; Burch, N.A.; VanHorn, R.L.
  Recipient: Not specified
  Date: 11/01/92

FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

- Document #: DOE/ID-10534
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 At the INEEL--Part A, RI/BRA Report (Final), Binder 3
  Author: Rodriguez, R.R.; Schafer, A.L.; McCarthy, J.; Martian, P.; Burns, D.E.; Raunig, D.E.; Burch, N.A.; VanHorn, R.L.
  Recipient: Not specified
  Date: 11/01/97

- Document #: DOE/ID-10572
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL--Part B, FS Report (Final), Binder 1
  Author: Rodriguez, R.R.; Schafer, A.L.; McCarthy, J.; Martian, P.; Burns, D.E. Raunig, D.E.; Burch, N.A.; VanHorn, R.L.
  Recipient: Not specified
  Date: 11/01/97

- Document #: DOE/ID-10572
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL--Part B, FS Report (Final), Binder 2
  Author: Rodriguez, R.R.; Schafer, A.L.; McCarthy, J.; Martian, P.; Burns, D.E.; Raunig, D.E.; Burch, N.A.; VanHorn, R.L.
  Recipient: Not specified
  Date: 11/01/97

- Document #: DOE/ID-10619, Rev. 2
  Title: Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL - Part B, FS Supplement Report, Vol. 1 and 2
  Author: Greenwell, R.D.; Evans, C.S.
  Recipient: Not specified
  Date: 10/01/98

- Document #: OPE-ER-160-98
  Title: Transmittal of the Final Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL--Part B, FS Supplement Report (Revision 2)
  Author: Hain, K.E.
  Recipient: Pierre, W.; Hygard, D.
  Date: 10/14/98

FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

- Document #: OPE-EP&SA-98-002
  Title: Transmittal of Final Comprehensive Remedial Investigation/Feasibility Study for the Idaho Chemical Processing Plan Operable Unit 3-13 at the Idaho National Engineering and Environmental Laboratory and Draft Proposed Plan for Waste Area Group 3
  Author: Depperschmidt, J.
  Recipient: Distribution
  Date: 01/05/98

- Document #: OPE-ER-95-222
  Title: Transmittal of Validated Analytical Sampling Data for Idaho Chemical Processing Plant (ICPP) Perched Water Wells, Snake River Plain Aquifer (SRPA) Wells, Well USGS-47 Vertical Contaminant Profiling, and ICPP Soil Samples Conducted for the Waste Area Group (WAG) 3 Comprehensive Remedial Investigation/Feasibility Study (RI/FS)
  Author: Green, L.A.
  Recipient: Pierre, W.; Nygard, D.
  Date: 12/05/95

- Document #: DEB-20-97
  Title: Summary of Assumptions Used During Development of Waste Area Group (WAG) 3 Remedial Investigation and Feasibility Study (RI/FS) Microshield Modeling Results
  Author: Burns, D.E.
  Recipient: Henry, R.L.
  Date: 10/13/97

- Document #: OPE-ER-253-97
  Title: Transmittal of the Final Comprehensive RI//FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 11/25/97

- Document #: OPE-ER-174-97
  Title: Transmittal of the Draft Final Comprehensive RI//FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 10/30/97

FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: OPE-ER-308-94
  Title: Transmittal of the Revised Track 2 Summary Report for Operable Unit 3-09
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 11/22/94

AR3.15 HEALTH AND SAFETY PLAN

- Document #: 6621
  Title: Site Specific Health and Safety Plan -FY-1992 Drilling and Sampling Program -Track 2 Investigation of OU 3-07 Tank Farm and OU 3-08 Tank Farm II
  Author: Mascarenas, C.S.
  Recipient: Not specified
  Date: 08/10/92

- Document #: 6651
  Title: Site Specific Health and Safety Plan -Solid Waste Management Unit (SWMU) CPP-14
  Author: Alcalde, A.
  Recipient: Not specified
  Date: 10/16/90

- Document #: 6652
  Title: Site Specific Health and Safety Plan -Solid Waste Management Unit (SWMU) CPP-36 INEL
  Author: Alcalde, A.
  Recipient: Not specified
  Date: 10/16/90

- Document #: 6656
  Title: Site Specific Health and Safety Plan -Land Disposal Unit (LDU) CPP-63
  Author: Alcalde, A.
  Recipient: Not specified
  Date: 10/16/90

- Document #: 6655
  Title: Site Specific Health and Safety Plan-ICPP Land Disposal Unit (LDU) CPP-48
  Author: Alcalde, A.
  Recipient: Not specified
  Date: 10 16 90

FILE NUMBER

AR3.15 HEALTH AND SAFETY PLAN (continued)

- Document #: 6653
  Title: Site Specific Health and Safety Plan -ICPP Land Disposal Unit (LDU) CPP-37
  Author: Alacade, A.
  Recipient: Not specified
  Date: 10/16/90

- Document #: 6654
  Title: Site Specific Health and Safety Plan -Land Disposal Unit (LDU) CPP-40; LDU CPP-47
  Author: Alacade, A.
  Recipient: Not specified
  Date: 10/16/90

- Document #: EGG-ER-10922, Rev. 0
  Title: Health and Safety Plan for the WAG 3/WAG 10 Radionuclide-Contaminated Soils Treatability Study
  Author: Barry, G.A.; Nuthak, S.A.; Pickett, S.L.
  Recipient: Not specified
  Date: 08/01/93

- Document #: INEL-95/0136, Rev. 0
  Title: Health and Safety Plan for the Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study (Final)
  Author: Meyer, T.J.
  Recipient: Not specified
  Date: 08/01/95
-
- Document #: INEL-95/0136, Rev.2
  Title: Health and Safety Plan for the Waste Area Group 3 Comprehensive Remedial Investigation Feasibility Study (Final)
  Author: Meyer, T.J.
  Recipient: Not specified
  Date: 07/01/95

- Document #: INEL-95/0292, Rev. 0
  Title: Health and Safety Plan for D&D of CPP-631, -709, -734
  Author: LaBuy, S.A.; Peterson, D.A.
  Recipient: Not specified
  Date: 06 01 95

FILE NUMBER

AR3.15 HEALTH AND SAFETY PLAN (continued)

- Document #: INEL-95/0292, Rev. 1
  Title: Health and Safety Plan for D&D of CPP-631, -709, -734
  Author: LaBuy, S.A.; Peterson, D.A.
  Recipient: Not specified
  Date: 06/01/97

AR3.17 REMEDIAL INVESTIGATION AND BASELINE RISK ASSESSMENT REPORT

- Document #: KLF-210-95
  Title: Modification to the WAG 3 Baseline Risk Assessment Approach
  Author: Rodriguez, R.R.
  Recipient: Green, L.A.
  Date: 06/21/95

AR3.20 TREATABILITY STUDY

- Document #: PTL-02-94
  Title: Comments on the Draft Technical Work Plan for the WAG 3 and WAG 10 Radionuclide Contaminated Soils Treatability Study
  Author: Laney, P.T.
  Recipient: Honeycutt, T.K
  Date: 03/22/94

- Document #: GMH-01-93
  Title: Comments concerning the treatability study of INEL soils, including ICPP soils
  Author: Huestis, G.M.
  Recipient: Daum, K.A.
  Date: 08/04/93

AR3.21 SCHEDULE

- Document #: OPE-ER-131-96
  Title: Transmittal of the Revised WAG 3 Operable Unit 3-13 Comprehensive RI/FS Schedule
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/27/96

FILE NUMBER

AR3.21 SCHEDULE (continued)

- Document #: OPE-ER-33-97
  Title: Transmittal of the Revised WAG 3 Operable Unit 3-13 Comprehensive RI/FS Schedule
  Author: Jines, A.T.
  Recipient: Pierre, W.; Nygard, D.
  Date: 03/05/97

- Document #: 10110
  Title: Revised Closure Plan Schedule
  Author: Solecki, J.E.
  Recipient: Monson, S.
  Date: 09/29/89

- Document #: 8206
  Title: Detailed Schedules for Prepration of Closure Plans
  Author: Solecki, J.E.
  Recipient: Gearheard, M.F.
  Date: 01/11/90

- Document #: KHK-147-89
  Title: Detailed Schedules for Prepration of Closure Plans
  Author: Blumberg, D.J.
  Recipient: Sato, W.N.
  Date: 12/22/89

AR4.2 FS REPORTS

- Document #: OPE-ER-18-98
  Title: Transmittal of the Draft OU 3-13 Feasibility StudySupplement to the Final OU 3-13 Comprehensive RI//FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 01/29/98

- Document #: OPE-ER-128-98
  Title: Transmittal of the Revised Draft Comprehensive RI//FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL -Part B, FS Supplement Report (Revision 1)
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/06/98

FILE NUMBER

AR4.21 SCHEDULE (continued)

- Document #: OPE-ER-40-98
  Title: Transmittal of Documents for Review of WAG 3 Cost Estimates
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 03/12/98

- Document #: FL-92-0234
  Title: Fleasibility of Performing Gamma Isotopic Profiles in the Idaho Chemical Processing Plant Waste Tank Farm Observations Wells
  Author: Battaglia, P.J.
  Recipient: Alexander, D.
  Date: 09/29/92

AR4.3 PROPOSED PLAN

- Document #: 10542
  Title: Proposed Plan for Waste Area Group 3 at the Idaho Chemical Processing Plant Idaho National Engineering and Environmental Laboratory
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 10/01/98

- Document #: OPE-ER-159-98
  Title: Transmittal of the Final Proposed Plan (Rev 6) for Waste Area Group 3--Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 10/14/98

- Document #: 15054
  Title: DOE-HQ Approval and Comments on the Draft Proposed Plan for Remediation of the Idaho National Engineering and Environmental Laboratory, Waste Area Group 3, Operable Unit 3-13, Idaho Chemical Processing Plant, Comprehesive Remedial Investigation/Feasibility Study
  Author: Robinson, S.A.
  Recipient: Hain, K.E.
  Date: 11/14/97

FILE NUMBER

AR4.3 PROPOSED PLAN (continued)

- Document #: OPE-ER-68-98
  Title: Transmittal of the Revised Draft Proposed Plan, (Rev. 1) for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 04/17/98

- Document #: OPE-ER-78-98
  Title: Transmittal of the Revised Draft Proposed Plan, (Rev. 2) for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 05/14/98

- Document #: OPE-ER-104-98
  Title: Transmittal of the Revised Draft Proposed Plan, (Rev. 3) for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/22/98

- Document #: OPE-ER-261-97
  Title: Transmittal of the Draft Proposed Plan for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 12/04/97

- Document #: OPE-ER-133-98
  Title: Transmittal of the Revised Draft Proposed Plan, (Rev. 4) for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/17/98

FILE NUMBER

AR4.3 PROPOSED PLAN (continued)

- Document #: OPE-ER-148-98
  Title: Transmittal of the Revised Draft Proposed Plan (Rev 5) for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 09/15/98

- Document #: OPE-ER-28-98
  Title: Transmittal of the Revised Draft Proposed Plan for Waste Area Group 3, Idaho Chemical Processing Plant, Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 02/13/98

AR5.1 RECORD OF DECISION

- Document #: OPE-ER-44-99
  Title: Transmittal of the Draft Record of Decision -Idaho Nuclear Technology and Engineering Center, Idaho National Engineering and Environmental Laboratory
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 03/29/99

- Document #: OPE-ER-119-99
  Title: Transmittal of the Final Record of Decision -Idaho Nuclear Technology and Engineering Center, Idaho National Engineering and Environmental Laboratory
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 08/30/99

- Document #: OPE-ER-99-99
  Title: Transmittal of the Draft Final Record of Decision -Idaho Nuclear Technology and Engineering Center, Idaho National Engineering and Environmental Laboratory
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 07/20/99

FILE NUMBER

AR5.1 RECORD OF DECISION (continued)

- Document #: OPE-ER-28-99
  Title: Transmittal fo the Draft Record of Decison -Idaho Nuclear Technology and Engineering Center, Idaho National Engineering and Environmental Laboratory
  Author: Hain, K.E.
  Recipient: Kluk, A.
  Date: 02/17/99

AR5.4 RECORD OF DECISION REVIEW COMMENTS

- Document #: 10679
  Title: IDHW/DEQ Comments on Draft Record of Decision - Idaho Nuclear Technology and Engineering Center
  Author: Not specified
  Recipient: Jenkins, T.W.
  Date: 03/01/99

- Document #: 10681
  Title: IDHW/DEQ Comments on Draft Record of Decision - Idaho Nuclear Technology and Engineering Center (DOE/ID-10660)
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 05/14/99

- Document #: 10682
  Title: IDHW/DEQ Comments on Draft Record of Decision, Idaho Nuclear Technology and Engineering Center (DOE/ID-10660)
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 08/04/99

- Document #: 10683
  Title: EPA Review of Draft Final Record of Decision (ROD) for O.U. 3-13, Idaho Chemical Processing Plant
  Author: Pierre, W.
  Recipient: Hain, K.E.
  Date: 08/04/99

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES

- Document #: 18079
  Title: Concern over Department' s Proposed Plan for Waste Area Group 3 at the Idaho Chemical Processing Plant at INEEL and Request Personal Attention in Redirecting Critical Aspects of Effort - Request Public Comment be Extended for Thirty Days
  Author: Chenoweth, H.
  Recipient: Richardson, B., DOE-HQ
  Date: 12/18/98

- Document #: 18080
  Title: Reponse to Congresswoman Helen Chenoweth
  Author: Owendoff, J.M.
  Recipient: Richardson, B., DOE-HQ
  Date: 02/01/99

- Document #: 18081
  Title: Reponse to Congresswoman Helen Chenoweth -Public Comment Period On Proposed Plan for INTEC Extended
  Author: Richardson, B., DOE-HQ
  Recipient: Chenoweth, H.
  Date: 02/22/99

- Document #: OPE-ER-73-98
  Title: Response to Recommendation on Proposed Soils Repository at the Idaho National Engineering and Environmental Laboratory
  Author: Jenkins, T.W.
  Recipient: Rice, C.M.
  Date: 04/29/98

- Document #: OPE-ER-48-99
  Title: Response to Recommendation on the Proposed Plan for Remedial Action at the Idaho Chemical Processing Plant (Waste Area Group 3)
  Author: Jenkins, T.W.
  Recipient: Rice, C.M.
  Date: 03/31/99

- Document #: 10684
  Title: Comments on the WAG 3 Proposed Plan
  Author: Christinna
  Recipient: Lyle, J. L.
  Date: 12/17/98

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

- Document #: 10685
  Title: Comments on WAG 3
  Author: Priestley, F.
  Recipient: Chenoweth, H.
  Date: 01/01/99

- Document #: 10686
  Title: Comments on the Proprosed Plan for WAG 3
  Author: Vanhorn, R. L.
  Recipient: Simpson, E. A.
  Date: 12/15/98

- Document #: 10687
  Title: WAG 3 Comments
  Author: Ansley, Shannon L.
  Recipient: Simpson, E. A.
  Date: 12/02/98

- Document #: 10688
  Title: Comments on WAG 3
  Author: Taylor, A. E.
  Recipient: Simpson, E. A.
  Date: 10/31/98

- Document #: 10689
  Title: Comments on WAG 3
  Author: Randolph, P.
  Recipient: Simpson, E. A.
  Date: 10/27/9

- Document #: 10690
  Title: Idaho Chemical Processing Plant (INTEC) Proposed Plan Comments
  Author: Commander, J.
  Recipient: Lyle, J. L.
  Date: 12/01/98

- Document #: 10691
  Title: Comments on Proposed Clean-up Plan for INEEL Chemical Processing Plant
  Author: Lemley, J. K.
  Recipient: Lyle, J. L.
  Date: 12/18/98

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

- Document #: 10692
  Title: Comments on WAG 3
  Author: Hobson, S.
  Recipient: Chenoweth, H.
  Date: 02/08/99

- Document #: 10693
  Title: Comments on WAG 3
  Author: Crapo, M; Craig, L; Simpson, M.
  Recipient: Bergholz, W.
  Date: 02/09/99

- Document #: 10694
  Title: Comments on WAG 3
  Author: Robertson, B. B.
  Recipient: DOE-ID
  Date: 02/11/99

- Document #: 10695
  Title: Comments on WAG 3
  Author: Kuehn, R. M.
  Recipient: Simpson, E. A.
  Date: 02/08/99

- Document #: 10696
  Title: Comments on Environmental Remediatiion at Idaho National Engineering Laboratory, Idaho Chemical Processing Plant Radioactive Waste Management Complex
  Author: Broscious, C.
  Recipient: Community Relations Coordinator
  Date: 04/06/99

- Document #: 10697
  Title: Draft Comments (7/14/98) ICPP Draft Cleanup Plan
  Author: Broscious, C.
  Recipient: Community Relations Coordinator
  Date: 07/14/98

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

- Document #: 10698
  Title: Comments ICPP Draft Cleanup Plan
  Author: Broscious, C.
  Recipient: Pierre W.; Trever, K.; Wichmann, T.
  Date: 08/14/98

- Document #: 10699
  Title: Comments on Department of Energy Idaho National Engineering and Environmental Laboratory Idaho Chemical Processing Plan Proposed Cleanup Plan
  Author: Broscious, C.
  Recipient: Community Relations Coordinator
  Date: 11/19/98

- Document #: 10700
  Title: Comments on Proposed Plan for Idaho Chemical Processing Plant
  Author: Coperfield, C.
  Recipient: Lyle, J. L.
  Date: 12/21/98

- Document #: 10701
  Title: Public Comment Clean Up Plan for Waste Group 3 (Idaho Chemical Processing Plant) INEEL
  Author: Stewart, M. M.
  Recipient: Community Relations Coordinator
  Date: 12/22/98

- Document #: 10702
  Title: Idaho Chemical Processing Plant IINTEC) Proposed Plan -Comment
  Author: Hensel, D.
  Recipient: Community Relations Coordinator
  Date: 12/22/98

- Document #: 10703
  Title: Comments to WAG 3 Proposed Plan
  Author: Robo, R.
  Recipient: Lyle, J. L.
  Date: 12/21/98

FILE NUMBER

AR10.1 COMMENTS AND RESPONSES (continued)

- Document #: 10704
  Title: Comments on the Proposed Plan for Waste Area Group 3-Idaho Chemical Processing Plant Idaho National Engineering and Environmental Laboratory –Snake River Alliance
  Author: Brailsford, B.
  Recipient: Community Relations Coordinator
  Date: 12/22/98

- Document #: 10705
  Title: Comments on ICPP Proposed Plan
  Author: McCarthy, J. M.
  Recipient: Community Relations Coordinator
  Date: 12/22/98

- Document #: 10706
  Title: WAG 3 Comments
  Author: Citizens Advisory Board
  Recipient: Community Relations Coordinator
  Date: 11/18/98

AR10.3 PUBLIC NOTICE(S)

- Document #: 10545
  Title: Notice of Availability - Meetings Scheduled on Cleanup of Idaho Nuclear Technology and Engineering Center
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 10/22/98

- Document #: 16878
  Title: Notice of Availability - Comment Period Extended on Proposed Cleanup Plan for Idaho Nuclear Technology and Engineering Center
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 01/11/99

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 10675
  Title: INEEL Public Meeting on Proposed Cleanup Plan for Idaho Chemical Processing Plant (INTEC) -Idaho Falls, Idaho
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 11/16/98

- Document #: 10676
  Title: INEEL Public Meeting on Proposed Cleanup Plan for Idaho Chemical Processing Plant (INTEC) -Twin Falls, Idaho
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 11/17/98

- Document #: 10677
  Title: INEEL Public Meeting on Proposed Cleanup Plan for Idaho Chemical Processing Plant (INTEC) -Boise, Idaho
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 11/18/98

- Document # 10678
  Title: INEEL Public Meeting on Proposed Cleanup Plan for Idaho Chemical Processing Plant (INTEC) -Moscow, Idaho
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 11/19/98

AR10.6 FACT SHEETS AND PRESS RELEASES

- Document #: 14841
  Title: Update Fact Sheet - Comprehensive investigation identifies extent of contamination within Waste Area Group 3
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 11/01/97

FILE NUMBER

AR10.6 FACT SHEETS AND PRESS RELEASES (continued)

- Document #: 14840
  Title: Update Fact Sheet - Waste Area Group 3 environmental investigation nearly complete
  Author: INEEL Community Relations
  Recipient: Not specified
  Date: 09/01/98

- Document #: 6520
  Title: DOE NEWS -for Immediate Release -WINCO Coordinates Effort to Recycle Contaminated Metal
  Author: Bugger, B.
  Recipient: Not specified
  Date: 06/01/93

- Document #: 6548
  Title: DOE NEWS -for Immediate Release -DOE Completes Environmental Assessment on Upgrading Chem Plant Tank Farm
  Author: Coe, M.
  Recipient: Not specified
  Date: 06/24/93

- Document #: 6710
  Title: DOE NEWS -for Immediate Release -Idaho Chemical Processing Plant Transition Plan Made Available to the Public
  Author: Coe, M.
  Recipient: Not specified
  Date: 08/05/93

- Document #: 6805
  Title: DOE NEWS -for immediate Release -Removal Actions to Take Place at the Idaho Chemical Processing Plant
  Author: Bugger, B.
  Recipient: Not specified
  Date: 09/24/93

- Document #: 6836
  Title: DOE NEWS - for Immediate Release - WINCO, Private Vendor Demonstrates Technology for Cleaner Decontamination
  Author: Bugger, B.
  Recipient: Not specified
  Date: 10/15/93

AR10.6 FACT SHEETS AND PRESS RELEASES (continued)

- Document #: 7559
  Title: DOE NEWS -for Immediate Release -Retech Sign Agreement for Test Melt of Contaminated Metal
  Author: Bugger, B.
  Recipient: Not specified
  Date: 03/30/94

- Document #: 7595
  Title: DOE NEWS -for Immediate Release -Engineers New Sensor System with Arms Control, Cleanup Applications
  Author: Bugger, B.
  Recipient: Not specified
  Date: 04/01/94

AR11.1 EPA HEADQUARTERS GUIDANCE

- Document #: 14842
  Title: Response to Recommendations from the National Remedy Review Board (NRRB) on the Proposed Remedy for INTEC
  Author: Rose, K.A.
  Recipient: Jenkins, T.
  Date: 08/05/98

AR11.4 TECHNICAL SOURCES

- Document #: WM-F1-83-006
  Title: Internal Technical Report -Radiological Characterization and Decision Analysis for the CPP-603 BIF Filter Room
  Author: Schmidt, D.A.; Smith, D.L.; Smith, S.S.; Wilding, M.W.
  Recipient: Not specified
  Date: 05/01/83

- Document #: WM-F1-83-024
  Title: Internal Technical Report -Radiological Characterization and Decision Analysis for the CPP-603 Fuel-Element Cutting Facility
  Author: Schmidt, D.A., Smith, D.L.
  Recipient: Not specified
  Date: 09/01/83

FILE NUMBER

AR11.4 . TECHNICAL SOURCES (continued)

- Document #: WM-F1-81-004
  Title: Internal Technical Report -CPP-633 NaK Furnace Characterization
  Author: Smith, D.L.; Bradford, D.J.
  Recipient: Not specified
  Date: 03/01/81

- Document #: WM-Fl-81-010
  Title: Internal Technical Report -Characterization of the RALA Off-Gas Cell, CPP-631
  Author: Smith, D.L.; Bradford, D.J.
  Recipient: Not specified
  Date: 05/01/81

- Document #: WM-F1-81-023, Rev. 1
  Title: Internal Technical Report -Radioactive Waste Characterization of CPP 603 Cleanup Basin System -CPP-740
  Author: Low, J.O.
  Recipient: Not specified
  Date: 05/01/82

AR11.6 TECHNICAL MEMORANDUM

- Document #: 17286
  Title: Transmittal of the Draft Technical Memorandum on the Hydrogeology at the Idaho Chemical Process Plant
  Author: Jenkins, T.W.
  Recipient: Jones, E.; Reno, S.L.
  Date: 10/28/94

- Document #: OPE-ER-199-96
  Title: Transmittal of the Three Technical Memoranda on Technology Screening, Remedial Action Objectives, and Applicable or Relevant and Appropriate Requirements
  Author: Jensen, N.R.
  Recipient: Pierre, W.; Nygard, D.
  Date: 12/23/96

FILE NUMBER

AR11.6 TECHNICAL MEMORANDUM (continued)

- Document #: WINCO-1060
  Title: Modeling Hypothetical Groundwater Transport of Nitrates, Chromium, and Cadmium at the Idaho Chemical Processing Plant
  Author: Thomas, T.R.
  Recipient: Not specified
  Date: 11/01/88

- Document #: EGG-ER-11101
  Title: Technical Memorandum for the WAG 3 and WAG 10 Soils Treatability Study: Physical Separation of Radionuclides in Soils
  Author: Gombert, D.: Honeycutt, T.K.; Goettsche, J.H.; Huestis, G.M.; Tranter, T.J.
  Recipient: Not specified
  Date: 12/01/93

AR12.1 EPA COMMENTS

- Document #: 5776
  Title: Comments on the Technical Memorandum Conceptual Flow and Transport Models of the Unsaturated and Saturated Zones for the WAG 3 Comprehensive RI/FS
  Author: Meyer, L.
  Recipient: Green, L.
  Date: 06/17/94

- Document #: 5778
  Title: EPA Comments on the Draft Aquifer Characteristics Technical Memorandum
  Author: Meyer, L.
  Recipient: Green, L.
  Date: 08/10/94

- Document #: 5777
  Title: Review Comments of the Draft Technical Work Plan for the WAG 3 and WAG 10 Radionuclide-Contaminated Soils Treatability Study
  Author: Liverman, E.
  Recipient: Green, L.
  Date: 03/18/94

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

- Document #: 5783
  Title: EPA Comments, Draft Scope of Work for the Waste Area Group 3 Comprehensive RI/FS
  Author: Meyer, L.
  Recipient: Green, L.
  Date: 08/08/94

- Document #: 10429
  Title: EPA Comments, Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant (OU 3-13)
  Author: Orlean, H.
  Recipient: Hain, K.E.
  Date: 08/13/97

- Document #: 15038
  Title: EPA Comments on Idaho Chemical Processing Plant (ICPP), INEL Waste Area Group (WAG) 3 Technical Workplan for Perched Water Pumping and Tracer Tests
  Author: Jones, E.
  Recipient: Green, L.A.
  Date: 10/19/94

- Document #: 15053
  Title: Additional EPA Comments on Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant (OU 3-13)
  Author: Orlean, H.
  Recipient: Hain, K.E.
  Date: 09/12/97

- Document #: 18066
  Title: Idaho Chemical Processing Plant (ICPP), INEL Waste Area Group (WAG) 3 Technical Memorandum for Radiologically Contaminated Soils (New Unit NU-21.93)
  Author: Jones, E.
  Recipient: Green, L.A.
  Date: 11/18/94

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

- Document #: 18071
  Title: EPA Review of "Draft ICPP Radionuclide-Contaminated Soils Removal Action EE/CA"
  Author: Pierre, W.
  Recipient: Jensen, N.R.
  Date: 01/30/97

- Document #: 18077
  Title: EPA Comments on the Supplemental Feasibility Study for the Idaho Chemical Processing Plan by the Environmental Protection Agency
  Author: EPA
  Recipient: Not specified
  Date: 09/09/99

- Document #: 18078
  Title: EPA Comments on the Draft Final Proposed Plan for the ICPP
  Author: Rose, K.R.
  Recipient: Not specified
  Date: 09/09/99

- Document #: 12995
  Title: EPA Comments on Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 -Part A, RI/BRA Report
  Author: Orlean, H.
  Recipient: Jensen, N.R.
  Date: 10/04/96

- Document #: 2317
  Title: EPA Comments on INEL Initial Assessment Ranking Update on CPP-55 Closure Plan Review, and CPP-77 Summary Assessment Review
  Author: Feigner, K.D.
  Recipient: Gesell, T.F.
  Date: 12/24/87

- Document #: 2494
  Title: EPA Review of Selected Summary Assessments
  Author: Feigner, K.D.
  Recipient: Gesell, T.F.
  Date: 01/05/88

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

- Document #: 2668
  Title: EPA Review of INEL Closure Plan Reviews for TAN-726, Ion Exchange Treatment Unit, TAN-674 Tank, JET Container Storage Unit, and Hg Contaminated Area -CPP-55
  Author: Feigner, K.D.
  Recipient: Gesell, T,F.; Clark, C.E.
  Date: 10/27/87

- Document #: 3537
  Title: EPA Review Summary Assessments
  Author: Gearheard, M.; Koshuta, C.
  Recipient: Weiler, H.
  Date: 10/16/89

- Document #: 6318
  Title: EPA Closure Plan Review Mercury Contaminated Area CPP-55
  Author: Tetra Tech, Inc.
  Recipient: Not specified
  Date: 10/01/87

- Document #: 6497
  Title: EPA Summary Assessment Reviews
  Author: Feigner, K.D.
  Recipient: Clark, C.E.
  Date: 05/21/87

- Document #: 6709
  Title: EPA Notice of Deficiency for Closure Plan Submittal
  Author: Gearheard, M.F.; Koshuta, C.R.
  Recipient: Solecki, J.E.
  Date: 10/26/89

- Document #: 8682
  Title: EPA/IDHW Notice of Deficiencies for Sixteen INEL Closure Plans; CPP-55, CPP-37, CPP-33, CPP-34, CPP-48, CPP-39, CPP-63, CPP-47, CPP-40, CPP-59, CPP-64, TSF Disposal Pond, CFA-03, CFA-02, TAN-629 and CFA Motor Pool Pond
  Author: Gearheard, M.F.: Koshuta, C.R.
  Recipient: Weiler, F.H.
  Date: 11/08/86

FILE NUMBER

AR12.2 IDHW COMMENTS

- Document #: 5779
  Title: IDHW/DEQ Informal Comments on Sediment Layering Effect on Contaminant Transport for Nonperched Unsaturated Areas at the ICPP
  Author: Reno, S.L.
  Recipient: Jenkins, T.
  Date: 08/30/94

- Document #: 5782
  Title: IDHW/DEQ Comments, Draft Scope of Work for the Waste Area Group 3 Comprehensive RI/FS
  Author: Reno, S.L.
  Recipient: Green, L.
  Date: 08/10/94

- Document #: 15034
  Title: IDHW/DEQ Comments on Draft Technical Memorandum Waste Area Group 3, Comprehensive Remedial Investigation Baseline Risk Assessment Methodology, OU 3-13, September 28, 1994
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 11/01/94

- Document #: 15035
  Title: IDHW/DEQ Concurrence with Draft Final Scope of Work, Waste Group 3 Comprehensive Remedial Investigation/Feasibility Study
  Author: Reno, S.L.
  Recipient: Green, L.A.
  Date: 10/06/94

- Document #: 15040
  Title: IDHW/DEQ Comments on Technical Memorandum on the Hydrogeology at the Idaho Chemical Processing Plant, OU 3-13
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 11/22/94

FILE NUMBER

AR 12.2 IDHW COMMENTS (continued)

- Document #: 15045
  Title: IDHW/DEQ Review and Comment Period for Draft Sampling and Analysis Plan for the Waste Area Group 3 Remedial Investigation/Feasibility Study
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 02/17/95

- Document #: 15051
  Title: IDHW/DEQ Comments on the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL (Draft), June 1997
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 09/03/97

- Document #: 5784
  Title: IDHW/DEQ Informal Comments on Technical Memorandum Assessment of Porflow Boundary Conditions for Use in the ICPP Unsaturated Zone Model and Attachment A Assessment of the Cylindrical Coordinate Option in Porflow
  Author: Reno, S.L.
  Recipient: Jenkins, T.
  Date: 08/30/94

- Document #: 5785
  Title: IDHW/DEQ Concurrence with Draft Final Scope of Work, Waste Area Group (WAG) 3 Comprehensive RI/FS
  Author: Reno, S.L.
  Recipient: Green, L.
  Date: 10/06/94

- Document #: 15039
  Title: IDHW/DEQ Comments on Draft Technical Memorandum for the Water Quality Trend Analysis in the Snake River Plain Aquifer, Idaho Chemical Processing Plant, October 6, 1994, OU 3-13
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 11/07/94

FILE NUMBER

AR 12.2 IDHW COMMENTS (continued)

- Document #: 15044
  Title: IDHW/DEQ Informal Comments on Draft WAG 3 Saturated Zone Conceptual Model
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 01/09/95

- Document #: 15036
  Title: IDHW/DEQ Comments on Closure Plan for CPP-34/INEL
  Author: Lane, R.
  Recipient: Monson, B.R.
  Date: 08/14/90

- Document #: 15037
  Title: IDHW/DEQ Comments on Draft Technical Work Plan for the Idaho Chemical Processing Plant Perched Ground Water Pumping and Tracer Tests, September 16, 1994
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 10/18/94

- Document #: 18069
  Title: IDHW/DEQ Review Comments on the Draft Track Two Summary Report for Operable Unit (OU) 3-08 at the Idaho Chemical Processing Plant (ICPP), Waste Area Group 3 (WAG 3)
  Author: Stoops, T.M.
  Recipient: Green, L.A.
  Date: 06/09/93

- Document 18040
  Title: IDHW/DEQ Review of Draft Final Scope of Work for the WAG 3 North Area Remedial Investigation/Feasibility Study (OU 3-08a)
  Author: Rosenberger, M.S.
  Recipient: Green, L.A.
  Date: 03/09/94

FILE NUMBER

AR12.2 IDHW COMMENTS (continued)

- Document #: 18041
  Title: IDHW/DEQ Review of Draft SOW for Waste Area Group 03, Operable Unit 08a; Idaho Chemical Processing Plant
  Author: Stoops, T.M.
  Recipient: Green, L.A.
  Date: 01/19/94

- Document #: 15055
  Title: IDHW/DEQ Comments on the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL (Draft Final)
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 11/14/97

- Document #: 15059
  Title: IDHW/DEQ Informal Comments on the Working Draft of Proposed Plan for Waste Area Group 3, Idaho Chemical Processing Plant
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 01/09/98
- Document #: 18023
  Title: IDHW/DEQ Comments on Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (Draft)
  Author: Reno, S.L.
  Recipient: Green, L.A.
  Date: 05/01/95

- Document #: 18068
  Title: IDHW/DEQ Comments on Technical Memorandum for the ICPP Radiologically Contaminated Soils (New Unit NU-21.93), OU 3-13
  Author: Reno, S.L.
  Recipient: Jenkins, T.W.
  Date: 11/18/94

- Document #: 12996
  Title: IDHW/DEQ Comments on Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEL -Part A, RI/BRA (Draft) (DOE ID-10534, August 1996, Revision 0)
  Author: Reno, S.L.
  Recipient: Jensen, N.R.
  Date: 10/08/96

FILE NUMBER

AR12.2 IDHW/DEQ COMMENTS (continued)

- Document #: 14351
  Title: IDHW/DEQ Comments on Engineering Evaluation/Cost Analysis for Radionuclide-Contaminated Soils Removal Action at the Idaho Chemical Processing Plant (DOE/ID-10568, February 1997)
  Author: Reno, S.L.
  Recipient: Jensen, N.R.
  Date: 03/27/97

- Document #: 16292
  Title: IDHW/DEQ Comments on the Revised Draft Proposed Plan for Waste Group 3 at the Idaho Chemical Processing Plant
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 03/06/98

- Document #: 16293
  Title: IDHW/DEQ Comments on the Draft Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL -Part B, FS Supplement Report
  Author: Reno, S.L.
  Recipient: Hain, K.E.
  Date: 03/26/98

- Document #: 6112
  Title: IDHW/DEQ Comments Concerning the Public Comment Period for the Closure Plan for CPP-55
  Author: Donovan, R.P.; Findley, C.E.
  Recipient: Barry, J.H.
  Date: 09/19/89

- Document #: 6725
  Title: IDHW/DEQ Review of the Revised Closure Plan for CPP-23
  Author: Koshuta, C.R.
  Recipient: Solecki, J.E.
  Date: 04/17/90

FILE NUMBER

AR12.3 DOE RESPONSE TO COMMENTS

- Document #: 2820
  Title: Caliper Logs for CPP-23 Injection Well
  Author: Solecki, J.E.
  Recipient: Monson, B.R.
  Date: 08/22/90

- Document #: 6036
  Title: Summary Assessments
  Author: Solecki, J.E.
  Recipient: Gearheard, M.
  Date: 03/13/90

- Document #: 906
  Title: State of Idaho Request for Information Concerning the Status of "A Shallow Seepage Pit on the West Side of CPP-603" (SWMU CPP-2)
  Author: Solecki, J.E.
  Recipient: Nygard, D.
  Date: 12/07/89

- Document #: 6635
  Title: Response to State Questions
  Author: Green, L.A.
  Recipient: Hendrickson, B.
  Date: 04/26/90

- Document #: OPE-EP-131-97
  Title: Regulatory Position on the Status of CPP 709 and CPP 734
  Author: Wessman, D.L.
  Recipient: Steger, R.
  Date: 04/10/97

- Document #: OKE-21-90
  Title: Strontium 90 in Borehole CPP-55-06
  Author: Earle, O.K.
  Recipient: Lyle, J.L.
  Date: 12/06/90

FILE NUMBER

AR 12.3 DOE RESPONSE TO COMMENTS (continued)

- Document #: OKE-13-91
  Title: Revised LDU Questionnaires
  Author: Earle, O.K.
  Recipient: Lyle, J.L.
  Date: 02/04/91

- Document #: OKE-18-90
  Title: Strontium 90 in Borehole CPP-55-06
  Author: Earle, O.K.
  Recipient: Sato, W.N.
  Date: 11/19/90

- Document #: OPE-ER-101-97
  Title: Response to Recommendation on the Technology Screening and Alternative Development for WAG 3 Comprehensive Feasibility Study Report
  Author: Jenkins, T.W.
  Recipient: Rice, C.M.
  Date: 06/18/97

- Document #: DJB-41-89
  Title: Summary Assessment Review Letter from the EPA/STATE
  Author: Blumberg, D.J.
  Recipient: Weiler, F.H.
  Date: 11/09/89

- Document #: DJB-49-90
  Title: October 16, 1989 EPA Request for Additional Information for Deletion of Selected SWMU' s from the COCA through the Summary Assessment Process
  Author: Blumberg, D.J.
  Recipient: Panasiti, J.D.
  Date: 05/23/90

- Document #: DJB-09-90
  Title: Summary Assessment Review Letter from the EPA/STATE
  Author: Blumberg, D.J.
  Recipient: Weiler, F.H.
  Date: 01/12/90

FILE NUMBER

AR 12.3 DOE RESPONSE TO COMMENTS (continued)

- Document #: AJM-23-89
  Title: EPA Region X and Idaho Department of Health and Welfare Conditions for Closure of LDU CPP-55
  Author: Matule, A.J.
  Recipient: Weiler, F.H.
  Date: 05/26/89

- Document #: OPE-ER-196-96
  Title: Response to Comments for the Waste Area Group 3, Draft Comprehensive Remedial Investigation and Baseline Risk Assessment Report (RI/BRA), Part A of the Comprehensive Remedial Investigation, Feasibility Study Report
  Author: Jines, A.T.
  Recipient: Pierre, W.; Nygard, D.
  Date: 12/17/96

- Document #: DJB-40-89
  Title: Response to Notice of Deficiency for Closure Plan Submittal Received from the EPA/STATE
  Author: Blumberg, D.J.
  Recipient: Weiler, F.H.
  Date: 11/09/89

- Document #: GS-04-90
  Title: Revision of WINCO' s Response to EPA Region X' s Review of Summary Assessments CPP-41, CPP-43, CPP-70, CPP-71, CPP-76, and CPP-77
  Author: Sehlke, G.
  Recipient: Blumberg, D.J.
  Date: 03/07/90

- Document #: GS-15-89
  Title: Response to EPA' s Notice of Deficiency for WINCO' s Accelerated Closure Plan Schedule
  Author: Sehlke, G.
  Recipient: Blumberg, D.J.
  Date: 11/08/89

FILE NUMBER

AR12.3 DOE RESPONSE TO COMMENTS (continued)

- Document #: ERD-161-91
  Title: Response to Information Request by Mr. Walker Howell Regarding Sampling Data at CPP-55-06
  Author: Lyle, J.L.
  Recipient: Ledger, J.D.
  Date: 05/09/91

- Document #: ERD-209-91
  Title: Response to Regulatory Comments on Closure Plan for CPP-59, Kerosene Tank Overflow
  Author: Burns, T.F.
  Recipient: Gearheard, M.
  Date: 05/30/91

AR12.4 EXTENSION REQUESTS AND APPROVALS

- Document #: 10298
  Title: Extension of Review Period on the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEL--Part A, RI/BRA Report (Draft) - (OPE-ER-122-96)
  Author: Reno, S.L.
  Recipient: Jensen, N.R.; Pierre, W.
  Date: 08/29/96

- Document #: 10430
  Title: Extension of Review Period on the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL (Draft) - (DOE/ID-10572, June 1997)
  Author: Reno, S.L.
  Recipient: Hain, K.E.; Pierre, W.
  Date: 08/11/97

- Document #: OPE-ER-67-98
  Title: Request for Extension of the OU 3-13 Draft ROD and Related Documents
  Author: Hain, K.E.
  Recipient: Pierre, W.; Nygard, D.
  Date: 05/15/98

FILE NUMBER

AR12.4 EXTENSION REQUESTS AND APPROVALS (continued)

- Document #: 10446
  Title: Concurrence with enforceable schedule extension for OU 3-13 Draft Record of Decision
  Author: Nygard, D.
  Recipient: Hain, K.E.
  Date: 05/27/98

- Document #: 10447
  Title: Concurrence on Request for Extension of Enforceable Milestone for OU 3-13 Draft Record of Decision (ROD)
  Author: Pierre, W.
  Recipient: Hain, K.E.
  Date: 05/27/98

- Document #: 15057
  Title: Request for 20-Day Extension of Comment Period on the Draft Proposed Plan for the Idaho Chemical Processing Plant at INEEL
  Author: Rose, K.A.
  Recipient: Hain, K.E.
  Date: 12/30/97

- Document #: 6115
  Title: Receipt of your Notice of Delay dated 9/28/92 for submission of Track Two Summary Reports for Operable Units 3-07 and 3-08
  Author: Stoops, T.M.
  Recipient: Lyle, J.L.
  Date: 10/26/92

- Document #: 905
  Title: INEL Request for Extension for Closure Plans for COCA Units CPP-64, CPP-59 and CPP-39
  Author: Gearheard, M.F.; Koshuta, C.R.
  Recipient: Solecki, J.E.
  Date: 08/03/90

FILE NUMBER

AR 12.4 EXTENSION REQUESTS AND APPROVALS (continued)

- Document #: OPE-ER-102-95
  Title: Extension of Comment Resolution Period on the Waste Area Group 3 Remedial Investigation/Feasibility Study Work Plan
  Author: Green, L.A.
  Recipient: Pierre, W.; Nygard, D.
  Date: 06/05/95

- Document #: OPE-ER-173-96
  Title: Twenty Day Extension Notification for Submittal of the Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEL -Part A, RI/BRA Report (Draft Final)
  Author: Jenkins, T.W.
  Recipient: Pierre, W.; Nygard, D.
  Date: 11/13/96

- Document #: ERD-197-91
  Title: Request for Extension of the CPP-59 Closure Plan Revision Schedule
  Author: Burns, T.F.
  Recipient: Ledger, J.D.; Gearheard, M.
  Date: 05/21/91

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IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 01/21/2000
Operable Unit: 11
ROD ID: EPA/541/R-00/039

Text: Full-text ROD document follows on next page.

EPA 541-R00-039
2000

EPA Superfund
Record of Decision:

Idaho National Engineering Laboratory (USDOE)
Operable Unit 11
Idaho Falls, ID
01/21/2000

DOE/ID-10700
January 2000

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Environmental Cleanup Office

INEEL

IDAHO DEPARTMENT OF HEALTH AND WELFARE

DIVISION OF ENVIRONMENTAL QUALITY

Record of Decision

Power Burst Facility and Auxiliary Reactor Area

Operable Unit 5-12
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DOE/ID-10700

Record of Decision for the Power Burst Facility and Auxiliary Reactor Area

Published January 2000

Operable Unit 5-12
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

PART 1: DECLARATION

Site Name and Location

Power Burst Facility and Auxiliary Reactor Area

Waste Area Group 5 Comprehensive Remedial Investigation Feasibility Study, Operable Unit 5-12

Incorporating 55 individual sites in Operable Units 5-1 through 5-13

Idaho National Engineering and Environmental Laboratory Idaho Falls, Idaho

CERCLIS ID 4890008952.

Statement of Basis and Purpose

This decision document presents the selected remedy for Waste Area Group (WAG) 5 at the Idaho National Engineering and Environmental Laboratory (INEEL). The selected remedy comprises remedial action at seven individual sites and outlines the limited action comprising institutional controls that will be implemented for nine additional sites. The components of the selected remedy were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. The selected remedy is intended to be the final action for contamination at WAG 5.

The U.S. Department of Energy Idaho, Operations Office (DOE-ID), is the lead agency for this decision. The U.S. Environmental Protection Agency (EPA) approves the decision and the Idaho Department of Health and Welfare (IDHW) concurs. The EPA and IDHW have participated in the evaluation and selection of remedies for WAG 5 sites of concern, the no action and institutional control decisions, and the identification of sites that will be administered under other INEEL regulatory programs. The bases for decisions are established in this Record of Decision (ROD) and documented in the Administrative Record for WAG 5.

Assessment of Site

Actual or threatened releases of hazardous substances from WAG 5, if not addressed by implementation of response actions selected in this ROD, may pose an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

Waste Area Group 5 at the INEEL, comprising the Power Burst Facility (PBF) and the Auxiliary Reactor Area (ARA), is one of 10 WAGs identified in the Federal Facility Agreement and Consent Order (FFA/CO). Operable Unit (OU) 5-12 encompasses the WAG 5 Comprehensive Remedial Investigation/Feasibility Study (RI/FS). The FFA/CO, which provides the framework and schedule for the implementation of CERCLA at the INEEL, was negotiated and signed by DOE-ID, EPA Region 10, and the IDHW Division of Environmental Quality. Waste Area Group 10 is the INEEL-wide investigation. Results from the WAG 5 Comprehensive RI/FS and the other eight waste area groups will be evaluated cumulatively in the WAG 10 study to reach final CERCLA-based decisions for the entire INEEL.

The PBF contains five separate operational areas and the ARA, which is undergoing decontamination and dismantlement, historically comprised four separate facilities. The INEEL Comprehensive Facility and Land Use Plan projects that the ARA will be encompassed by a future buffer to public roads (i.e., State Highway 20) and will not be reused for future INEEL operations. Conversely, the forecast for the PBF area includes modification and reuse for industrial operations over the next 100 years. In combination, the ARA and PBF contain 55 individual sites. The Comprehensive RI/FS tasks were to estimate the cumulative risks associated with all 55 sites and identify and evaluate appropriate remedial actions for those sites posing unacceptable risk. The RI/FS results and the preferred remedial alternatives were summarized in the WAG 5 Proposed Plan, which was issued for public review in May 1999.

The Comprehensive ROD is the culmination of the WAG 5 Comprehensive RI/FS. This ROD documents the remedies selected for six sites at ARA and one site at PBF that pose unacceptable risk to human health or the environment. The remedial actions were selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan. This ROD is based on the information contained in the INEEL Administrative Record and is designed to satisfy the requirements of the FFA/CO.

The selected remedy for WAG 5 comprises three remedial actions to mitigate the risk associated with seven specific sites, and limited action to implement institutional controls. Management of stored and investigation-derived waste and groundwater monitoring also are components of the selected remedy. The first remedial action addresses a collection of five individual sites where contaminated soil is the only source medium. The second remedial action will mitigate residual contamination in a sanitary waste system. The only principal threat identified in WAG 5, addressed by the third remedial action, is posed by the contents of an underground storage tank. The limited action addresses institutional controls that will be implemented at nine additional sites and outlines the development of an institutional control plan for WAG 5.

Selected Remedy for Contaminated Soil Sites

Unacceptable risk to human health or the environment from contaminated soil sites designated as ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16 have been identified. The human health risk associated with ARA-01, ARA-12, ARA-23, and ARA-25 is primarily external exposure to ionizing radiation. Adverse effects to ecological receptors are associated with ARA-01, ARA-12, ARA-25, and PBF-16. Removing all soil that is contaminated with concentrations in excess of the remediation goals will mitigate these threats. The remediation of the soil sites will include the following activities:

- Soil contaminated with concentrations in excess of the remediation goals will be removed using conventional earth-moving equipment (e.g., scrapers and backhoes).

- Areas that have been excavated to depths greater than 0.3 m (1 ft) will be backfilled with uncontaminated soil or sloped to promote drainage. All excavations will be contoured to match the surrounding terrain and vegetated.

- Contaminated soil will be characterized and sent to the INEEL CERCLA Disposal Facility (ICDF) or another location within the INEEL for permanent disposal.

- Existing institutional controls will be maintained until the selected remedy has been implemented at four of the five contaminated soil sites. Interim controls are not required for PBF-16, a site identified for remediation based on ecological risk from exposure to mercury.

Institutional controls will not be required after remediation if all contaminated media are removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, post-remediation institutional controls consisting of signs, access controls, and land-use restrictions will be established and maintained until discontinued based an the results of a 5-year review.

Selected Remedy for the ARA-02 Sanitary Waste System

The ARA-02 Sanitary Waste System will be remediated to mitigate excess human health risk. External exposure to radioactive contaminants is the primary exposure of concern. The entire system (i.e., three septic tanks, a seepage pit, and piping) will be removed. However, the unacceptable risk is associated only with contaminants in residual dry sludge at the bottom of the seepage pit. A time-critical removal action was implemented in 1996 to remove the contents of the septic tanks. The remediation of the Sanitary Waste System will include the following activities:

- The sludge in the seepage pit will be removed and sent to the INEEL Waste Experimental Reduction Facility (WERF) for batch incineration and final disposition.

- The components of the Sanitary Waste System (i.e., the seepage pit gravel and cinder blocks, three septic tanks, and pipes) will be excavated. The debris will be sent to a permitted disposal facility off the INEEL such as Envirocare in Clive, Utah, or an approved facility on the INEEL such as the ICDF for final disposal. The debris will be decontaminated or encapsulated only if necessary to meet waste acceptance criteria for disposal.

- The excavated areas will be backfilled, contoured to match the surrounding terrain, and vegetated.

- Based on soil sampling results, soil contaminated with concentrations in excess of remediation goals is not expected. However, if such soil is identified by observation or using field survey equipment during remediation of the Sanitary Waste System, the soil will be removed and managed in conjunction with the remediation of the contaminated soil sites described above.

- Existing institutional controls will be maintained until the selected remedy has been implemented. Institutional controls will not be required after remediation if all contaminated media are removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, post-remediation institutional controls consisting of signs, access controls, and land-use restrictions will be established and maintained until discontinued based on the results of a 5-year review.

Selected Remedy for the ARA-16 Radionuclide Tank

The ARA-16 Radionuclide Tank will be remediated to mitigate excess human health risk from contaminated soil and to prevent a release from the tank that could expose human and ecological receptors to toxic and radioactive contaminants. The contents of the tank pose the only principal threat identified in WAG 5.

The tank site is located within a larger contaminated soil area (i.e., Site ARA-23). Though tank operations are not the cause of the soil contamination, the primary quantified risk identified for this site is external exposure to contaminated soil surrounding the tank. Risk estimates for the tank contents were not quantified in the WAG 5 baseline risk assessment because a release has not occurred. However, the

remediation of the site will address both the contaminated soil and the principal threat posed by a potential release of the tank contents to the environment. The remediation of ARA-16 will include the following activities:

- The tank contents will be removed, placed in drums, and transported to the Transuranic Storage Area at the Radioactive Waste Management Complex (RWMC) for monitored storage until an approved treatment facility is available. The RWMC operates under a Resource Compensation and Recovery Act permit, and the waste will be subsequently treated and disposed of to satisfy the appropriate waste acceptance criteria and to comply with applicable regulations.

- An approved treatment facility, such as the INEEL Advanced Mixed Waste Treatment Facility (AMWTF) or the ATG, Inc. Richland (ATG) facility in Richland, Washington, will batch incinerate the waste. The AMWTF is being constructed to treat transuranic waste and will manage the final disposition of the post-treatment residual material. Depending on the post-treatment characterization data, the waste may be certified and packaged to satisfy the waste acceptance criteria for the Waste Isolation Pilot Plant near Carlsbad, New Mexico. The ATG facility has a thermal treatment system compliant with the Resource Conservation and Recovery Act and the Toxic Substance Control Act. If the tank waste is sent to ATG, the treatment process will be controlled so that the final waste form meets the acceptance criteria for the selected disposal facility. Candidate disposal facilities for the waste residuals include the ICDF, the Waste Isolation Pilot Plant, and Envirocare.

- The tank and pipes will be removed, decontaminated to the extent practicable, and either recycled or sent to the RWMC for disposal depending on the degree of decontamination that is achieved.

- The concrete vault and gravel around the tank will be removed and sent to the ICDF, the RWMC, or the Central Facilities Area for final disposal, depending on the results of waste characterization analyses.

- Contaminated soil will be excavated and dispositioned in conjunction with the remediation of the contaminated soil sites as described above.

- The excavated areas will be backfilled, contoured to match the surrounding terrain, and vegetated.

- Existing institutional controls will be maintained until the selected remedy has been implemented. Institutional controls will not be required after remediation if all contaminated media are removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, post-remediation institutional controls consisting of signs, access controls, and land-use restrictions will be established and maintained until discontinued based on the results of a 5-year review.

Limited Action

No additional remediation will be conducted under CERCLA for the remaining 48 of the 55 sites in WAG 5. However, institutional controls will be maintained at nine of these sites, enumerated in the table below, because residual contamination precludes unrestricted land use. In April 1999, the EPA Region 10 developed a policy for institutional controls. During the remedial design/remedial action (RD/RA) phase, an institutional control plan for WAG 5 will be developed that follows the guidelines in the policy.

Institutional control sites at Waste Area Group 5.

Site Code	Description
ARA-03	ARA-I Lead Sheeting Pad Near ARA-627
ARA-06	ARA-II Stationary Low-Power Reactor No. 1 Burial Ground
ARA-24	ARA-III Radiologically Contaminated Soil
PBF-10	PBF Reactor Area Evaporation Pond (PBF-733)
PBF-12	PBF SPERT-I Leach Pond
PBF-13	PBF Reactor Area Rubble Pit
PBF-21	PBF SPERT-III Large Leach Pond
PBF-22	PBF SPERT-IV Leach Pond (PBF-758
PBF-26	PBF SPERT-IV Lake

The U.S. Department of Energy (DOE) ensures that institutional controls are in effect over the next 100 years unless a 5-year review concludes that unrestricted land use is allowable. After 100 years, DOE may no longer manage INEEL activities and controls will take the form of land-use restrictions. Though land use after 100 years is highly uncertain, it is likely that industrial applications will continue at the INEEL and WAG 5.

Additional Components of the Selected Remedy

In addition to the remediation that will be applied to specific sites, several activities will be implemented at WAG 5 to complete the selected remedy. These activities, including disposition of stored and investigation-derived waste and groundwater monitoring, are discussed below.

Disposition of Stored Waste and Investigation-Derived Waste. The treatment and disposal of 55 drums of waste currently stored at ARA-II will be achieved as a component of the selected remedy for WAG 5. The drums contain septic tank waste from the ARA-02 Sanitary Waste System, decontamination waste, and investigation-derived waste from sampling the ARA-16 Radionuclide Tank contents.

Of the 55 drums, 47 contain waste that can be accepted at the WERF and will be sent to that facility for incineration. The eight remaining drums contain polychlorinated biphenyl (PCB) concentrations at levels regulated by the Toxic Substance Control Act and cannot be treated at WERF. The eight drums will remain in storage at ARA-II until the waste can be sent to the AMWTF or another compliant facility for treatment. If the waste is not be sent to a treatment facility within 2 years of the issuance of this ROD, the waste will be relocated to the Mixed Waste Storage Facility or another compliant centralized INEEL location for continued storage until a treatment facility is available.

Contaminated media such as soil, debris, liquids, sample residue, sampling equipment, and personnel protective equipment not specifically identified by the INEEL FFA/CO or in this comprehensive investigation may be generated as a result of RD/RA activities at WAG 5. Procedures to address the investigation-derived waste will be documented in the remedial action work plan. In addition, legacy waste that has been generated as a result of previous sampling activities at WAG 5 will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to achieve remediation goals consistent with remedies selected for the sites in this ROD.

Groundwater Monitoring. Surveillance monitoring of the groundwater beneath the ARA and PBF facilities will resume as a component of the selected remedy for WAG 5 specified in this ROD. Groundwater monitoring is not required to satisfy WAG 5 remedial action objectives or cleanup goals, but will reduce the uncertainty in previous sampling results and provide trend data to assess the

possibility that an unidentified source of lead contamination is affecting the aquifer. The complete list of analytes will be determined in consultation with other INEEL groundwater monitoring efforts and may be modified as needed to support collective data needs. Samples will be collected annually until the first 5-year review for this ROD. Based on the results of the 5-year review, DOE-ID, EPA, and IDHW will determine whether continued groundwater monitoring will be required at WAG 5.

Statutory Determinations

Statutory Requirements

The selected remedies are protective of human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate to the remedial actions, are cost-effective, and utilize permanent solutions and alternative treatments (or resource recovery) technologies to the maximum extent practicable.

Statutory Preference for Treatment

The selected remedy for the contaminated soil sites does not satisfy the CERCLA statutory preference for treatment to reduce toxicity, mobility, and volume. Most of the contaminants of concern are radionuclides that cannot be destroyed through treatment. However, the soil will be excavated, consolidated, disposed of appropriately, and managed at the ICDF or another location within the INEEL. Management of the contaminated soil will include measures to limit contaminant mobility (e.g., containment). A cost-effective method to separate the contaminants from the soil is not available. Therefore, the volume of contaminated soil will not be reduced.

The selected remedy for the ARA-02 Sanitary Waste System satisfies the statutory preference for treatment as a principal element of the remedy (i.e., the remedy reduces toxicity, mobility, or volume through treatment). The source of risk associated with this site is the dry residual sludge in the bottom of a seepage pit. This sludge will be removed and treated by incineration. Incineration will reduce toxicity by destroying the low-level concentrations of polychlorinated biphenyls in the sludge and will reduce the volume of the sludge from approximately 1.5 m^3 (2 yd^3) to a small quantity of low-level radioactive ash.

The selected remedy for the ARA-16 Radionuclide Tank satisfies the statutory preference for treatment as a principal element of the remedy (i.e., the remedy reduces the toxicity, mobility, or volume through treatment). The contents of the tank will be removed and stored until an appropriate treatment and disposal facility such as the AMWTF, scheduled to begin operation in 2003, or the ATG facility, scheduled to open in 2000, is available. Incineration is the planned treatment technology for the AMWTF, and vitrification is the treatment technology for ATG. Incineration or vitrification will destroy the hazardous constituents in the tank waste, thus reducing toxicity, and will reduce the waste volume to a small amount of radioactive ash or glass.

Because no active remediation will be applied to the nine additional institutional control sites, the selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

Five-Year Review Requirements

Because the components of the selected remedy for WAG 5 may result in hazardous substances, pollutants, or contaminants remaining in WAG 5 above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Most remediation goals are based on soil concentrations equivalent to a risk of 1E-04 (1 in 10,000) to a hypothetical resident 100 years in the future. Therefore, residual hazardous or radioactive substances may remain after remediation that preclude immediate unrestricted land use, and institutional controls will be applicable. Five-year reviews will be conducted for remediated sites with institutional controls until it is determined during a 5-year review that controls and reviews are no longer necessary.

As discussed above, limited action will be implemented to manage the residual contamination at nine sites in WAG 5. These sites also will be subject to 5-year reviews. Controls such as access restrictions will be maintained until it is determined during a 5-year review that controls are no longer necessary. The status of these sites will be examined during the 5-year reviews for WAG 5 to ensure that site conditions have not changed significantly and that the status of each site remains consistent with this ROD. The reviews will include an assessment of maintenance requirements such as subsidence and drainage repairs.

Record of Decision Data Certification Checklist

The information listed below is included in the Decision Summary (Part 2) of this ROD:

- Contaminants of concern (COCs) and their respective concentrations
- Baseline risks represented by the COCs
- Cleanup levels established for the COCs and the basis for the levels
- How source materials constituting principal threats are addressed
- Current and reasonably anticipated future land-use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD
- Potential land and groundwater use that will be available at the site as a result of the selected remedy
- Estimated capital, annual operation and maintenance, and total net present value costs; the discount rate; and the number of years over which the remedy cost estimates are projected
- Key factors that led to selecting the remedies (i.e., how the selected remedy provides the best balance of tradeoffs relative to the balancing and modifying criteria).

Additional information can be found in the Administrative Record for WAG 5.

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 5-12, located in Waste Area Group 5 comprising the Power Burst Facility and the Auxiliary Reactor Area of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy, Idaho Operations Office, and the U.S. Environmental Protection Agency Region 10, with concurrence by the Idaho Department of Health and Welfare, Division of Environmental Quality.

Beverly A Cook

Beverly A. Cook, Manager
U.S. Department of Energy,
Idaho Operations Office

2/7/00

Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 5-12, located in Waste Area Group 5 comprising the Power Burst Facility and the Auxiliary Reactor Area of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy, Idaho Operations Office, and the U.S. Enviroriniental Protection Agency Region 10, with concurrence by the Idaho Department of Health and Welfare, Division of Environmental Quality.

Chuck Clarke

Chuck Clarke, Regional Administrator
Region 10
U.S. Environmental Protection Agency

1-21-00
Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 5-12, located in Waste Area Group 5 comprising the Power Burst Facility and the Auxiliary Reactor Area of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of, Energy, Idaho Operations Office, and the U.S. Environmental Protection Agency Region 10, with concurrence by the Idaho Department of Health and Welfare, Division of Environmental Quality.

C. Stephen Allred, Administrator
Division of Environmental Quality
Idaho Department of Health and Welfare

2/7/2000
Date

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ACRONYMS

AMWTF	Advanced Mixed Waste Treatment Facility
ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirements
ATG	ATG, Inc. Richland (facility)
BLM	U.S. Bureau of Land Management
BRA	baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
D&D	decontamination and dismantlement
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
FFA/CO	Federal Facilities Agreement and Consent Order
Ge-spectrometer	germanium-spectrometer
GPRS	global positioning radiometric scanner
HEAST	Health Effects Assessment Summary Tables
HQ	hazard quotient
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
IRIS	Integrated Risk Information System
MTRU	mixed transuranic
NEPA	National Environmental Policy Act

NESHAP	National Emission Standards for Hazardous Air Pollutants
OU	operable unit
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SL-1	Stationary Low-Power Reactor No. 1
SPERT	Special Power Excursion Reactor Test
TBC	to-be-considered guidance
TRU	transuranic
TRV	toxicity reference value
TSCA	Toxic Substance Control Act
UCL	upper confidence limit on the mean
WAG	waste area group
WERF	Waste Experimental Reduction Facility

Part 2: Decision Summary

1. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

Comprising the Auxiliary Reactor Area (ARA) and the Power Burst Facility (PBF), Waste Area Group (WAG) 5 is in the south-central portion of the Idaho National Engineering and Environmental Laboratory (INEEL). The INEEL is located in southeastern Idaho and occupies 2,305 km^2(890 mi^2) in the northeastern region of the Snake River Plain (see Figure 1). The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 USC 9601) identification number for the INEEL is 1000305. Land use at the INEEL is classified as industrial (DOE-ID 1996a).

The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the Special Power Excursion Reactor Test (SPERT) facilities, PBF consists of five separate operational areas: the PBF Control Area, the PBF Reactor Area (SPERT-I), the Waste Engineering Development Facility (SPERT-II), the Waste Experimental Reduction Facility (WERF) (SPERT-III), and the Mixed Waste Storage Facility (SPERT-IV). Collectively, the WERF, Waste Engineering Development Facility, and the Mixed Waste Storage Facility are known as the Waste Reduction Operations Complex.

Fifty-five potential release sites have been identified at WAG 5: 25 at ARA and 30 at PBF. The sources of contamination at ARA include past discharges to underground storage tanks, septic systems, and several surface ponds. A low-level radioactive waste landfill and a large windblown contamination area associated with the cleanup of a 1961 reactor accident also are sources within ARA. The sources of contamination at PBF include past discharges to underground storage tanks, vadose zone injection wells, septic systems, and several surface ponds. Figure 2 illustrates the physical configuration of ARA and PBF.

The U.S. Department of Energy, Idaho Operations Office (DOE-ID), is the lead agency for the decisions presented in this Record of Decision (ROD). The U.S. Environmental Protection Agency (EPA) Region 10 approves of the decision and the Idaho Department of Health and Welfare (IDHW), Division of Environmental Quality, concurs. Both EPA and IDHW participated in the evaluation and selection of remedies for WAG 5

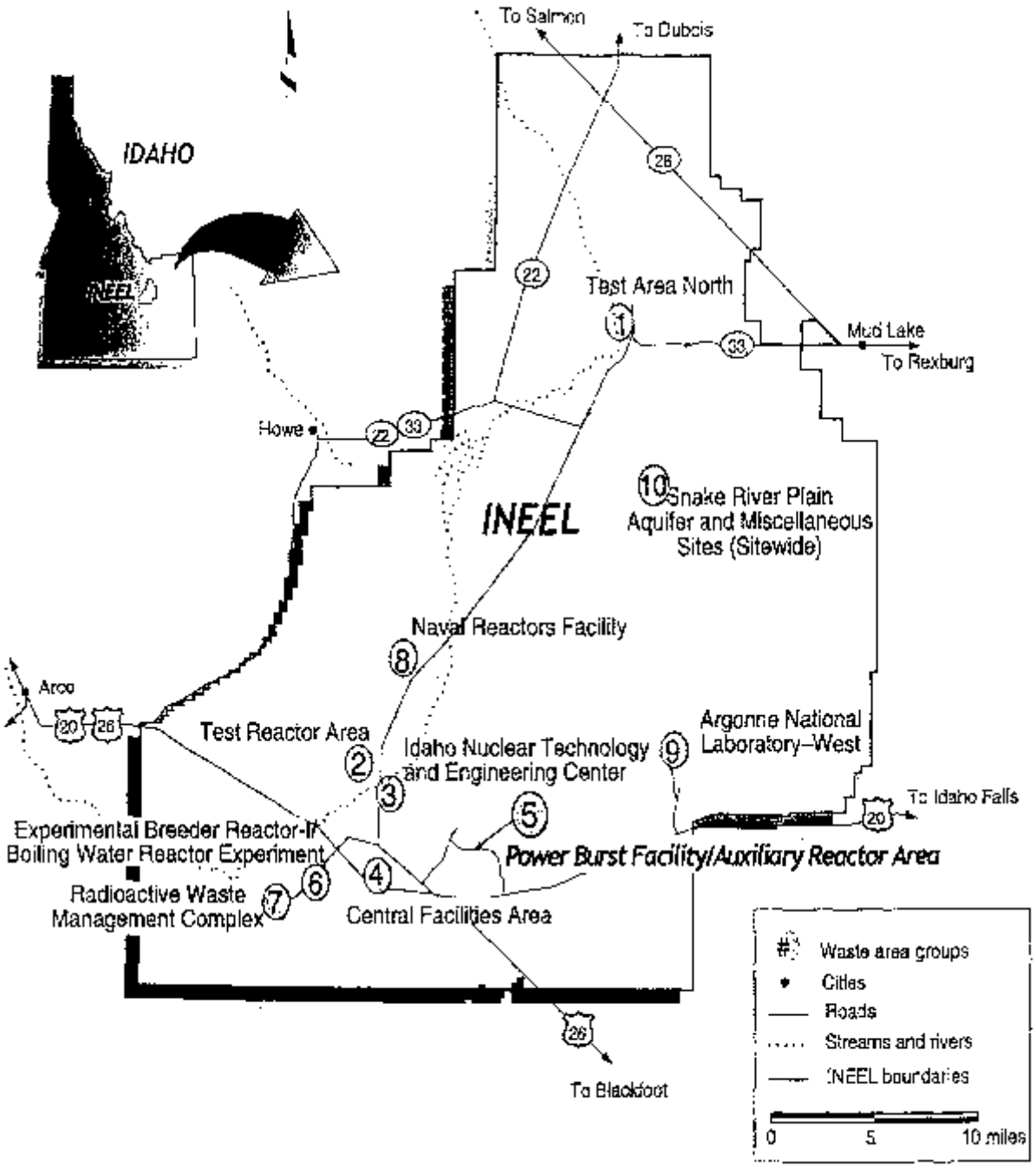


Figure 1. Location of WAG 5 at the Idaho National Engineering and Environmental Laboratory.

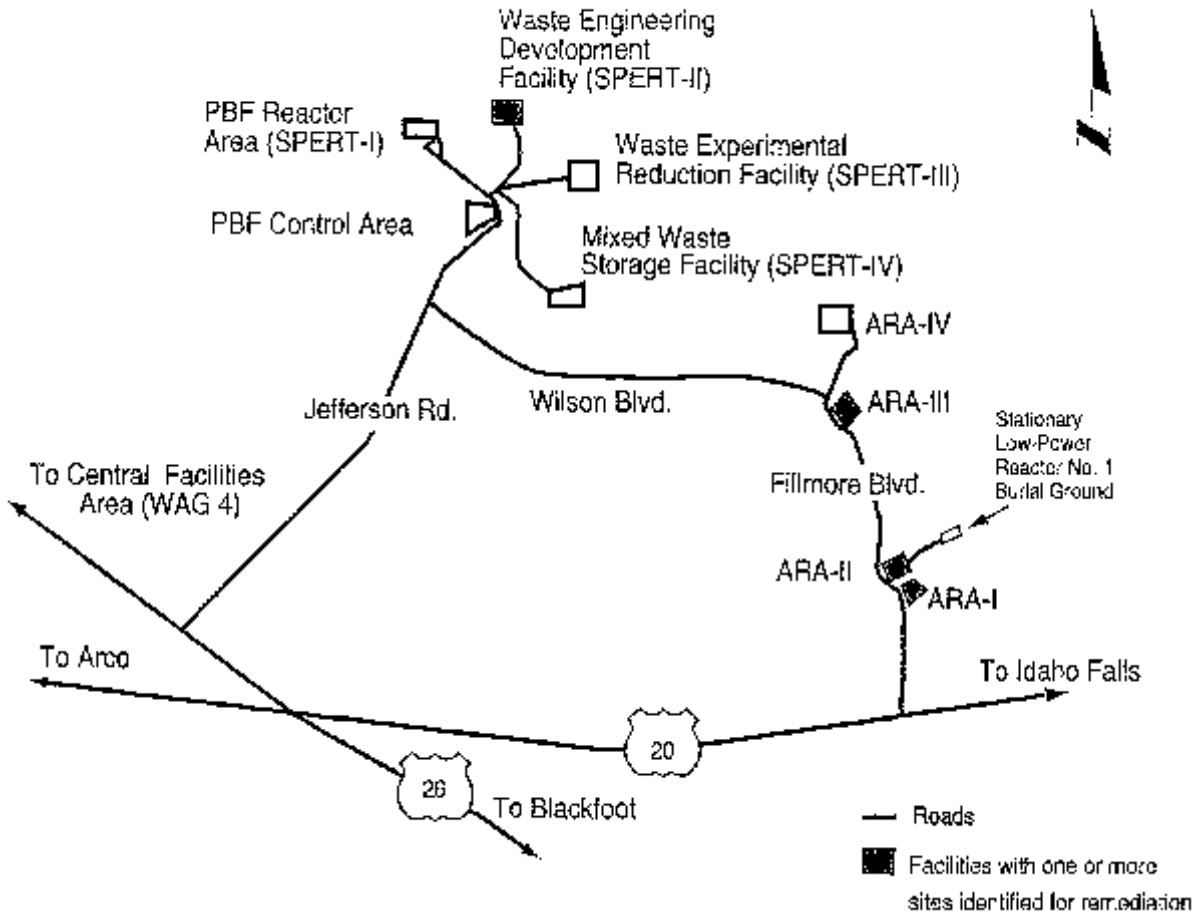


Figure 2. Physical configuration of WAG 5.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 INEEL History

The INEEL, originally established in 1949 as the National Reactor Testing Station, is a U.S. Department of Energy (DOE)— managed reservation that historically has been devoted to energy research and related activities. The National Reactor Testing Station was redesignated as the Idaho National Engineering Laboratory in 1974 to reflect the broad scope of engineering activities that were being conducted at various laboratory facilities. In 1997, the Idaho National Engineering Laboratory was redesignated as the Idaho National Engineering and Environmental Laboratory in keeping with contemporary emphasis on environmental research.

Historically, facilities at the INEEL were dedicated to the development and testing of peaceful applications for nuclear power. Throughout the 50 years of INEEL operations, disposal practices have been implemented in compliance with state and federal regulations and policies established by DOE and its predecessors. Some of these practices are not acceptable by contemporary standards and have been discontinued. Contaminated structures and environmental media such as soil and water are the legacy of some historical disposals. Occasional accidental releases also have occurred over time. In keeping with the contemporary emphasis on environmental issues, INEEL research is now focused on environmental restoration to address these contaminated media and waste management issues to minimize additional contamination from current and future operations. Spent nuclear fuel management, hazardous and mixed waste management and minimization, cultural resources preservation, and environmental engineering, protection, and remediation are challenges addressed by current INEEL activities (DOE-ID 1996a).

2.2 Waste Area Group 5 History

As shown on Figure 2, ARA and PBF are located fairly close together. In addition to proximity, the two areas have similar operational backgrounds and sources of contamination. Therefore, ARA and PBF were consolidated into one waste area group for comprehensive evaluation (DOE-ID 1991). A synopsis of the history for each facility is given below.

2.2.1 Auxiliary Reactor Area

The ARA-I and ARA-II facilities were constructed in 1957. The ARA-I facility was built to support the Stationary Low-Power Reactor No. 1 (SL-1) located in the adjacent ARA-II facility and was the staging area for the emergency response to the 1961 SL-1 reactor accident and cleanup. The SL-1 reactor at ARA-II was operated intermittently from August 1958 until it was destroyed by a nuclear accident in January 1961 (Holdren, Filemyr, and Vetter 1995). Subsequent to decontamination following the S L-1 accident, activities at ARA-I included hot cell operations, materials research, and laboratory operations including sample preparation and inspection. The main buildings at ARA-II were converted to offices and welding shops. The ARA-II facility also housed numerous minor structures such as a guardhouse, a well house, a chlorination building, a decontamination and laydown building, a power extrapolation building, an electrical substation, and several storage tanks. The ARA-I and ARA-II facilities were formally shut down in 1988 and 1986, respectively. Decontamination and complete dismantlement were initiated in 1995 and are nearing completion.

Construction of the ARA-III facility was completed about 1959 to house the Army Gas Cooled Reactor Experiment research reactor. Experiments with the reactor continued until the plant was deactivated in 1961. In 1963, the ARA-III facility was modified to support the Mobile Low Power Reactor series of tests conducted at ARA-IV and remained active until late 1965 when the Army Reactor

Program was phased out. In 1969, two buildings were constructed at ARA-III to provide additional laboratory and office space in Support of other INEEL programs. The facility was shut down in 1989. Decontamination and complete dismantlement was initiated in 1990 and completed in 1999.

The ARA-IV facility was built to accommodate the Mobile Low Power Reactor 1, an active project from 1957 to 1964. The Nuclear Effects Reactor was operated at ARA-IV from 1967 to 1970. The area was closed down until 1975, at which time it was used temporarily for some welding qualification work. Decontamination and dismantlement were performed in 1984 and 1985. Since 1985, the area has been used occasionally for testing explosives in powdered-metal manufacture experiments. A small control building, a bunker, the buried remains of two leach pits, and a sanitary waste system are all that remain.

2.2.2 Power Burst Facility

The PBF Control Area was originally built in the late 1950s for remote control of the SPERT experiments. As shown in Figure 2, the PBF Control Area is centrally located relative to the four SPERT facilities that surround it. The facility was greatly expanded for the PBF program, but its primary function as a support facility has not changed. The facility provides raw water storage and distribution, administrative offices, instrument and mechanical work areas, and data acquisition resources.

The SPERT-I reactor was operated from 1955 to 1964, and was decommissioned in 1964 and demolished in 1985. Remnants of the original SPERT-I facility, which consist of a small terminal building, a small instrument cell, some decomposing pavement, an abandoned seepage pit, and an old leach pond, remain in the vicinity. The PBF Reactor was constructed in 1972 just north of the remains of the SPERT-I facility. The PBF Reactor has been on standby since 1985. Other structures include a maintenance and storage building, cooling towers, two electrical substations, and numerous smaller buildings and structures.

The Waste Engineering Development Facility, originally built to contain the SPERT-II reactor, was constructed in the late 1950s. The SPERT-II reactor was operational from 1960 to 1964. After the reactor was removed, the facility was converted for research purposes. Current activities include waste treatment development and laboratory operations. A guardhouse is the only other building at the facility. An electrical substation, a leaching pond, a seepage pit, and a couple of underground tanks are the only other structures. The area also is used for temporary storage of uncontaminated lead. The lead is stored outside in cargo containers stacked on asphalt pads.

The WERF building, originally constructed to contain the SPERT-III reactor, was constructed in the late 1950s. The SPERT-III reactor was operational from 1958 to 1968. The reactor building was decontaminated in 1980, and the building was modified to contain the WERF, which began operation in 1982. Operations at WERF involve volume reduction of low-level radioactive waste. In addition to the WERF building, the facility contains a metal processing facility, a waste storage and handling building, an electrical substation, two exhaust stacks, and underground tanks.

The Mixed Waste Storage Facility originally housed the SPERT-IV reactor, which was operational from 1961 to 1970. After the reactor was removed, the building was modified slightly and converted to a waste storage facility. Mixed low-level waste, including radioactively contaminated polychlorinated biphenyl (PCB) waste, is stored in the former reactor pit. The facility also contains an electrical substation, a leach pond, and underground tanks.

2.3 Enforcement Activities

In January 1986, hazardous waste disposal sites within the INEEL that could pose an unacceptable risk to human health and safety or the environment were identified (EG&G 1986). The sites were ranked using either the EPA hazard ranking system for sites with chemical contamination or the DOE modified hazard ranking system for sites with radiological contamination. Based on the results of the hazard ranking, DOE-ID entered into a Consent Order and Compliance Agreement with Region 10 of the EPA and the U.S. Geological Survey on July 28, 1986 (DOE-ID 1986). The agreement called for implementing an action plan to remediate active and inactive waste disposal sites at the INEEL under the authority of the Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.), which regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. A hazard ranking score of 28.5 or higher qualifies a site for the National Priorities List (54 FR 48184) as amended by CERCLA (42 USC 9601 et seq.). Because several sites within the INEEL received scores in excess of 28.5, the INEEL in its entirety became a candidate for the National Priorities List.

On November 15, 1989, the EPA added the INEEL to the National Priorities List under CERCLA (42 USC 9601 et seq.). The Federal Facility Agreement and Consent Order and Action Plan (FFA/CO) (DOE-ID 1991) were negotiated and signed by DOE-ID, EPA, and the IDHW in December 1991 to implement the remediation of the INEEL under CERCLA. Effective December 9, 1991, the FFA/CO superseded parts of the Consent Order and Compliance Agreement.

The Secretary of Energy's policy statement (DOE 1994) on the National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) stipulates that DOE will rely on the CERCLA process for review of actions to be taken under CERCLA. The policy statement also requires that DOE address NEPA values by incorporating such values, to the extent practicable, in documents and public involvement activities generated under CERCLA.

In the Action Plan of the FFA/CO (DOE-ID 1991), potential source areas (sites) within each WAG were assigned to an operable unit (OU) for investigation or remedial activities. The assignments were designed to match the rigor of the assessment process with the complexity of each site and to allow for flexibility in determining appropriate further action as each assessment or action was completed. Waste Area Group 5 was subdivided into 13 OUs, originally containing a total of 48 individual sites. Subsequent to the publication of the FFA/CO, six additional sites were formally assigned to OUs within WAG 5. During the development of the WAG 5 remedial investigation/feasibility study (RI/FS), one more potential site was identified. In total, 55 sites are incorporated in OU 5-12, the Comprehensive RI/FS for WAG 5.

The comprehensive investigation is the final action for WAG 5 identified in the FFA/CO. Several actions have already been implemented under environmental authorities at WAG 5. The actions conducted under the authority of CERCLA, RCRA, and a State of Idaho investigation are summarized below. Cleanup actions conducted under the authority of DOE management also are listed.

2.3.1 CERCLA Authority

Three records of decision and two time critical removal actions have been completed for WAG 5 under CERCLA. The Record of Decision for Operable Units 5-05 and 6-01 (DOE-ID 1996b) addressed the ARA-06 SL-1 Burial Ground. The remedial action prescribed by the ROD consisted of consolidating the contaminated soil over the pits and trench and capping the low-level waste landfill with an engineered barrier. The selected remedy was im lemented in 1996.

The Record of Decision for Operable Unit 5-13 (DOE-ID 1992b) addressed two sites: the PBF-08 Corrosive Waste Sump and the PBF-10 Evaporation Pond. The interim action prescribed by the ROD included removing the PBF-08 Corrosive Waste Sump contents, transporting the contents to the Mixed Waste Storage Facility for storage, and decontaminating the sump. The piping from the sump to the evaporation pond was removed, and effluent from the sump was rerouted to a new disposal tank. The interim action prescribed by the ROD for the PBF-10 Evaporation Pond included excavating sediments from the pond in areas with high chromium concentrations. Later the pond liner was removed and disposed of, the berm was pushed into the pond, and the area was graded and seeded with grasses. Remediation was completed in 1994.

The Record of Decision for Operable Unit 5-10 (DOE-ID 1992a) addressed the ARA-01 Chemical Evaporation Pond at ARA-I. No action with further evaluation of groundwater pathways in another operable unit was documented in the ROD. The groundwater pathway evaluation was included in the WAG 5 Comprehensive RI/FS, (Holdren et al. 1999).

A time-critical removal action was implemented at the ARA-02 Sanitary Waste System (Dietz 1998). Liquid levels inside the system's three tanks were observed and found to vary over time, which indicated possible leakage to the soil below. In September 1996, the contents of all three septic tanks were removed and placed in drums in an approved temporary accumulation area to await final disposition.

A time-critical removal action was recommended for the PBF-26 site because of a historical single high detection of Aroclor-1254. Before the removal action, field immunoassay kits for PCBs were used to define the area of contamination. However, because the analytical results for PCB were below the field-screening level, the planned removal action was not performed and further evaluation of the site was not required (Hiaring 1998).

2.3.2 Inspector General Authority Action

The ARA-14 Septic Tank and Drain Field at ARA-III was removed by the decontamination and dismantlement (D&D) program at the INEEL in 1996, and the waste is currently in a temporary accumulation area at the ARA-III facility under the control of the DOE Inspector General (Falconer 1997).

2.3.3 Other Programmatic Activities

Cleanup activities have been conducted under several other programs at WAG 5. The achievements of the D&D program, the underground tank management program, and other DOE activities are summarized below.

2.3.3.1 Decontamination and Dismantlement. Over time, the D&D program has conducted numerous cleanup activities within WAG 5, and activities are currently ongoing at ARA. In addition to the complete demolition of the ARA-I, -II, and -III facilities, the following sites have been specifically addressed by the D&D program:

- ARA-03, ARA-I Lead Sheeting Pad: Soil was removed as part of the D&D of ARA-I and disposed of at the Radioactive Waste Management Complex (RWMC).
- ARA-09, ARA-II Septic Tank: The septic tank and sludge were removed during 1994 D&D activities at ARA-II

- ARA-10, ARA-II Septic Tank East: The septic tank and sludge were removed during 1994 D&D activities at ARA-II.

- ARA-11, ARA-II Septic Tank West: The septic tank was removed during 1995 D&D activities at ARA-II.

- ARA-15, ARA-III Radionuclide Tank: The septic tank was removed during 1993 D&D activities at ARA-III.

- ARA-18, ARA-III Radionuclide Tank: As part of the D&D of ARA-III, all three tanks and the associated piping were examined and removed in 1993 and the earthen berm was leveled.

- ARA-19, ARA-II Detention Tank for Fuel Oil/Radionuclides: The underground radionuclide detention tank and piping were removed during 1995 D&D activities at ARA-III.

- ARA-20, ARA-IV Test Area Leach Pit No. 2: Thee pit structure, with the exception of the base ring located 5.5 m (18 ft) below the surface, was removed in 1983 when the ARA-IV facility underwent D&D.

- ARA-21, ARA-IV Test Area Septic Tank and Leach Pit No. 2: During D&D operations in 1987, all pipes to the system were removed and the septic tank and leach pit were covered with 1.4 m (4.5 ft) of soil.

- PBF-12, SPERT-I Leach Pond: In 1984, D&D were performed at the site. Remediation included removing the drain line and the top 0.8 m (2.5 ft) of contaminated soil, and mounding the area slightly with a 2.4-m (8-ft) cover of clean soil seeded with grass.

- PBF-20, SPERT-III Small Leach Pond: The pond area was sampled and backfilled by the D&D program in 1982.

- PBF-21, SPERT-III Large Leach Pond: The pond was sampled, partially excavated, and backfilled by the D&D program in 1983.

2.3.3.2 Underground Storage Tank Program Action Authority. Several underground storage tanks within WAG 5 have been abandoned in place, removed, or replaced with tanks with double containment. The following WAG 5 sites are tank sites where one of these actions has been implemented:

- PBF-04, PBF Control Area Oil Tank: Excavated and removed in 1990, the tank at the PBF-04 site was found in very poor condition with observable rust and pinholes. Because of safety issues related to the proximity of the substation and grounding grid, only 9 m^3 (12 y^3) of contaminated soil were removed.

- PBF-14, SPERT-II Inactive, Fuel Oil Tank: The tank at the PBF-14 site was filled with sand and abandoned in place, and the fuel line was disconnected.

- PBF-19, SPERT-III Inactive Fuel Oil Tank: The tank and contaminated soil associated with the tank at the PBF-19 site were removed.

- PBF-29, PBF Reactor Area Abandoned Fuel Oil Tank: The tank at the PBF-29 site was removed in 1996.

- PBF-31, SPERT-II Fuel Oil Tank: The tank at the PBF-31 site was removed and replaced in 1994.

- PBF-32, PBF Control Area Fuel Oil Tank: The tank at the PBF-32 site was removed and replaced in 1994.

2.3.3.3 Department of Energy Management Authority. Two additional actions have been completed as best-management practice by the INEEL management and operations contractor under the authority of DOE-ID:

- PBF-13, PB Reactor Area Rubble Pit: All visible materials containing asbestos were removed in 1993 from PBF-13, the PB Reactor Rubble Pit, and the pit was backfilled with clean soil and basalt rubble. Some buried asbestos may remain.

- PBF-22, SPERT-IV Leach Pond: In 1985, the PBF-22 site was surveyed and contaminated soil was removed and transported to the RWMC for disposal.

3. COMMUNITY PARTICIPATION

In accordance with CERCLA § 113(k)(2)(B)(i-v) and § 117 and the INEEL Community Relations Plan (DOE-ID 1995), opportunities for the public to obtain information and participate in the remedial investigation and decision process for WAG 5 were provided from May 1997 through June 1999. The documents providing information and opportunities to provide input included a "kick-off" fact sheet, which briefly discussed the status of the RI/FS (DOE-ID) 1997b); various *INEEL Reporter* newsletter articles (a publication of the INEEL Environmental Restoration Program); three supplemental updates to the *INEEL Reporter* (LMITCO 1999, 1998, 1997); one "update" fact sheet (DOE-ID 1999c); a Proposed Plan (DOE-ID 1999b); briefings and presentations to interested groups; interviews; and public meetings.

In May 1997, a "kickoff fact sheet" (DOE-ID 1997b) about the WAG 5 RI/FS was mailed to about 500 members of the general public and more than 200 INEEL employees. Included in the fact sheet was a postage-paid return mailer comment form. No comments were received. This fact sheet also offered technical briefings to those interested in the WAG 5 comprehensive investigation. It was the initial opportunity for the public to be involved in how the investigation would be conducted. No one requested a briefing at the time, but briefings were conducted later in the investigation process.

In addition, an "update fact sheet" (DOE-ID 1999c) was mailed to approximately 700 citizens in January 1999. The purpose of the document was to keep citizens apprized of developments during the RI/FS, to include a schedule of the investigation, and to announce the approximate dates of public meetings. This fact sheet also offered technical briefings to those interested in the WAG 5 investigation.

Regular reports about the status of the project were included in bimonthly issues of the *INEEL Reporter* and were mailed to those on a document mailing list maintained by the Community Relations Program. Reports also appeared in three supplements to the *INEEL Reporter* in 1999, 1998, and 1997 (LMITCO 1999, 1998, 1997).

Several briefings on the WAG 5 investigation were given by DOE-ID to the INEEL Citizens Advisory Board and its Environmental Restoration Program Subcommittee. The advisory board is a group of 15 people representing the citizens of Idaho, who make recommendations to DOE-ID, EPA, and the State of Idaho about environmental restoration activities at the INEEL. The subcommittee reviewed a draft proposed plan, and the majority of its comments were incorporated into the final Proposed Plan (DOE-ID) 1999b), which was distributed to the public in May 1999. In addition, recommendations from a citizens' focus group on two previous INEEL proposed plans also were incorporated into the final WAG 5 Proposed Plan. On May 19, 1999, the INEEL Citizens Advisory Board met again to finalize and submit its formal recommendations on the draft proposed plan to DOE-ID.

Also in 1999, briefings were held with members of an Idaho-based environmental organization, an organization consisting largely of retired INEEL employees, the Shoshone-Bannock tribes, several Idaho radio stations, several Idaho newspapers, national publications, and four Idaho television stations. Previously in 1998, members of the Shoshone-Bannock tribes toured areas of WAG 5.

Personal calls were made to stakeholders in the Pocatello, Boise, and Moscow areas the week of May 3, 1999, to inform individuals about the upcoming public meetings and to determine whether briefings were desired. As a result, technical briefings were held with a member of an environmental organization, an organization of retired INEEL employees on May 14, 1999, and members of the Shoshone-Bannock Tribes on May 17, 1999.

During the week of May 3, 1999, DOE-ID issued a news release to more than 100 media contacts about the 30-day public comment period for the WAG 5 Proposed Plan. This period began

May 10, 1999, and ended June 9, 1999. The issuance of the news release led to the publication of a short note in the community calendar sections of newspapers and in public service announcements on radio stations. The news release provided notice to the public that supportive WAG 5 investigation documents were available in the Administrative Record section of the INEEL information repositories located in the INEEL Technical Library in Idaho Falls, the Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow. On May 10, a revised news release was sent to media contacts, correcting a typographical error about the date of the Boise public meeting. Display advertisements announcing the availability of the Proposed Plan and the locations of public meetings appeared in six Idaho newspapers during the week of May 3, 1999, in Idaho Falls, Boise, Lewiston, Fort Hall, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Idaho Falls *Post Register*, the Fort Hall *Sho-Ban News*, the Pocatello *Idaho State Journal*, the Twin Falls *Times News*, the *Boise Idaho Statesman*, and the Lewiston *Lewiston Morning Tribune*. On May 12, a corrected display advertisement ran in the Idaho *Statesman*. A follow up advertisement ran in newspapers approximately 2 days before the public meetings in Idaho Falls, Boise, and Lewiston. To encourage attendance at the Lewiston meeting, an RSVP card was mailed to more than 200 citizens who reside in northern Idaho between the cities of Riggins and Sandpoint. No response was received based on the mailing. In addition, a post card was mailed to about 6,200 citizens informing them of the availability of the Proposed Plan, comment period, and upcoming public meetings. Also, an electronic note was sent to all INEEL employees informing them of the same.

Copies of the Proposed Plan (DOE-ID 1999b) were mailed to about 700 members of the public the week of May 3, 1999, urging citizens to comment on the Proposed Plan and to attend the public meetings. Public meetings were held in Idaho Falls on May 17, Boise on May 18, and Lewiston on May 19, 1999. Before the public meetings in each location, an availability session took place from 6 to 7 p.m. to allow for informal discussion of the issues. The public meetings began at 7 p.m.

For the general public, the activities associated with participating in the decision-making process included receiving the Proposed Plan, attending the availability sessions before the public meetings to informally discuss the issues, and submitting verbal and written comments to DOE-ID, EPA, and IDHW—during the 30-day public comment period.

Written comment forms available at the meeting locations (including a postage-paid business-reply form) were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. The reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to keep transcripts of discussions and public comments. The meeting transcripts were placed in three INEEL information repositories in the Administrative Record section for the WAG 5 Comprehensive RI/FS. For those who could not attend the public meetings but wanted to make formal written comments, a postage-paid written comment form was attached to the WAG5 Proposed Plan.

A total of about 30 people not associated with the project attended the public meetings. Overall, seven citizens provided formal comments: five citizens provided oral comments and three provided written comments (one person provided both oral and written comments). All comments received on the Proposed Plan were considered during the development of this ROD. The decision for this action is based on the information in the Administrative Record for WAG 5.

A Responsiveness Summary has been prepared as part of the ROD. All formal oral comments presented at the public meetings and all written comments are included in Part 3 and in the Administrative Record for WAG 5.

4. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The Operable Unit 5-12 Comprehensive RI/FS is the culmination of all of the CERCLA evaluations performed for WAG 5. According to the FFA/CO, the boundary of WAG 5 encompasses the facility locations presently or historically used within the PBF and ARA areas, immediately adjacent areas where waste activities may have taken place, and all surface and subsurface areas. The boundary of the PBF area is well defined by a perimeter fence that surrounds the entire PBF complex. However, the ARA does not have a perimeter fence.

The issuance of the ROD for OU 5-12, the comprehensive WAG 5 operable unit, marks the beginning of final remedial activities. As specified in the Action Plan attached to the FFA/CO (DOE-ID 1991), post-ROD activities will include remedial design/remedial action (RD/RA) phases. The RD/RA will commence with the development of a scope of work to identify and establish deadlines for submitting other documents and outline the overall strategy for managing the RD/RA. A draft scope of work will be submitted to EPA and IDHW for review within 21 days of the issuance of the ROD. Substantial continuous physical remedial action within WAG 5 will commence within 15 months of the issuance of the ROD.

The selected remedy for WAG 5 comprises remedial actions that are protective of human health and the environment. Three actions will be implemented to mitigate the unacceptable risks to human or ecological receptors associated with the seven specific sites identified in the WAG 5 Comprehensive RI/FS (Holdren et al. 1999) and Proposed Plan (DOE-ID) 1999b). In addition, limited action comprising institutional controls at nine other sites, management of stored and investigation-derived waste, and groundwater monitoring are components of the selected remedy.

The first remedial action addresses the risk associated with a collection of five individual sites where contaminated soil is the. only source medium (see Section 8). The soil sites are contaminated with radionuclides and toxic metals. However, based on the detected concentrations of the contaminats, the soil at these sites is not regulated under the Toxic Substance Control Act (TSCA) (40 CFR 761) or RCRA and is not identified as mixed waste.

The second action will be implemented to mitigate the risk posed by residual contamination in a sanitary waste system (see Section 9). Residual sludge in the seepage pit is the only waste present. The sludge is identified as mixed waste containing low levels of radionuclides and low concentrations of toxic metals and organics. The waste is not RCRA characteristic but is identified as RCRA F-listed (i.e., F-001) (40 CFR 261, Subpart D) waste based on knowledge that solvents were used in the facility (Holdren et al. 1999).

The only principal threat identified in WAG 5, addressed by the third remedial action, is posed by the contents of an underground storage tank (see Section 10). A principal threat is defined by the EPA as source material considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur (EPA 1999a). Waste in the underground storage tank is classified as mixed waste that contains radionuclides, toxic metals, and organic compounds. The tank contents are classified as RCRA characteristic waste based on detected concentrations of trichloroethene and RCRA F-listed mixed waste based on process knowledge (Holdren et al. 1999). Because concentrations of the PCB Aroclor-1260 exceed 50 ppm, the waste also is regulated under TSCA.

Waste regulated under RCRA or TSCA is not associated with the nine sites identified for limited action (see Section 11). However, RCRA or TSCA requirements apply to mixed waste currently in storage at the ARA-II facility and also may apply to investigation-derived waste generated by implementing the selected remedy. Applicable or relevant and appropriate requirements for the stored and investigation-derived waste will be determined as the waste is characterized for final disposition.

5. GENERAL SITE CHARACTERISTICS

The general characteristics of WAG 5 are consistent with those found across the entire INEEL. These characteristics and the conceptual site models used to evaluate the risks associated with WAG 5 sites are summarized below. Site-specific information such as size, the nature and extent of contamination, and sampling results are described in Section 8 for the contaminated soil sites ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16; Section 9 for the ARA-02 Sanitary Waste System; and Section 10 for the ARA-16 Radionuclide Tank.

5.1 Physical Characteristics

The INEEL is located on the Eastern Snake River Plain, a large topographic depression extending from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. The surface of the INEEL in general is covered by basalt flows and intennittent, discontinuous pockets of sediment. In the WAG 5 area, basalt flows are the dominant surface features and surface sediments are generally sparse and thin. The average surficial sediment thicknesses are 0.4 m (1.5 ft) at ARA and 3 m (10 ft) at PBF (Holdren et al. 1997).

The vadose zone is the unsaturated region extending from land surface down to the water table, and varies in thickness from approximately 61 m (200 ft) thick in the northern part of the INEEL to more than 274 m (900 ft) in southern portions of the Site Irving 1993). Except for some areas adjacent to the Big Lost River, the vadose zone is a complex series of heterogeneous basalt flows and thin layers of interbedded sediments. The vadose zone is approximately 189 m (620 ft) thick beneath the ARA. At PBF, the average vadose zone thickness is 139 m (455 ft) but varies as much as 7 m (23 ft) within the immediate vicinity of PBF (DOE-ID 1997a). About 90% of the vadose zone is characterized by thick sequences of interfingered basalt flows. These sequences exhibit large void spaces resulting from fissures, rubble zones, lava tubes, undulatory basalt-flow surfaces, and fractures. Sedimentary interbeds in the vadose zone consist of sands, silts, and clays and are generally thin and discontinuous. Lithologic logs collected from wells drilled within WAG 5 indicate cumulative sediment thicknesses in the vadose zone ranging from 5.4 to 17.6 m (18 to 58 ft) beneath ARA and 3 to 13 m (10 to 42 ft) under the PBF (Holdren et al. 1999).

Perched water at the INEEL forms when the hydraulic conductivity of a vadose zone layer is sufficiently low to impede the vertical movement of water. Though perched water has been detected at other INEEL facilities, it has not been observed at WAG 5. The absence of perched water beneath WAG 5 may be related to the sedimentary interbeds that appear to be discontinuous and limited in areal extent. More likely, however, perched water has not developed at ARA or PBF because volumes of infiltrating water are not sufficient. Typically, the formation of perched water at the INEEL is associated with evaporation ponds.

Surface hydrology includes water from three streams that flow intermittently onto the INEEL and from local runoff caused by precipitation and melting snow. Ponds and streams do not exist within WAG 5 except very briefly in conjunction with runoff. The Big Lost River is the nearest surface water feature (see Figure 1) and is not influenced by activities at WAG 5. Because ARA is no longer operational, no evaporation ponds or other surface impoundments are available for process discharges. At PBF, the surface impoundment of process effluent has been discontinued and all liquid waste is collected in tanks or aboveground containment structures.

The Snake River Plain Aquifer underlies most of the INEEL. The aquifer, defined as the saturated region beneath the vadose zone, arcs approximately 354 km (220 mi) through the eastern Idaho subsurface and varies in width from approximately 80 to 113 km (50 to 70 mi). The total area is about

24,862 km^2 (9,600 mi^2). The depth to groundwater, synonymous with the thickness of the vadose zone, ranges from approximately 61 m (200 ft) below land surface in the north to more than 274m (900 ft) in the south (Irving 1993). The aquifer contains numerous, relatively thin basalt flows extending to depths of 1,067 m (3,500 ft) below land surface. Like the vadose zone, the Snake River Plain Aquifer is characterized by sedimentary interbeds that are typically discontinuous. The aquifer has an estimated capacity of 2.5E+12 m^3 (8.8E+13 ft^3) of water, which is approximately equivalent to the amount of water contained in Lake Erie, or enough water to cover the entire State of Idaho to a depth of 1.2 m (4 ft) (Hackett, Pelton, and Brockway 1986).

The Snake River Plain Aquifer is recharged primarily by infiltration from precipitation and from deep percolation of irrigation water. Annual recharge rates depend largely on snowfall. Regional groundwater flows to the south-southwest; however, the flow direction can be affected locally by recharge from rivers, surface water spreading areas, and heterogeneity in the aquifer. Estimates of flow velocities within the aquifer range from 1.5 to 6.1 m/day (5 to 20 ft/day) (Irving 1993). Flow in the aquifer primarily is through fractures, through interflow zones in the basalt, and in the highly permeable rubble zones located at the tops of basalt flows. The aquifer is considered heterogeneous and anisotropic (having properties that differ depending on the direction of measurement) because of the permeability variations within the aquifer that are caused by basalt irregularities, fractures, void spaces, rubble zones, and sedimentary interbeds. The heterogeneity is responsible for the variability in transmissivity values (measures of the ability of the aquifer to transmit water). Transmissivity measurements in wells at the INEEL range from 1.0E-01 to 1.1 E+06 m^2/day (1.1E+00 to 1.2E+07 ft^2/day) (Wylie et al. 1995). Concerns about groundwater contamination from INEEL operations have prompted an extensive monitoring system over the INEEL (Irving 1993). Over the vast majority of the INEEL, maximum contaminant levels are not exceeded.

The hydraulic gradient at WAG 5 was evaluated in 1996 and 1997 (Dustin 1996; Neher 1997a, 1997b) to support the WAG 5 Work Plan (DOE-ID 1997a). The evaluation included (1) collecting three quarterly groundwater elevation measurements from 20 wells in and around WAG 5 beginning in August 1996; (2) reviewing borehole lithology, deviation, and well construction for 37 wells in and around WAG 5 to develop water table contour maps; (3) evaluating barometric data during each groundwater monitoring event to determine potential barometric influences on the resulting water table contour maps; and (4) continuous monitoring of water levels in two wells at PBF for a period of 16 days to determine the effects, if any, from PBF production well pumping on the WAG 5 area water table. The results of the evaluation were used to develop the WAG 5 water table contour map presented in Figure 3. Well construction, barometric effects on water level measurements, and the effect of production well pumping were found to have no influence on the resulting water table contour interpretation. The contour map and inferred groundwater flow paths presented in Figure 3 are considered an accurate representation of the aquifer flow system beneath WAG 5 and are most likely the result of heterogeneity in the aquifer.

The hydraulic gradient evaluation showed that measured water table elevations in the WAG 5 area range from 1,362 m (4,468 ft) in Well USGS 5 to 1,352 m (4,435 ft) in Well USGS 107 (see Figure 3). The depth to the water table ranges from 189 m (620 ft) in Well AREA-II to 139 m (455 ft) in Well USGS 82. Thus, the water table gradient varies widely beneath WAG 5. The general gradient is about 0.8 m/km (4 ft/mi) to the south and southwest. However, beneath the PBF area, the southeast gradient is fairly steep: approximately 4 m/km (23 ft/mi). A review of borehole deviation logs and barometric data collected during each quarterly measurement event indicated that neither of these two factors has a significant effect on the resulting water table contour interpretation (Holdren et al. 1999). In addition, an evaluation of the effects of pumping the PBF production wells, SPERT 1 and SPERT 2, indicated that local pumping is not causing the gradient beneath PBF (Holdren et al. 1999). Based on the available data, the steep water table gradient beneath PBF is most likely the result of aquifer

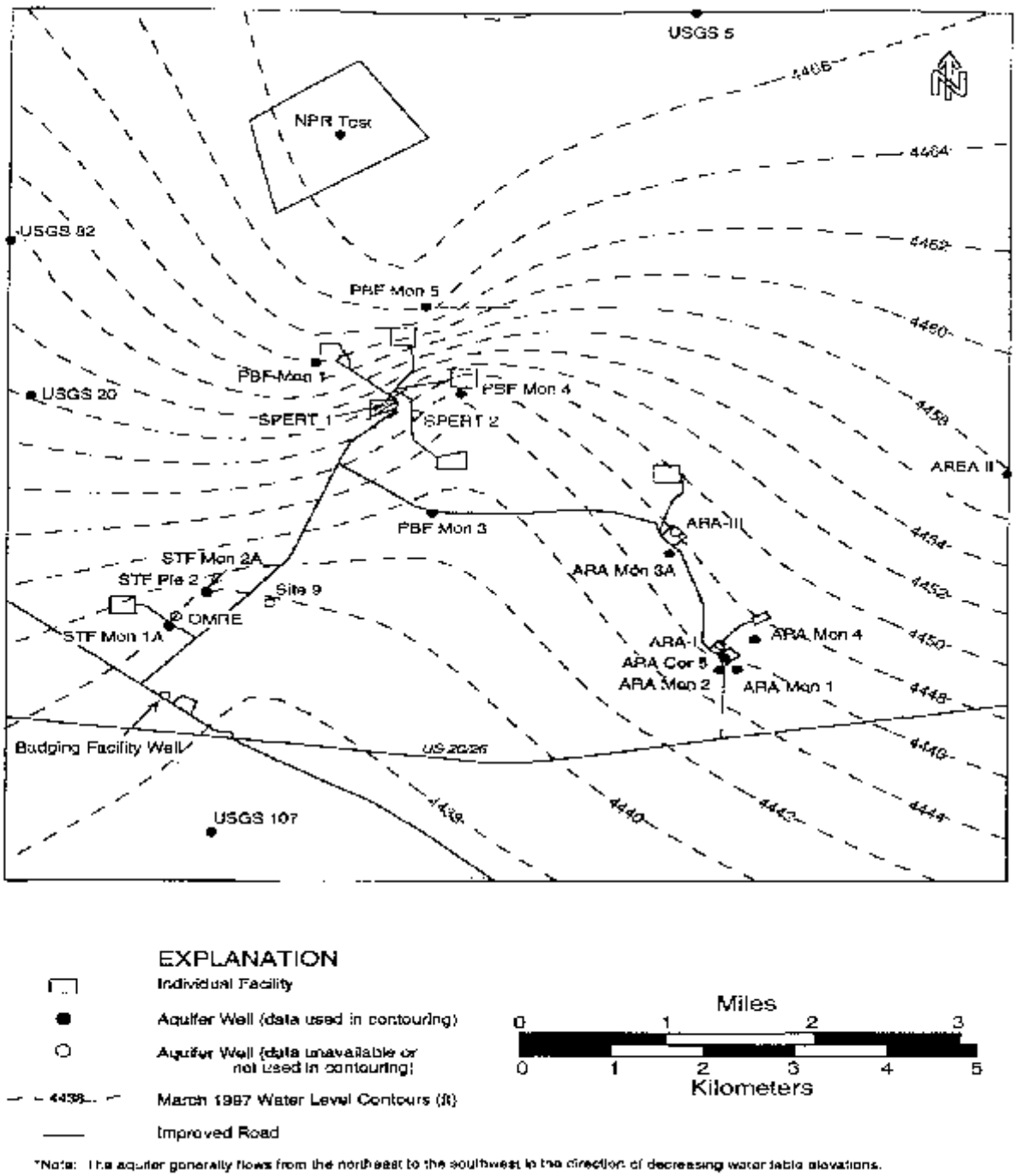


Figure 3. Groundwater gradient at WAG 5.

heterogeneity. The existing monitoring network is adequate, as shown by the SL-1 sensitivity analysis (Magnuson and Sondrup 1998) and because WAG 5 operations primarily generated surface contamination, not groundwater contamination.

Information obtained during quarterly water-level measurements (Neher 1997a) also indicates a potentially confined or semiconfined deeper portion of the aquifer in the WAG 5 area. Monitoring of the Site 9 well during the quarterly water-level measurements revealed a hydraulic head approximately 3.7 m (12 ft) higher than expected, given the water table elevation in surrounding wells. The higher hydraulic head in Site 9 is most likely caused by confined or semiconfined conditions at depth. This inference is supported by the presence of several thick clay layers observed at elevations between 1,310 m (4,300 ft) and 1,220 m (4,000 ft) in the well logs from the Site 9, SPERT 2, and Organic-Moderated Reactor Experiment wells.

5.2 Climate

Meteorological and climatological data for the INEEL and the surrounding region are collected and compiled from several meteorological stations operated by the National Oceanic and Atmospheric Administration field office in Idaho Falls, Idaho. Three stations are located at the INEEL.

Annual precipitation at the INEEL is light, with an annual average of 22.1 cm (8.7 in.). Therefore, the region is classified as and to semiarid (Clawson, Start, and Ricks 1989). The rates of precipitation are highest during the months of May and June and lowest during July. Normal winter snowfall occurs from November through April, though occasional snowstorms occur in May, June, and October. Snowfall at the INEEL ranges from about 17.3 cm (6.8 in.) per year to about 151.6 cm (59.7 in.) per year, and the annual average is 70.1 cm (27.6 in.) (Clawson, Start, and Ricks 1989). The INEEL is subject to severe weather episodes throughout the year. Thunderstorms are observed mostly during the spring and summer. An average of two to three thunderstorms occurs during each of the months from June through August (EG&G 1981). Thunderstorms are often accompanied by strong gusty winds that may produce local dust storms. Precipitation from thunderstorms at the INEEL is generally light. Occasionally, however, rain resulting from a single thunderstorm on the INEEL exceeds the average monthly total precipitation (Bowman et al. 1984).

The moderating influence of the Pacific Ocean produces a climate at the INEEL that is usually warmer in the winter and cooler in summer than locations of similar latitude in the United States east of the Continental Divide. The mountain ranges north of the INEEL act as an effective barrier to the movement of most of the intensely cold winter air masses entering the United States from Canada. Occasionally, however, cold air spills over the mountains and is trapped in the plain. The INEEL then experiences below-normal temperatures usually lasting from 1 week to 10 days. The relatively dry air and infrequent low clouds permit intense solar heating of the surface during the day and rapid radiant cooling at night. These factors combine to give a large diurnal range in temperature near the ground. The average summer daytime maximum temperature is 28EC (83EF), while the average winter daytime maximum temperature is –0.6EC (31EF). Recorded temperature extremes at the INEEL vary from a low of –44EC (–47EF) in January to a high of 38EC (101EF) in July (Clawson, Start, and Ricks 1989).

The relative humidity at the INEEL ranges from a monthly average minimum of 18% during the summer months to a monthly average maximum of 55% during the winter. The relative humidity is directly related to diurnal temperature fluctuations. Relative humidity reaches a maximum just before sunrise (the time of lowest daily temperature) and a minimum in midafternoon (the time of maximum daily temperature) (Clawson, Start, and Ricks 1989).

The INEEL is in the belt of prevailing westerly winds, which are channeled within the Eastern Snake River Plain to produce a west-southwest or southwest wind approximately 40% of the time. Local mountain valley features exhibit a strong influence on the wind flow under other meteorological conditions as well. The average midspring windspeed recorded at a height of 6 m (20 ft) is 9.3 mph, while the average midwinter windspeed is 5.1 mph (Irving 1993).

5.3 Flora and Fauna

Six broad vegetation categories representing nearly 20 distinct habitats have been identified on the INEEL: juniper-woodland, native grassland, shrub-steppe off lava, shrub-steppe on lava, modified, and wetlands. Though small riparian and wetland regions exist along the Big Lost River and Birch Creek, (see Figure 1) nearly 90% of the Site, including WAG 5, is covered by shrub-steppe vegetation. Big sagebrush, saltbush, rabbitbrush, and native grasses are the most common varieties.

The INEEL serves as a wildlife refuge because a large percentage of the Site is undeveloped and human access is restricted. Grazing and hunting are prohibited in the central part of the Site. Mostly undeveloped, this tract may be the largest relatively undisturbed sagebrush steppe in the Intermountain West outside of the national parklands (DOE-ID 1996a). More than 270 vertebrate species including 43 mammalian, 210 avian, 11 reptilian, nine fish, and two amphibious species have been observed on the Site. During some years, hundreds of birds of prey and thousands of pronghom antelope and sage grouse winter on the INEEL. Mule deer and elk also reside at the Site. Observed predators include bobcats, mountain lions, badgers, and coyotes. Bald eagles, classified as a threatened species, are commonly observed on or near the Site each winter. Peregrine falcons, recently removed from the federal endangered species list, also have been observed. In addition, other speciei that are candidates for listing as threatened or endangered by the U.S. Fish and Wildlife Service may either inhabit or migrate through the area. Candidate species that may frequent the area include ferruginous hawks, pygmy rabbits, Townsend's big-eared bats, burrowing owls, and loggerhead shrikes.

At ARA and PBF, trees are sparse and no surface water features exist to attract wildlife. No ecologically sensitive areas (i.e., areas of critical habitat) are located in WAG 5 (Holdren et al. 1997).

5.4 Demography

The populations potentially affected by INEEL activities include INEEL employees, ranchers who graze livestock in areas on or near the INEEL, hunters on or near the Site, residential populations in neighboring communities, and highway travelers.

Nine separate facilities at the INEEL include a total of approximately 450 buildings and more than 2,000 other support facilities. In January 1996, the INEEL employed 8,616 contractor and government personnel. Approximately 60% of the total work force is employed at the INEEL Site and 40% is located in Idaho Falls, Idaho (DOE-ID 1996a). According to DOE-ID (1996a), as of 1996, approximately 112 employees were working at PBF. The ARA is not an active facility. Decommissioning and dismantlement crews have been working at ARA-I, -II, and -III, and personnel occasionally visit ARA-IV. However, a full-time staff is not maintained at ARA. Employee totals at other INEEL locations in 1996 included approximately 190 at the RWMC, 883 at the Central Facilities Area, 360 at Test Area North, 470 at the Test Reactor Area, 1,300 at the Naval Reactors Facility, 1,162 at the Idaho Nuclear Technology and Engineering Center, 750 at Argonne National Laboratory–West, and 10 within the remaining Site-wide areas, which include the ARA. in addition, approximately 3,400 INEEL employees occupy numerous offices, research laboratories, and support facilities in Idaho Falls (DOE-ID 1996a).

The INEEL Site is bordered by five counties: Bingham, Bonneville, Butte, Clark, and Jefferson. Major communities include Blackfoot and Shelley in Bingham County, Idaho Falls and Ammon in Bonneville County, Arco in Butte County, and Rigby in Jefferson County. The nearest community to the INEEL is Atomic City, located south of the Site border on U.S. Highway 26. Other population centers near the INEEL include Arco, 11 km (7 mi) west of the Site; Howe, west of the Site on U.S. Highway 22/33; and Mud Lake and Terreton on the northeast border of the Site.

5.5 Cultural Resources

Over the past two decades, detailed inventories of cultural resources at some parts of the INEEL have been assembled. Initial surveys have been focused on areas within and around major operating facilities at the Site. Proposed future construction areas also have been examined. As of January 1, 1998, approximately 6.6% (37,681 acres) of the 2,305-km^2 (890-mi^2) INEEL has been systematically surveyed for archaeological resources and 1,839 archaeological localities have been identified. The inventory includes prehistoric resources representing a span of approximately 12,000 years as well as historic resources representing the last 150 years. Cultural resources on the INEEL also include a number of more recent buildings, structures, and objects that have made significant contributions to the broad patterns of American history through the Site's association with World War II, the Cold War, and important advances in nuclear science and technology. One INEEL facility, the Experimental Breeder Reactor I, is recognized.as a national historic landmark.

The experiments conducted within the PBF complex in the 1960s and early 1970s provided the nuclear industry with information needed for the design and safe operation of boiling water, pressurized water, heavy water, and open pool reactors. In a preliminary survey of buildings administered by DOE-ID (Arrowrock 1997), 16 of the 27 buildings associated with the PBF experiments are potentially eligible for nomination to the National Register of Historic Places. Detailed historical documentation must be completed in the event of proposed demolition or major structural modification to any of these 16 buildings. Such documentation must be formalized through a memorandum of agreement between DOE-ID and the State Historic Preservation Office.

Many cultural resource investigations have been completed in the WAG 5 area (Miller 1995). Activities have included archaeological surveys (Reed et al. 1987) and test excavations (Ringe 1988), excavations of sensitive Native American burial sites (Miller 1994, 1997), historic building inventories (Arrowrock 1997), and the development of detailed documentation (DOE-ID 1993).

Since 1984, six major archaeological survey projects encompassing nearly 1,200 acres have been completed in the PBF area. As a result, 86 sensitive resources have been identified within or immediately adjacent to the fenced perimeter of the facility. Resources include hunting campsites and game processing areas, stone-tool processing areas, hunting blinds made of locally available basalt cobbles, and Native American burial sites. Shoshone-Bannock tribal members have indicated that the sandy ridges and basins so common to WAG 5 may contain additional areas of traditional cultural importance. Limited archaeological test excavations completed in 1988 and intensive investigations of Native American human remains discovered in 1994 and 1996 at PBF provide further evidence of the sensitivity of the area and indicate a high potential for stratified subsurface cultural deposits, even in areas where no surface indications are apparent.

Relatively recent archaeological surveys of the ARA facilities have revealed a number of significant archaeological resources. Examination of 255 acres within and around the fenced facility perimeters has resulted in the preliminary documentation of 14 sensitive archaeological resources. Generally, these resources are very similar to those identified within the PBF area, though no Native American burial sites have been discovered at the ARA.

Local Native American people, particularly the Shoshone-Bannock tribal members of Fort Hall, Idaho, view all of the prehistoric sites on the INEEL as ancestral and of traditional cultural significance. A variety of natural features also are important to Native Americans. Though rare on the INEEL, Native American burial sites are of special concern. Tribal representatives will be consulted to ensure that no significant resources are inadvertently harmed by remedial activities at WAG 5.

5.6 Conceptual Site Models

The conceptual site models for WAG 5 reflect the types of receptors that could be affected by exposures to contaminants in the area. Two human health conceptual site models were developed and are illustrated graphically in Figures 4 and 5. One model represents a hypothetical future residential scenario beginning 100 years in the future, and the other reflects current and future occupational scenarios. The models are based on land-use assumptions and the exposure assessment conducted for the WAG 5 Comprehensive RI/FS (Holdren et al. 1999). Further discussion of INEEL land use appears in Section 6, and the exposure assessment is summarized in Section 7. The human health conceptual site models reflect the following land-use assumptions:

- The INEEL will remain under government ownership and institutional control for at least the next 100 years (i.e., until the year 2095, 100 years from the date of INEEL land-use projections [DOE-1D 1996])

- No residential development (e.g., housing) will occur within the INEEL boundaries within the institutional control period.

The conceptual site models for the ecological risk assessment reflect the locations of contaminated media that ecological receptors may be exposed to surface sediments comprising the top 0.15 m (0.5 ft) of soil and subsurface soil. The complete ecological conceptual site model is shown pictorially in Figure 6. The two components of the model are illustrated graphically in Figures 7 and 8, and a summary of the exposure media and ingestion routes for INEEL ecological receptors is given in Table 1.

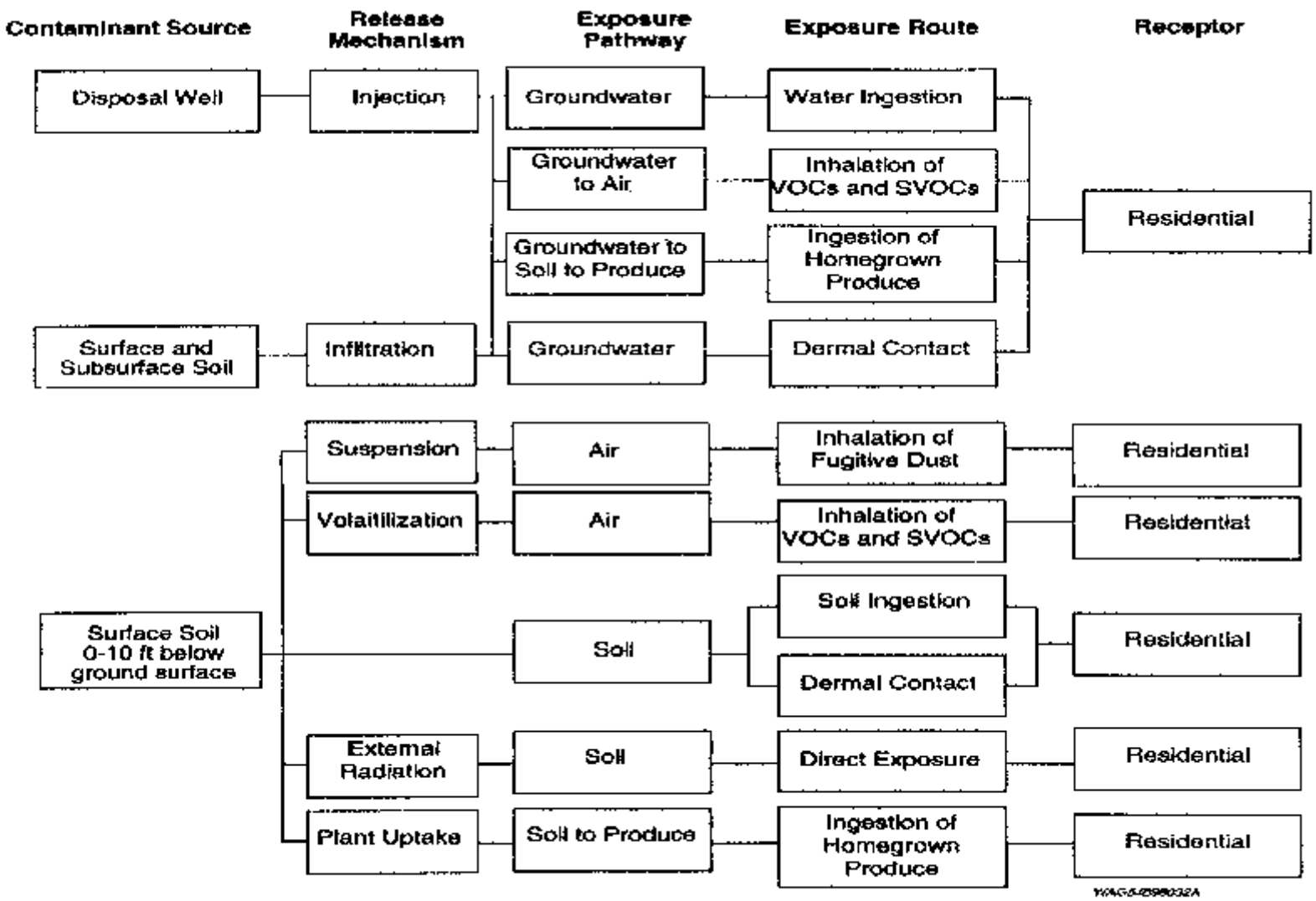


Figure 4. Human health conceptual site model for the hypothetical future residential scenario beginning in 2095.

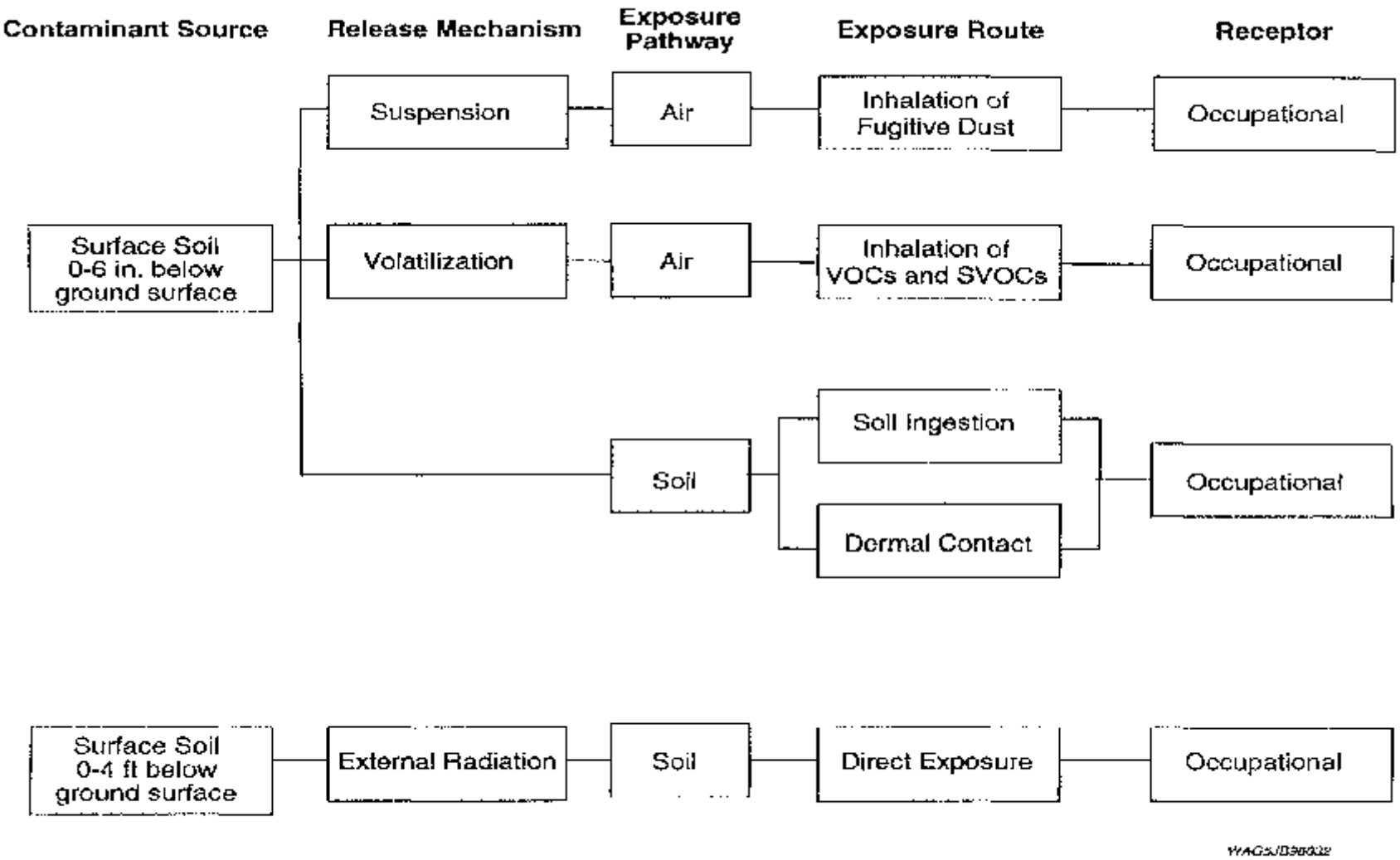


Figure 5. *Human health conceptual site model for the current and future occupational scenarios.*

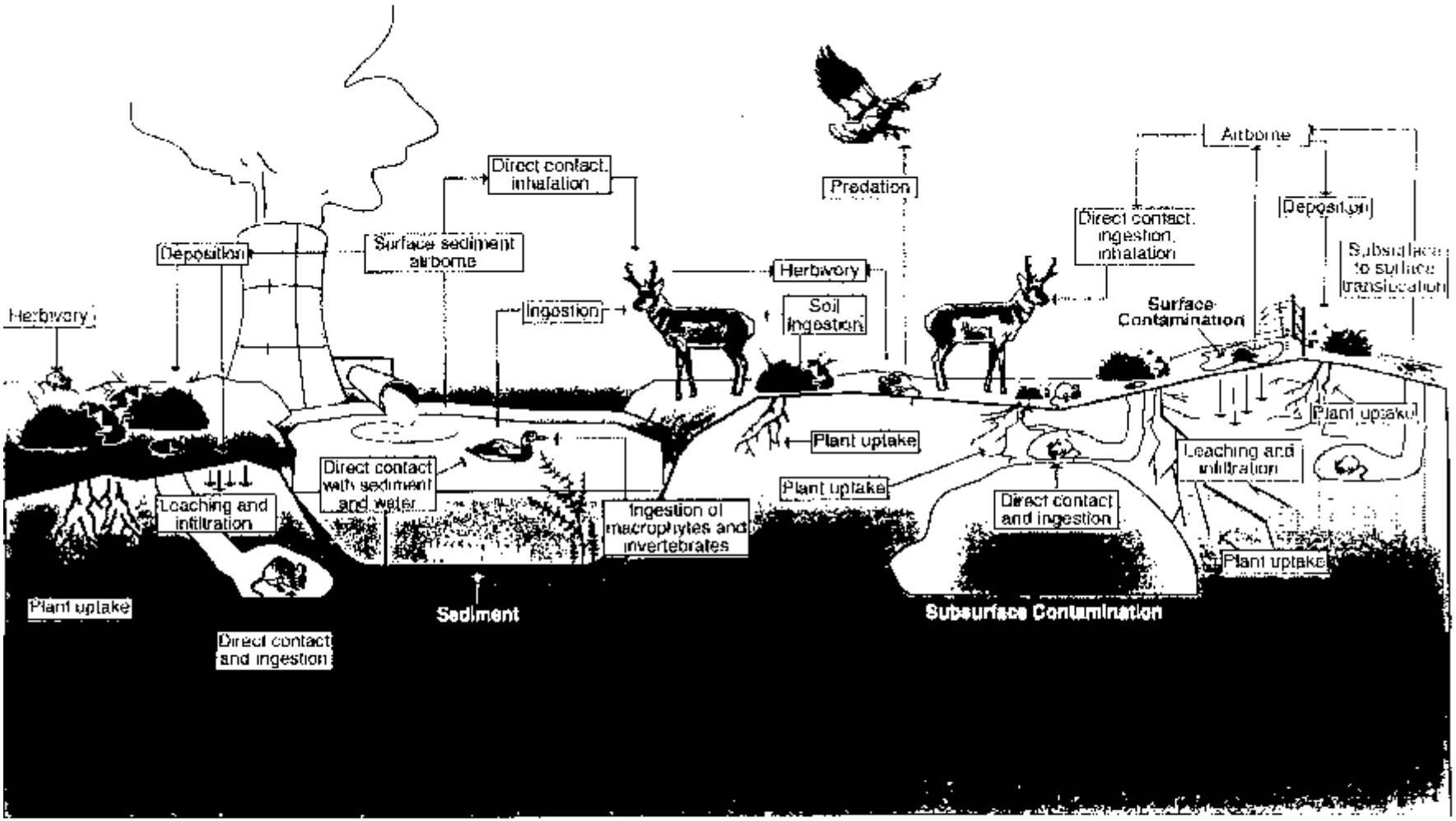


Figure 6. Ecological conceptual site model.

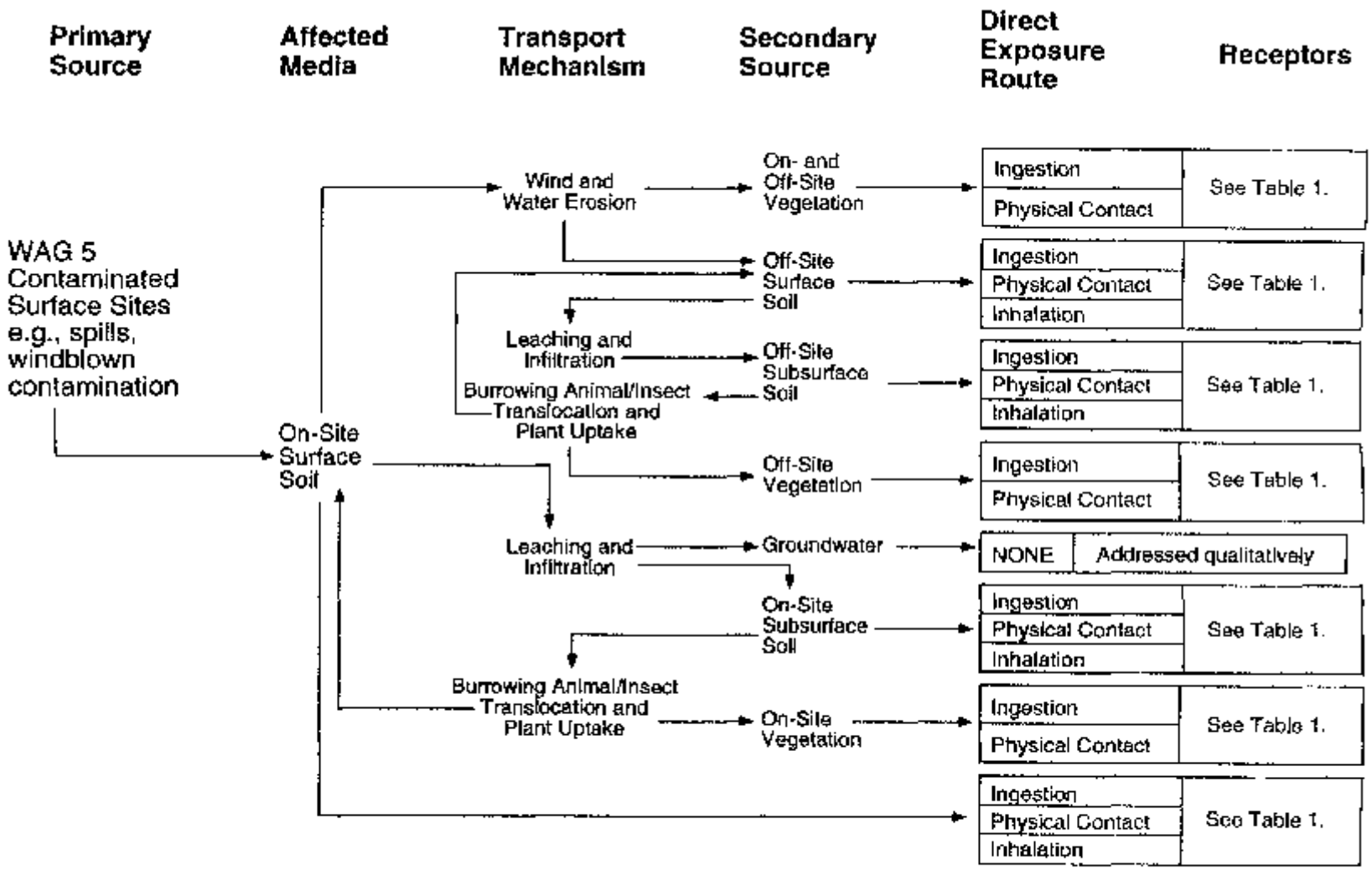


Figure 7. Model for screening level ecological risk assessment pathways and exposure for WAG 5 surface contamination.

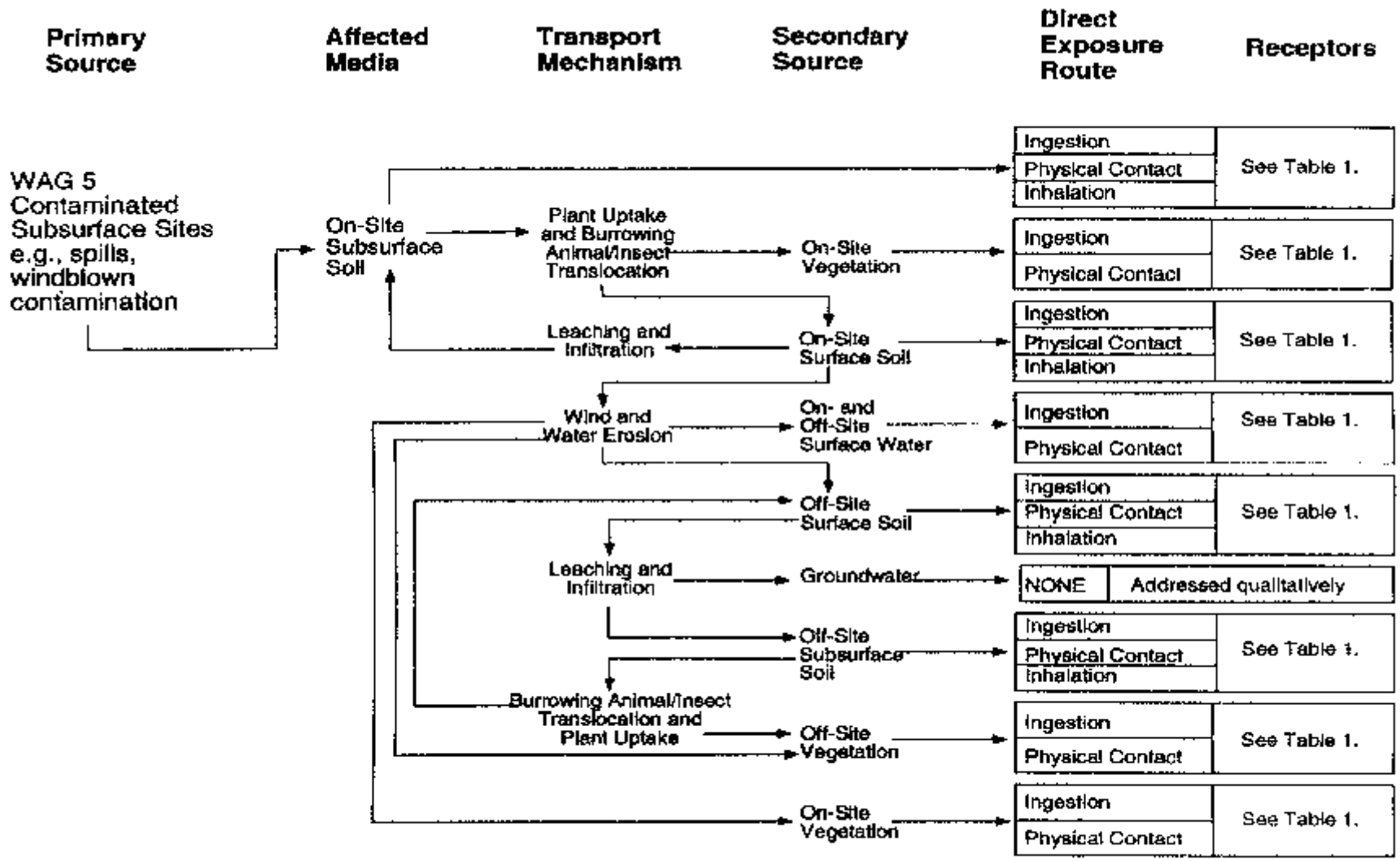


Figure 8. Model for screening level ecological risk assessment pathways and exposure for WAG 5 subsurface contamination.

Table 1. Summary of WAG 5 exposure media and ingestion routes for INEEL functional groups.

Receptor	Surface Soil	Subsurface Soil	Vegetation	Sediment	Prey Consumption Invertebrates	Prey Consumption Mammals	Prey Consumption Birds
Avian herbivores (AV122)	X						
Avian insectivores (AV210A)				X	X		
Avian insectivores (AV222)	X				X		
Avian insectivores (AV232)				X	X		
Avian carnivores (AV310)	X					X	X
Northern goshawk	X					X	X
Peregrine falcon	X					X	
Avian carnivores (AV322)						X	
Bald eagle						X	
Ferruginous hawk						X	X
Loggerhead shrike							
Avian carnivores (AV322A) Burrowing owl	X	X			X	X	
Avian omnivores (AV422)			X		X	X	X
Mammalian herbivores (M122)	X		X				
Mammalian herbivores (M122A)	X	X	X				
Pygamy rabbit	X	X	X				
Mammalian insectivores (M210A)	X				X		
Townsend's western big-eared bat	X				X		
Small-footed myotis	X				X		
Long-eared myotis					X		
Mammalian insectivores (M222) Merriam's shrew	X			X	X		
Mammalian carnivore (M322)	X					X	
Mammalian omnivores (M422)	X	X	X		X		
Reptilian carnivores (R322)						X	
Plants							

6. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The INEEL land area consists of approximately 2,305 km^2 (890 mi^2) (230,266 ha [569,000 acres]). The majority of this land, approximately 98%, has not been disturbed by Site operations. Land use on the entire INEEL is restricted, and access to the INEEL and WAG 5 is controlled. Though public highways traverse the INEEL, public access beyond the highway right-of-way is not allowed. Access to INEEL facilities requires proper clearance, training or an escort, and controls to limit exposures. Current land use and projections are summarized below.

6.1 Current Land Use

The acreage within the INEEL is classified as industrial and mixed use by the Bureau of Land Management (DOE-ID 1996a). Typical INEEL land use consists of wildlife management areas, government industrial operations areas, and waste management areas. No residential areas are contained within the INEEL boundaries. As shown in Figure 9, large tracts of land are reserved as buffer and safety zones around the boundary of the INEEL, and operations are generally restricted to the central area. Aside from the operational facilities, the remaining land within the core of the Site is largely undeveloped and is used for environmental research, ecological preservation, and sociocultural preservation. Any future construction of new facilities at the INEEL likely will occur within the preferred development corridors.

The buffer consists of 1,295 km^2 (500 mi^2) of grazing land (DOE-ID 1996a) administered by the Bureau of Land Management. Grazing areas at the INEEL support cattle and sheep, especially during dry conditions. Depredation hunts of game animals managed by the Idaho Department of Fish and Game are permitted on the INEEL within the buffer zone during selected years (DOE-ID 1996a). Hunters are allowed access to an area that extends 0. 8 km (0.5 mi) inside the INEEL boundary on portions of the northeastern and western borders of the Site (DOE-ID 1997a).

State Highways 22, 28, and 33 cross the northeastern portion of the Site, and U.S. Highways 20 and 26 cross the southern portion (Figure 1). One hundred forty-five km (90 mi) of paved highways used by the general public pass through the INEEL (DOE-ID 1996a), and 23 km (14 mi) of Union Pacific Railroad tracks traverse the southern portion of the Site. A government-owned railroad passes from the Union Pacific Railroad through the Central Facilities Area to the Naval Reactors Facility, and a spur runs from the Union Pacific Railroad to the RWMC.

In the counties surrounding the INEEL, approximately 45% of the land is used for agriculture, 45% is open land, and 10% is urban (DOE-ID 1996a). Livestock uses include the production of sheep, cattle, hogs, poultry, and dairy cattle (Bowman et al. 1984). The major crops produced on land surrounding the INEEL include wheat, alfalfa, barley, potatoes, oats, and corn. Sugarbeets are grown within about 40 mi of the INEEL in the vicinity of Rockford, Idaho, southeast of the INEEL in central Bingham County (Idaho 1996). Most of the land surrounding the INEEL is owned by private individuals or the U.S. government. The Bureau of Land Management (BLM) administers the government land on the INEEL (DOE-ID 1996a).

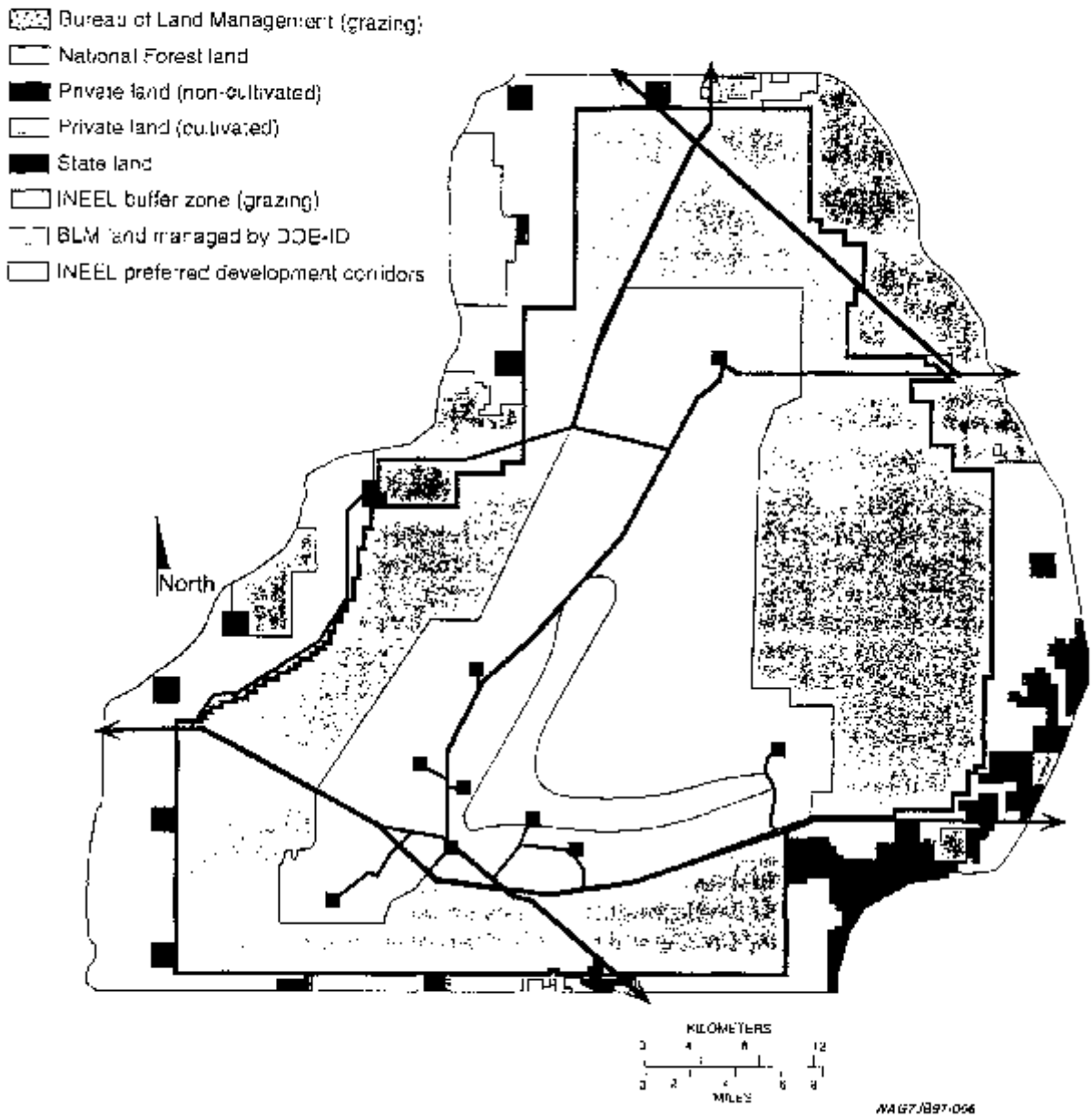


Figure 9. Land ownership distribution in the vicinity of the INEEL (DOE-ID 1996a).

6.2 Future Land Use

The projections for future land use at the INEEL area are influenced by the following assumptions and factors (DOE-DD 1996a):

- Department of Energy projections for the future of its national laboratory research and development activities and nuclear reactor programs
- The presence of active industrial and research facilities
- The presence of an industrial infrastructure
- The likely inability to "green field" (e.g., return to natural state with unrestricted land use) the industrial complex without total removal
- All land use, with the exception of grazing by permit, will be industrial
- Recommendations from the INEEL Citizen's Advisory Board and other stakeholders about future use assumptions.

Land-use projections in the INEEL Comprehensive Facility Land Use Plan (DOE-ID 1996a) incorporate the assumption that the INEEL will remain under government management and control for at least the next 100 years. Therefore, the baseline risk assessment (Holdren et al. 1999) simulates a hypothetical residential scenario beginning in 100 years. However, implementation of this management and control becomes increasingly uncertain over this time period. Regardless of the future use of the land now occupied by the INEEL, the federal government has an obligation to provide adequate institutional controls (i.e., limit access) to areas that pose significant health or safety risks until those risks diminish to acceptable levels (see Section 11). Fulfillment of this obligation hinges on the continued viability of the federal government and on Congress appropriating sufficient funds to maintain the institutional controls for as long as necessary.

A mix of land uses across the INEEL is anticipated to include unrestricted industrial uses, government-controlled industrial uses, unrestricted areas, controlled areas for wildlife management and conservation, and waste management areas. No residential development will be allowed within INEEL boundaries, and no new major private developments (residential or nonresidential) on public lands are expected in areas adjacent to the Site. Grazing will be allowed to continue in the buffer area (DOE-ID 1996a).

The Land Use Plan (DOE-ID 1996a) was developed using a stakeholder process that involved a public participation forum, a public comment period, and the INEEL Citizens' Advisory Board. The public participation forum membership included members from the local counties and cities, the Shoshone-Bannock Tribes, the Bureau of Land Management, DOE, the U.S. Forest Service, the U.S. National Park Service, the Idaho Department of Transportation, Idaho Fish and Game, and eight business, education, and citizen organizations. In addition, the EPA and IDHW participated in an ex-officio capacity. Following review and comment by the public participation forum, the document underwent a 30-day public comment period and was subsequently submitted to the INEEL Citizen's Advisory Board for review and recommendations. No recommendations for residential use of any portions of the INEEL within at least the next 100 years have been received to date. Projected nonindustrial use is limited to grazing and similar activities. In addition, the INEEL is currently a National Environmental Research Park and is expected to remain so for the foreseeable future.

Generally, future land use within the INEEL will remain essentially the same as the current use: a research facility within the INEEL boundaries and agriculture and open land surrounding the INEEL. Other potential but less likely land use within the INEEL includes agricultural applications and the return of the areas to their natural undeveloped states. The INEEL Land Use Plan (DOE-ID 1996a) projects that the ARA will be encompassed by a future buffer to public roads (i.e., State Highway 20) and will not be reused for future INEEL operations. Conversely, the forecast for the PBF area includes modification and reuse for industrial operations over the next 100 years (DOE-ID) 1996a).

6.3 Groundwater Uses

Current use of groundwater from the Snake River Plain Aquifer is for drinking and irrigation. Groundwater is extracted from two production wells at PBF. Groundwater use at ARA has been discontinued. Restrictions on groundwater use based on the impacts of WAG 5 operations on the aquifer are not anticipated. Aquifer contamination originating at WAG 5 has not been identified and, as discussed in Section 7.3, fate and transport modeling does not indicate that future contamination in excess of risk-based concentrations from sources at the ARA and PBF will occur.

6.4 Groundwater Classification and Basis

The ARA and PBF facilities are situated above the Snake River Plain Aquifer. The eastern portion of the aquifer was granted sole source status by the EPA on October 7, 1991 (56 FR 50634). Idaho water quality standards are dictated primarily by the Idaho Ground Water Quality Rule (IDAPA 16.01.11), the Idaho Ground Water Quality Standards (IDAPA 16.01.11.200), and the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 16.01.02). These standards and requirements can be accessed at the Internet address “www.idwr.state.id.us/apa/idapa.”

Three categories of protectiveness apply to the aquifer and its associated resources under Idaho regulations: (1) Sensitive Resources, (2) General Resources, and (3) Other Resources. Because no previous action to categorize the Snake River Plain Aquifer under Idaho regulations has occurred, the aquifer defaults to the “General Resources” category. General Resource aquifers are protected to ensure that groundwater quality is not jeopardized. Idaho’s groundwater standards incorporate federal radiation exposure and drinking water standards (10 CFR 20, Appendix B, Table 2, and 40 CFR 141 and 143). When the two federal standards are not in agreement, the more restrictive standard applies.

7. BASELINE RISK ASSESSMENT METHODOLOGY

The baseline risk assessment developed for WAG 5 (Holdren et al. 1999) evaluated the risk potential associated with contaminated media at ARA and PBF. The evaluation simulated a no action alternative, meaning that mitigative measures to reduce risk were not considered. The methodologies implemented to evaluate the baseline human health and ecological risks are outlined below, followed by a summary of the results for WAG 5. Components of the risk assessment specific to the selected remedies, such as contaminants of concern, contaminant concentrations, and risk estimates, are presented in more detail in Sections 8, 9, and 10.

7.1 Human Health Risk Evaluation Summary

The human health risk assessment approach used in the WAG 5 baseline risk assessment (BRA) was based on the EPA *Risk Assessment Guidance for Superfund* (RAGS) (EPA 1989, 1992a), INEEL Track 2 guidance (DOE-ID 1994), and INEEL cumulative risk assessment guidance protocol (LMITCO 1995). The tasks associated with development of the WAG 5 human health risk assessment included the following:

- Data evaluation
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Qualitative uncertainty analysis.

These tasks are described in the subsections below.

7.1.1 Data Evaluation

Data evaluation tasks that were completed as part of the BRA included site and contaminant screening and development of data sets for use in the risk assessment.

The site screening consisted of a review of previous risk assessments conducted for WAG 5 sites identified in the FFA/CO. As a result of the site screening, 15 of the individual sites identified in the FFA/CO were retained for quantitative risk assessment in the comprehensive BRA. The remaining sites either exhibited no risk potential (e.g., the site had no source of contamination) or a risk potential sufficiently below threshold values to preclude a significant contribution to cumulative risk. Individual sites with risk estimates greater than 1E-07 or hazard indices greater than 0.1 were retained.

In addition, because past and present activities associated with ARA and PBF facilities and structures are proximal or “co-located” to WAG 5 CERCLA sites, an analysis was performed to assess their potential impacts to cumulative risk estimates and to ensure that all historical releases were identified and assessed. The analysis included a review of past and present operational activities at ARA and PBF, existing facilities and structures, and management control procedures for mitigating the effects of future environmental releases of contaminants. Buildings and structures with a history of releases not subject to current management controls and those that possess the potential to impact cumulative risk at WAG 5 sites normally would be retained for consideration in the BRA. However, no such facilities or structures were identified in the facilities assessment analysis for WAG 5.

Contaminant screening consisted of comparing detected concentrations to INEEL background concentrations (Rood, Harris, and White 1996) and EPA 1E-06 risk-based concentrations (EPA 1995) for the most sensitive exposure pathway. Those contaminants that exceeded the screening criteria were identified as contaminants of potential concern and retained for quantitative analysis in the BRA. Potential exposure routes also were identified in conjunction with the contaminant screening.

All sampling data collected at WAG 5 sites were evaluated to determine whether the data were appropriate and adequate for use in the BRA. This evaluation was conducted generally in accordance with EPA guidance (EPA 1992a). As part of this analysis, sampling data sets were assumed to have lognormal distributions in accordance with EPA guidance on calculating concentration terms (EPA 1992a). However, true statistical distributions for the data were not determined. To calculate upper confidence limits on the means (UCLs), zero concentrations were assumed for all sampling results below minimum detection limits. The recommended method by the EPA to calculate upper confidence limits is to assign a value of one-half the detection limit for a sample result below the detection limit. However, this methodology was not used in the BRA because detection limits were not available for all of the sampling analyses. Assigning a zero value to all concentrations below detection limits allowed the upper confidence limits to be calculated consistently for all of the sampling results.

7.1.2 Exposure Assessment

The process of exposure assessment quantifies the receptor intake of contaminants of potential concern for those exposure pathways with a potential to cause adverse effects. The assessment consists of estimating the magnitude, frequency, duration, and exposure route of contaminants to receptors. The following exposure assessment characteristics were identified:

- Exposed populations
- Complete exposure pathways
- Contaminant concentrations at the points of exposure for the complete exposure pathways
- Intake rates
- Intake factors.

The land-use assumptions and projections discussed in Section 6 were used to identify exposure scenarios, pathways, and routes. The exposure scenarios and default soil depths evaluated in the WAG 5 BRA are given in Table 2. The associated populations and exposure pathways are listed below and illustrated in Figures 4 and 5.

- Exposure scenarios
  - % Occupational
  - % Residential intrusion
- Exposure pathways
  - % Groundwater pathway
  - % Air pathway
  - % Soil pathway

Table 2. Exposure scenarios and soil depths used in the WAG 5 baseline risk assessment.

Potentially Exposed Receptor	Land Use Scenario	Evaluated Exposure Pathways and Soil Depths
Occupational worker	Current industrial	Inhalation of volatiles (0–15 cm [0–0.5 ft])[a] Inhalation of fugitive dust (0–15 cm [0–0.5 ft])[a] Ingestion of surface soil (0–15 cm [0–0.5 ft])[a] External radiation (0–1.22 m [0–4 ft])[b]
Residential	Future residential	Inhalation of volatiles (0–3.05 m [0–10 ft])[c] Inhalation of fugitive dust (0–3.05 m [0–10 ft)[c] Ingestion of surface soil (0–3.05 m [0–10 ft)[c] Ingestion of homegrown produce (0–3.05 m [0–10 ft])[c] Ingestion of groundwater External radiation (0–3.05 m [0–10 ft])[c]
Occupational worker	Future industrial	Inhalation of volatiles (0–15 cm [0–0.5 ft][a] Inhalation of fugitive dust (0–15 cm. [0–0.5 ft])[a] Ingestion of surface soil (0–15 cm [0–0.5 ft])[a] External radiation (0–1.22 m 15 cm [0–4 ft])[b]

a. Exposure assessment considered the surface soil, defined as the top 0 to 15 cm (0 to 0.5 ft).

b. Exposure assessment considered the 0 to 1.22-m (0 to 4-ft) interval for undisturbed soil. Contamination below that depth is shielded by the topsoil

c. Exposure assessment considered contamination within the 0 to 3.05-m (0 to 10-ft) interval because of the excavation required for a hypothetical basement.

- Exposure routes
  - % Soil ingestion
  - % Inhalation of fugitive dust
  - % Inhalation of volatiles
  - % External radiation exposure
  - % Dermal absorption from soil (arsenic only)
  - % Groundwater ingestion (residential scenario only)
  - % Ingestion of homegrown produce (residential scenario only)
  - % Dermal absorption of contaminants in groundwater (residential scenario only)
  - % Inhalation of volatiles from indoor use of groundwater (residential scenario only).

Contaminant concentrations at the points of exposure for complete exposure pathways were based on detected concentrations as described in Section 7.1.1. If sufficient data were not available for calculating upper confidence limit concentrations, the maximum detected concentration was used. For radioactive contaminants, radioactive decay was incorporated into the intake calculations. Otherwise, no degradation mechanisms for reducing the toxicity of contaminants were considered.

Groundwater fate and transport modeling was used to predict the maximum contaminant concentrations that could occur in the aquifer from leaching and transport of nonradionuclide and radionuclide contaminants from WAG 5. The GWSCREEN model was used to simulate the potential release of contaminants from the release sites and the transport of the contaminants through the vadose zone to the aquifer. The maximum 30-year average groundwater concentration for each contaminant of potential concern was estimated at 100 and 1,000 years in the future, and at the time of maximum contaminant concentration up to 10,000 years (Holdren et al. 1999).

To calculate intake rates, default intake factors from EPA guidance (EPA 1989, 1991, and 1992a) and Track 2 guidance for the INEEL (DOE-ID 1994) were used. In conjunction with conversion factors and site-specific contaminant concentrations, these values were used to calculate contaminant intakes used in the risk calculations. The specific exposure parameters used for each receptor and exposure pathway are given in the RI/FS (Holdren et al. 1999, Appendix B). Generally, occupational scenarios simulate worker exposures for 8 hours/day, 250 days/year for 25 years and residential scenarios simulate exposures for 24 hours/day, 350 days/year, for 30 years. Standard values were used to simulate the human body (e.g., mass, skin area, inhalation rates, and soil ingestion rates).

To satisfy the objective of the WAG 5 comprehensive risk assessment, risks produced through the air and groundwater exposure pathways were analyzed cumulatively. Cumulative risks were estimated by calculating one risk number for each contaminant of potential concern in each air and groundwater exposure route (e.g., inhalation of fugitive dust and ingestion of groundwater) for each collection of sites in close proximity to one another. Analyzing the risks for the air and groundwater pathways in a cumulative manner is necessary because contamination from all sites within an area can contribute to local air and groundwater contaminant concentrations. Conversely, individual sites within a WAG are typically isolated from one another relative to the soil pathway exposure routes (e.g., external exposure and ingestion of soil). As a result, site-specific soil pathway exposures were analyzed. Generally, however, the BRA is comprehensive because risks are evaluated from all known and potential sites within WAG 5, and it is cumulative because risks from multiple sites are evaluated in the air and groundwater exposure pathways.

7.1.3 Conduct Toxicity Assessment

Toxicity assessment is the process of characterizing the relationship between the intake of a substance and the incidence of an adverse health effect in the exposed population. Toxicity assessments evaluate the results from studies with laboratory animals or from human epidemiological studies. These evaluations are used to extrapolate from high levels of exposure, for which adverse effects are known to occur, to low levels of environmental exposures, for which effects can be postulated. The results of these extrapolations are used to establish quantitative indicators of toxicity.

Health risks from all routes of exposure are characterized by combining the chemical intake information with numerical indicators of toxicity (i.e., slope factors for carcinogens and reference doses for noncarcinogens). The toxicity constants that were used in the WAG 5 BRA were obtained from several sources. The primary source of information is the EPA online Integrated Risk Information System (IRIS). The IRIS database contains only those toxicity constants that have been verified by EPA work groups. The IRIS database is updated monthly and supersedes all other sources of toxicity information. If the necessary data are not available in IRIS, EPA Health Effects Assessment Summary Tables (HEAST) (EPA 1994a) are used. The toxicity constant tables are published annually and updated approximately twice per year. The HEAST contain a comprehensive listing of provisional risk assessment information that has been reviewed and accepted by individual EPA program offices, but has not had enough review to be recognized as high-quality, EPA-wide information (EPA 1994a).

Summaries of the toxicity profiles for the contaminants addressed in the selected remedies to mitigate unacceptable human health risk are given below.

7.1.3.1 Arsenic. Arsenic is classified as a metal. Acute exposure to arsenic causes severe throat irritation, gastrointestinal disturbance, and muscle spasms, which may be followed by vertigo, delirium, and coma. Facial edema also may be evident. Sensory loss and hematopoietic symptoms associated with acute exposure are usually reversible. Malaise and fatigue mark chronic exposure, either by ingestion or inhalation. Changes in the skin include hyperkeratosis. Anemia and neuropathy, liver injury, and "blackfoot disease" also result from chronic exposure.

Arsenic is a known carcinogen in humans. Ingestion is associated with increased incidence of skin cancer. Lung cancer results from inhalation. Insufficient data exist to determine the carcinogenic effects in animals.

The EPA oral slope factor for arsenic is 1.8E+00 $(m/kg\text{-}day)^{-1}$, and the inhalation unit risk is 2.4E-03 $(g/m^3)^{-1}$. The confidence in the inhalation unit risk is somewhat uncertain because of the confounding variables in epidemiological studies and only one exposure dose was used in the animal studies. Confidence in the oral slope factor is relatively high because several studies show significant increases in the carcinogenic response.

7.1.3.2 Lead. Lead is classified as a metal. No critical effects of lead have been reported; however, many organs and systems are adversely affected by lead exposures. The major target organs and systems are the central nervous system, the peripheral nerves, the kidneys, the gastrointestinal system, and the blood system (Sittig 1985). Anemia is one of the early manifestations of lead poisoning. Other early effects of lead poisoning can include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms, abdominal pains, and decreased appetite. The major central nervous system effects can include dullness, irritability, headaches, muscular tremors, inability to coordinate voluntary muscles, and loss of memory. The most sensitive effect for adults in the general population may be hypertension (Amdur, Doull, and Klaassen 1991).

Ingestion and inhalation of lead have the same effects on the human body. Large amounts of lead can result in severe convulsions, coma, delirium, and possibly death. A high incidence of residual damage, similar to that following infections or traumatic damage or injury, is observed from sustained exposure to lead. Most of the body burden of lead is in the bone (ATSDR 1990a). Lead effects in the peripheral nervous system are primarily manifested by weakness of the exterior muscles and sensory disturbances. Lead also has been shown to adversely affect sperm and damage other parts of the male reproductive system (ATSDR 1990a). Dermal absorption of inorganic lead compounds is reported to be much less significant than absorption by inhalation or oral routes of exposure (ATSDR 1990a).

The behavioral effects of lead exposure are a major concern, particularly in children. Exposure to lead can cause damage to the central nervous system, mental retardation, and hearing impairment in children. Levels of exposure that may have little or no effect on adults can produce important biochemical alterations in growing children that may be expressed as altered neuropsychological behavior (Martin 1991).

Though an ability of lead to cause cancer in humans has not been shown, the EPA has classified lead as a probable human carcinogen through both the ingestion and inhalation routes of exposure. Lead classification is based on the available evidence of cancer from animal studies. Rats ingesting lead demonstrated statistically increased incidence of kidney tumors (ATSDR 1990a). According to some epidemiological studies, lead workers developed cancer, but the data are considered inadequate to

demonstrate or refute the potential carcinogenicity of lead in humans. The EPA has not established toxicity values for lead.

7.1.3.3 Polychlorinated Biphenyls. Polychlorinated biphenyls (PCBs) comprise a physicochemically and toxicologically diverse group of 209 compounds. Their widespread use has made them ubiquitous in the environment. Aroclor-1242, which is contained in the sludge in the ARA-02 seepage pit, is a PCB.

Polychlorinated biphenyls are classified as probable human carcinogens. Data on carcinogenicity in humans following exposures to PCBs are inadequate because of confounding exposures or lack of exposure quantification (EPA 1993). Exposure to commercial PCB mixtures caused hepatocellular cancer in rats and mice, while most genotoxic and mutagenic bioassays with PCBs have been negative. The oral slope factor listed by the EPA in the IRIS database for PCBs is 4.0E-01 $(mg/kg/day)^{-1}$.

Toxicity data for assessing the noncarcinogenic effects of Aroclor-1242 have not been approved. However, data for Aroclor-1254 were used to assess the potential toxicological effects. The oral reference dose for Aroclor-1254 in the IRIS database is 2.0E-05 $(mg/kg/day)^{-1}$. Estimates developed using this reference dose for Aroclor-1242 are classified as qualitative.

The routes of entry of PCBs into the body are inhalation of fumes or vapors and percutaneous absorption of liquid, ingestion, and eye and skin contact.

Prolonged skin contact may cause the formation of sebaceous cysts, and pustules known as chloracne. Irritation of the eyes, nose, and throat also may occur. Acute and chronic exposure can cause liver damage.

7.1.3.4 Cesium-137. The radioactive isotope Cs-137 is a fission product of nuclear reactors and nuclear weapons detonations. The EPA classifies all radioactive substances as probable carcinogens in the IRIS database.

Cesium-137 is rapidly absorbed into the bloodstream and is distributed throughout the active tissues of the body. Metabolically, Cs-137 behaves as an analog of potassium. Its distribution throughout the body and energetic beta and gamma radiation from its daughter, Ba-137m, results in whole-body irradiation (Amdur, Doull, and Klaassen 1991). The radioactive half-life of Cs-137 is 30 years. Its biological half-life in adults is 50 to 150 days, and in children is 44 days. Cesium-137 exists in secular equilibrium with Ba-137m, which is the major contributor to the dose received from a 0.662-MeV gamma ray. The critical organ for Cs-137 exposure is the whole body.

7.1.3.5 Radium-226. Radium is a naturally occurring silvery white radioactive metal that can exist in several isotopes, and is formed by the decay of uranium and thorium in the environment. Radium-226 is a gamma emitter and has a 1,600-year half-life. The EPA classifies all radioactive substances as probable carcinogens in the IRIS database.

Exposure to radium is constant because it is present at very low levels in the surrounding environment. Exposure to higher levels of radium can occur to those who live in an area in which it is released into the air from the burning of coal or other fuels. Exposure also results if drinking water is taken from a source that is high in natural radium, such as a deep well or from a source near a disposal site.

No clear evidence indicates that long-term exposure to radium at the levels that are normally present in the environment is likely to result in harmful health effects. Exposure to higher levels of

radium over a long period of time may result in harmful effects including anemia, cataracts, fractured teeth, cancer (especially bone cancer), and death. Some of these effects may take years to develop (ATSDR 1990b).

7.1.3.6 Silver-108m. The information identified in a literature search to support the development of a toxicity profile for Ag-108m was very sparse (Holdren et al. 1999). Though radioactive silver has been administered as a tracer, information about the radiotoxicity of Ag-108m was not found. Silver-108m is not naturally occurring, has a half-life of 130 years (which was recently modified to 418 years [Firestone and Shirley 1999]), and is primarily a gamma emitter. The EPA classifies all radioactive substances as probable carcinogens in the IRIS database.

7.1.3.7 Uranium-235 and –238. Natural uranium contains three isotopes: U-234, U-235, and U-238. The abundance of each isotope in natural uranium is, respectively, 0.006%, 0.72%, and 99.27% (ATSDR 1990c). Uranium can be found in the earth's crust at an average concentration of 2 ppm. The ambient air concentration of uranium in the United States ranges from 0.3 to 0.011 fCi/m^3 (1 fCi = 1E-03 pCi). The concentration in drinking water ranges from 0.07 to 653 pCi/L with a median value of 0.1 to 0.2 pCi/L.

In natural uranium, the radioactivity from U-238 accounts for about half the total radioactivity and the radiation from U-234 and U-235 accounts for the other half. Uranium emits primarily alpha radiation that cannot penetrate skin but can travel short distances in the body if the uranium is inhaled or ingested. Because natural uranium emits very small amounts of gamma radiation that can penetrate the skin, little danger, if any, exists from this type of radiation from uranium (ATSDR 1990c). Moreover, no human or animal studies have definitively linked inhalation or oral exposure to natural uranium to the development of cancer. However, the EPA classifies all radioactive substances as probable carcinogens in the IRIS database.

For the noncarcinogenic health risks associated with uranium, exposure to natural concentrations of uranium in food, water, air, and soil does not appear to have any toxic effects. Animals that have had oral, inhalation, or dermal exposure to large amounts of uranium have developed damage to the kidney tubules, but other systems were not affected. The only significant systemic health risk in humans from exposure to nonenriched uranium is potential damage to the kidneys. However, an increase in deaths from urogenital or renal diseases has not been noted in epidemiological studies and significant damage to human kidneys following exposure to uranium has not been identified in intravenous studies (ATSDR 1990c). Overall, studies in animals and humans indicate that exposure to uranium is unlikely to produce immunological or neurological effects.

7.1.4 Risk Characterization

The characterization of risk involves combining the results of the toxicity and exposure assessments to estimate health risks. These estimates are either a comparison of exposure levels with appropriate toxicity criteria or an estimate of the lifetime cancer risk associated with a particular intake. The nature and weight of evidence supporting the risk estimate, as well as the magnitude of uncertainty surrounding the estimate, also are considered in risk assessment.

To quantify human health risks, contaminant intakes are calculated for each contaminant by way of each applicable exposure route. As discussed above, these contaminant intakes are calculated values based on measured concentration estimates. To estimate human health risks, the contaminant-specific intakes are compared to the applicable chemical-specific toxicity data. The complete results of the BRA risk characterization process, including risk estimates for each retained site and groundwater and air pathway risks for each collection of sites, are presented in the RI/FS report (Holdren et al. 1999,

Appendix B). The generalized equations for calculating carcinogenic risk and noncarcinogenic hazard quotients are given below.

7.1.4.1 Carcinogenic Health Effects. The following calculations are used to obtain numerical estimates (i.e., unitless probability) of lifetime cancer risks. The risk probability is the product of the intake and the slope factor, as follows:

$$Risk = Intake \times SF \tag{1}$$

where

Risk = Potential lifetime cancer risk (unitless)

Intake = Chemical intake (mg/kg/day), or radionuclide intake (pCi)

SF = Slope factor, for chemicals $(mg/kg/day)^{-1}$, or radionuclides $(pCi)^{-1}$.

The linear low-dose equation shown above is valid at risk levels lower than 1E-02 (1 in 100). In accordance with EPA guidance (EPA 1989), risks that are greater than 1E-02 (1 in 100) are calculated using the following one-hit equation:

$$Risk = 1 - exp(-Intake \times SF) \tag{2}$$

where

Risk = Potential lifetime cancer risk (unitless)

Intake = Chemical intake $(mg/kg/day)^{-1}$, or radionuclide intake (pCi)

SF = Slope factor for chemicals $(mg/kg/day)^{-1}$ or radionuclides $(pCi)^{-1}$.

To develop a total risk estimate for a given site, cancer risks are summed separately a cross all potential carcinogens at the site, as shown in the following calculation:

$$Risk_T = \Sigma\ Risk_i \tag{3}$$

where

$Risk_T$ = Total cancer risk, expressed as a initless probability

$Risk_i$ = Risk estimate for the ith contaminant.

Similarly, risk values for each exposure route are summed to obtain the total cancer risk for each potential carcinogen.

7.1.4.2 Noncarcinogenic Effects. Health risks associated with exposure to individual noncarcinogenic compounds are evaluated by calculating hazard quotients. The hazard quotient is the ratio of the intake rate to the reference dose, as follows:

$$HQ = Intake / RfD \tag{4}$$

where

HQ = Noncarcinogenic hazard quotient (unitless)

$Intake$ = Chemical intake (mg/kg/day)

RfD = Reference dose (mg/kg/day).

Hazard indices are calculated by summing hazard quotients for each chemical across all exposure routes. If the hazard index for any contaminant of potential concern exceeds unity, potential health effects may be a concern from exposure to the contaminant of potential concern. The hazard index is calculated using the following equation:

$$HI = S \frac{Intake_i}{RfD_i} \tag{5}$$

where

HI = Hazard index (unitless)

$Intake_i$ = Exposure level (intake) for the ith toxicant (mg/kg/day)

RfD_i = Reference dose for the ith toxicant (mg/kg/day).

In the foregoing equation, intake and reference dose are expressed in the same units and represent the same exposure time period.

7.1.5 Qualitative Uncertainty Analysis

The risk assessment results are very dependent on the methodologies applied to develop the risk estimates. These analysis methods were developed over a period of several years by INEEL risk management and risk assessment professionals to provide realistic, yet conservative estimates of human health risks at WAG 5. Nonetheless, if different risk assessment methods had been used, the BRA likely would have produced different risk assessment results. To ensure that the risk estimates are conservative (i.e., generate upper-bound risk estimates), health protective assumptions that tend to bound the plausible upper limits of human health risks were applied throughout the BRA. Therefore, risk estimates that may be calculated by other risk assessment methods are not likely to be significantly higher than the estimates developed for the WAG 5 Comprehensive RI/FS.

Uncertainty in the BRA is produced by uncertainty factors in all four stages of risk analysis (i.e., data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization). The uncertainties associated with parameters used in the risk assessment are listed in Table 3. The conservative assumptions and uncertainties in the risk estimates for the five sites identified for remediation based on human health risk estimates in the WAG 5 Comprehensive RI/FS (Holdren et al. 1999) are summarized in Table 4. Qualitative consideration of the collective impact of all the assumptions indicates that the risks are more likely to be overestimated than underestimated.

Table 3. Human health baseline risk assessment uncertainty factors.

Uncertainty Factor	Effect of Uncertainty	Comment
Source term assumptions	May overestimate risk.	All contaminants are assumed to be completely available for transportation away from the source zone. In reality, some contaminants may be chemically or physically bound to the source zone and unavailable for transport.
Natural infiltration rate	May overestimate risk.	A conservative value of 10 cm/year was used for this parameter.
Moisture content	May overestimate or underestimate risk.	Soil moisture contents vary seasonally in the upper vadose zone and may be subject to measurement error.
Water table fluctuations	May slightly overestimate or underestimate risk.	The average value used is expected to be representative of the depth over the 30-year exposure period.
The mass of contaminants in soil was estimated by assuming a uniform contamination concentration in the source zone.	May overestimate or underestimate risk.	While not likely, most of the mass of a given contaminant at a given site may exist in a hotspot that was not detected by sampling. Such a condition could result in underestimating the mass of the contaminant used in the analysis. Assigning zero values to concentrations below detection limits also may cause mass to be underestimated. However, the 95% upper confidence limit on the mean (UCL) or the maximum detected contamination levels were used for all mass calculations. These concentrations are assumed to exist at every point in each waste site; therefore, the mass of contaminants used in the analysis is probably overestimated.
Plug flow assumption in groundwater transport	May overestimate or underestimate risk.	Plug flow models such as GWSCREEN (Rood 1994) are conservative relative to concentrations because dispersion is neglected and mass fluxes from the source to the aquifer differ only by the time delay in the unsaturated zone (the magnitude of the flux remains unchanged). For nonradiological contaminants, the plug flow assumption is conservative because dispersion is not allowed to dilute the contaminant groundwater concentrations. For radionuclides, the plug flow assumption may or may not be conservative. Based on actual travel time, the radionuclide groundwater concentrations could be overestimated or underestimated because a longer travel time allows for more decay. If the concentration decrease from the travel time delay is larger than the neglected dilution from dispersion, the model will not be conservative.
No migration of contaminants from the soil source before 1994 was modeled.	May overestimate or underestimate risk.	The effect of not modeling contaminant migration from the soil before 1994 is dependent on the contaminant half-life, radioactive ingrowth, and mobility characteristics.
Chemical form assumptions	May overestimate or underestimate risk.	In general, the methods and inputs used in contaminant migration calculations, including assumptions about chemical forms of contaminants, were chosen to err on the protective side. All contaminant concentration and mass are assumed available for transport. This assumption results in a probable overestimate of risk.

Table 3. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Exposure scenario assumptions	May overestimate risk.	The likelihood of future scenarios has been qualitatively evaluated as follows: Resident— improbable Industrial—credible. The likelihood of future residential development at the INEEL is small. If future residential use of this site does not occur, then the risk estimates calculated for future residents are likely to overestimate the risk associated with future use of this site.
Exposure parameter assumptions	May overestimate risk.	Assumptions about media intake, population characteristics, and exposure patterns may not characterize actual exposures.
Receptor locations	May overestimate risk.	Groundwater ingestion risks are calculated for a point at the downgradient edge of an equivalent rectangular area. The groundwater risk at this point is assumed to be the risk from groundwater ingestion at every point within WAG 5 boundaries. Changing the receptor location will affect only the risks calculated for the groundwater pathway because all other risks are site specific or assumed constant at every point within the WAG 5 boundaries.
For the groundwater pathway analysis, homogeneous distribution in a large mass of soil was assumed for all contaminants.	May overestimate or underestimate risk.	Homogeneous distribution in the soil volume beneath WAG 5 is assumed for the total mass of each contaminant of potential concern. This assumption tends to maximize the estimated groundwater concentrations produced by the contaminant inventories because homogeneously distributed contaminants would not have to travel far to reach a groundwater well drilled anywhere within the WAG 5 boundary. However, groundwater concentrations may be underestimated for a large mass of contamination (located in a small area with a groundwater well drilled directly downgradient).
The entire inventory of each contaminant was assumed to be available for transport along each pathway.	May overestimate risk.	Only a portion of the inventory of each contaminant will be transported by each pathway.
Exposure duration	May overestimate risk.	The assumption that an individual will work or reside at a site for 25 or 30 years is conservative. Short-term exposures involve comparison to subchronic toxicity values, which are generally less restrictive than chronic values.
Conservative values were used to represent constants not dependent on contaminant properties.	May overestimate risk.	Conservative or upper-bound values were used for all parameters incorporated into intake calculations.
Some hypothetical pathways were excluded from the exposure scenarios.	May underestimate risk.	Exposure pathways are considered for each scenario and eliminated only if the pathway is either incomplete or negligible compared to other evaluated pathways.
Biotic decay was not considered.	May overestimate risk.	Biotic decay would tend to reduce contamination over time.

Table 3. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Occupational intake value for inhalation is conservative.	May slightly overestimate risk.	Standard exposure factors for inhalation have the same value for occupational as for residential scenarios though occupational workers would not be onsite all day.
Use of cancer slope factors	May overestimate risk.	Slope factors are associated with 95% UCLs. They are considered unlikely to underestimate risk.
Toxicity values were derived primarily from animal studies for nonradioactive contaminants.	May overestimate or underestimate risk.	Extrapolation from animal to humans may induce error from differences in absorption, pharmacokinetics, target organs, enzymes, and population variability.
Toxicity values were derived primarily from high doses; however, most exposures are at low doses.	May overestimate or underestimate risk.	Linearity was assumed at low doses. The effect tends toward conservative exposure assumptions.
Toxicity values and classification of carcinogens	May overestimate or underestimate risk.	Not all values represent the same degree of certainty. All are subject to change as new evidence becomes available.
Lack of slope factors	May underestimate risk.	Contaminants of potential concern without slope factors may or may not be carcinogenic through the oral pathway.

Table 4. Summary of site-specific uncertainties and conservative assumptions for the human health baseline risk assessment.

Site	Uncertainties and Conservative Assumptions
ARA-12: ARA-III Radioactive Waste Leach Pond	The 95% upper confidence limit (UCL) or maximum contaminant concentrations are assumed to exist over the entire site. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed to the soil/basalt interface at depths of up to 7 ft. The residential scenario risks were calculated assuming that all 7 ft of soil would be excavated. This assumption may result in an overestimate of risk.
	In the absence of historical disposal data, the contaminant masses associated with the site were estimated based on source term volume and detected concentrations. This approach may result in an underestimate of risk.
	The hotspot detected during the global positioning radiometric scanner (GPRS) survey was not sampled. Therefore, risk was underestimated for ARA-12.
	Analytical results to confirm the GPRS data were not available for the baseline risk assessment. For the baseline risk assessment, the GPRS data were converted using the assumption that the elevated gamma radiation was caused by Cs-137. However, analytical results received after the publication of the Proposed Plan (DOE-ID 1999b) indicate that Ag-108m is the contaminant responsible for the elevated gamma reading. Therefore, Cs-137 risks for this site are overestimated. The risks from Ag-108m are not underestimated, however, because the maximum concentration detected in 1993 and used in the baseline risk assessment is higher than the recently detected maximum concentration.
ARA-23: Radiologically Contaminated Soils and Subsurface Structures in and Around ARA-I and ARA-II	Three aspects of the ARA-23 radionuclide source term calculations impact the results of the site risk assessment. First, the 95% UCL or maximum contaminant concentrations were assumed to exist over the nearly 170,000-m^2 site area. The true contaminant soil concentrations may be less than the 95% UCL or maximum detected concentrations over much of the site. Therefore, this assumption may result in an overestimate of the risk for the site.
	Second, the GPRS survey (see Section 4.2.1.6) indicated that an area of Cs-137 contamination was not considered during the calculation of the average Cs-137 concentration for the site. The GPRS survey was used to identify the 10-pCi/g Cs-137 isopleth for the site, and the Cs-137 samples evaluated in the baseline risk assessment were collected at this isopleth. The survey indicated high levels of contamination within this isopleth, but soil samples were not collected to verify this indication. Omission of the contamination within the isopleth probably produced an underestimation of the site average Cs-137 concentration and a corresponding underestimation of the site risk.
	Sampling at the site was performed down to a depth of only 2 ft. Contamination was detected at this depth; therefore, the conservative assumption that contamination extended all the way to a depth of 2 ft below ground surface was incorporated into the risk assessment. Because the transport mechanism operative at this site is windblown deposition, the contamination is probably concentrated in the top few inches of surface soil. Therefore, this assumption may result in an overestimate of risk for the site.

Table 4. (continued).

Site	Uncertainties and conservative Assumptions
ARA-25: Soils Beneath the ARA-626 Hot Cells	The 95% UCL or maximum contaminant concentrations were assumed to exist over the entire site. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed to a depth of 0.5 ft. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the soil/basalt interface at an estimated depth of 5 ft. This assumption may overestimate the risk.
	In the absence of quantified release data, the contaminant masses associated with the site were estimated based on estimated source term volume and detected concentrations. This approach may underestimate the risk.
ARA-02: ARA-I Sanitary Waste Leach Field and Seepage Pit	The source terms specific to the two sources associated with this site (i.e., the seepage pit and the septic tank soil) were assumed to exist over the entire surface of the two separate areas of the site. This conservative assumption probably causes an overestimation of the calculated risks at the site. However, the pipeline between the seepage pit and the septic tanks is assumed intact, which may underestimate the source term and the resultant risks.
	No attempt was made to estimate the amount of contamination that may have been released to the subsurface over the operational lifetime of the seepage pit. Only the current concentrations in the existing sludge were evaluated. Therefore, risks associated with past releases from the seepage pit are underestimated.
	For the seepage pit evaluation, data from the seepage pit sludge were combined with the soil samples outside the pit for risk assessment purposes. The combining of the data overestimates the risk for the types of contaminants found outside the tank when only the soil sample data are used.
ARA-16: ARA-I Radionuclide Tank	The 95% UCL or maximum contaminant concentrations were assumed to exist over the entire surface of the site. The site area (660 ft^2) was conservatively assumed to equal the area of the grid for the 1997 sampling. This assumption may overestimate the risks for the site.
	The contents of the tank were not considered in the risk assessment because no evidence of release from the tank was observed. This approach may underestimate the risk.

7.2 Ecological Risk Evaluation Summary

The WAG 5 ecological risk assessment (ERA) is a component of the phased approach developed for ERA at the INEEL. The results of the WAG 5 ERA will be integrated into an INEEL-wide evaluation of potential risks to ecological receptors as a component of the WAG 10 ERA. The ERA was conducted as outlined in the guidance for the INEEL (VanHorn, Hampton, and Morris 1995).

An ecological site and contaminant screening was conducted to determine which sites and contaminants would be subjected to further analysis in the WAG 5 Comprehensive RI/FS. The screening was completed and documented as part of the WAG 5 Work Plan (DOE-ID 1997a). A site-by-site evaluation of the risks to ecological resources as a result of exposure to contaminants at WAG 5 was developed in the RI/FS. The evaluation included a review of the screening completed in the Work Plan to ensure that sites or contaminants were not inappropriately omitted from further evaluation. Complete details of the WAG 5 ERA are presented in Sections 7 and 8 of the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999). The primary components of the WAG 5 ERA, discussed below, include problem formulation, analysis, risk characterization, and transition to the INEEL-wide ERA.

7.2.1.1 Problem Formulation. The goal of the problem formulation step is to investigate the interactions between the stressor characteristics (i.e., contaminant characteristics), the ecosystem potentially at risk, and the potential ecological effects (EPA 1992b). Site screening was conducted to identify the sites that could pose unacceptable risk. Of the 55 sites in WAG 5, 16 were retained for quantitative evaluation in the ERA.

Contaminant screening and data evaluation were conducted to identify contaminants of potential concern and define exposure point concentrations. For the most part, the results of the data evaluation conducted for the human health BRA (see Section 7.1) were applied to the ERA. For those contaminants that were not retained for evaluation in the human health risk assessment, additional data evaluation to support the completion of the ERA was performed. Contaminant concentrations were compared to background concentrations and ecologically based screening levels. All radioactive contaminants were eliminated on the basis of this comparison.

Site-specific data characterizing contaminant concentration in biota for the INEEL ERAs are sparse. Consequently, the definition of assessment and measurement endpoints (i.e., ecological receptors) is based primarily on pathway and exposure analyses. Pathway and exposure models for contaminated surface and subsurface media (Figures 7 and 8) were combined with a food web analysis to characterize the potential risks illustrated in the ERA conceptual site model (see Figure 6).

7.2.1.2 Analysis. In the analysis component of the ERA, the likelihood and significance of an adverse reaction from exposure to stressors were evaluated. The exposure assessment involves relating contaminant migration to exposure pathways for ecological receptors. The behavior and fate of contaminants of potential concern in the terrestrial environment were presented in a general manner because formal fate and transport modeling was not conducted for the WAG ERA (Holdren et al. 1999). The ecological effects assessment consisted of a hazard evaluation and a dose-response assessment. The hazard evaluation involved a comprehensive review of toxicity data for contaminants to identify the nature and severity of toxic properties. The dose from multiple media (surface and subsurface soil) identified at WAG 5 was developed and used to assess the potential risk to receptors. Because dose-based toxicological criteria exist for few ecological receptors, development of appropriate toxicity reference values (TRVs) was necessary for the contaminants and functional groups at the INEEL. A semi-quantitative analysis was used, augmented by qualitative information and professional judgment as necessary.

Exposures for each functional group, threatened or endangered species, and sensitive species were estimated based on site-specific life history and, when possible, feeding habits. Quantification of group and individual exposures incorporated species-specific numerical exposure factors including body weight, ingestion rate, and the fraction of diet composed of vegetation or prey and soil consumed from the affected area. Parameters used to model contaminant intakes by the functional groups were derived from a combination of parameters that produced the most conservative overall exposure for the group. Parameter values and associated information sources are discussed in further detail in the WAG 5 RI/FS (Holdren et al. 1999, Appendix I). The development of the TRVs for those contaminants targeted for remediation based on unacceptable ecological risks is described below.

7.2.1.2.1 Copper—Copper is one of the least mobile of the trace elements and tends to be uniformly distributed in the soil horizon. Copper is one of seven essential plant micronutrients. Extensively complexed by humic materials, copper is readily available to plants when the soil pH is below 6, especially in soil with low organic matter and humic material content. Plants uptake is limited in soil with large amounts of organic matter. The recommended screening benchmark concentration for phytotoxicity in soil for copper of 100 mg/kg was used as the TRV for terrestrial plants (Will and Suter 1995).

Copper is an essential element for the normal function of several critical enzymes and the use of iron in animals. Copper deficiency is, therefore, usually a greater health concern than copper excess, though severe poisoning can result from the salt form. Depressed food intake, body-weight gain, egg number and weight, and organ weights are associated with copper excess in poultry (Stevenson and Jackson 1981). A no observed adverse effect level of 24 mg/kg/day was identified and used to develop TRVs for avian functional groups.

High doses of copper have caused liver, kidney, and stomach damage and anemia in a number of mammalian species. A quantified critical exposure of 66 mg/kg/day (a no observed adverse effect level) identified from a study of effects on rats and mice was used to develop mammalian TRVs. A mammalian TRV also was derived from a chronic feeding study in mink to determine growth and survival effects (Aulerich et al. 1982).

7.2.1.2.2 Lead—Lead is a ubiquitous trace constituent in rocks, soil, plants, water, and air. Lead is neither essential nor beneficial to living organisms. For plants, the recommended screening benchmark concentration for phytotoxicity in soil for lead of 50 mg/kg was used as the TRV for terrestrial plants (Suter, Will, and Evans 1993).

In birds and animals, lead affects the kidneys, blood, bone, and the central nervous system. Ingestion of lead shot is a significant cause of mortality among waterfowl that are partially or completely protected by law. Lead toxicity varies widely with the form and dose of administered lead. Generally, organic compounds are more toxic than inorganic compounds. For avian herbivores, a TRV was estimated using a study of mallards (Dieter and Finley 1978). The results of studies of avian insectivores (Eisler 1988), European starlings (Osborn, Eney, and Bull 1983), and American kestrels (*Falco sparverius*) (Colle et al. 1980) were used to develop TRVs for avian functional groups. Studies of rats administered lead in drinking water (Kimmel et al. 1980), lead toxicity of calves (Zmudzki et al. 1983), and lead toxicity of dogs (DeMayo et al. 1982) were used to develop TRVs for mammalian receptors.

7.2.1.2.3 Mercury—Mercury exists in the environment in three oxidation states. Because speciation is a major determinant of the fate, bioavailability, absorption, and toxicological characteristics of mercury compounds, lack of knowledge of the state of the mercury in INEEL soil is a large source of uncertainty in both exposure assessment and TRV development. The organic forms of mercury are generally more toxic but are unlikely to persist in the environment. However, toxic organic mercury may

form in biotic tissues and are known to biomagnify through ecosystems (Wren 1986; Scheuhammer 1987). Therefore, TRVs were developed from studies of the toxic effects of organic mercury to ensure that the TRVs are protective. This measure is highly conservative and tends to result in an overestimate of risks for receptors lower in the food web because the majority of mercury in soil and plants (i.e., the majority of exposures to plants and soil-dwelling and herbivorous animals) is inorganic. A TRV of 0.3 mg/kg was assigned for mercury for terrestrial plants based on the toxicological benchmark (Suter, Will, and Evans 1993).

Mercury exposure affects the central nervous system in both mammals and birds. Reproductive effects from lower doses have been observed. For herbivores, the effects of organic mercury compounds on galliformes (e.g., domestic chickens, quail, and pheasants) have been investigated by several groups. However, no study was reviewed that identified a no observed adverse effect level. The lowest observed adverse effect level for relevant endpoints (i.e., reproductive success) of several similar studies was found in a study of the effects of mercury on birds (Fimreite 1979). An avian TRV was derived from this study. Two studies examined the effects of mercury exposure on the reproductive competence of male and female rats (Khera and Tabacova 1973; Khera 1973). The no observed adverse effect level identified for both sexes was 0.25 mg/kg/day.

Much less information is available about mercury toxicity to herbivores. In a study of acute toxicity in mule deer (*Odocoileus hemionus*), 17.88 mg/kg was said to be the lethal dose of 50% of the exposed organisms (Eisler 1987). A number of studies have examined the effects of chronic ingestion on carnivorous mammals, particularly cats (e.g., Albanus, et al. 1972; Charbonneau. et al. 1976; Eaton, Secord, and Hewitt 1980) and mink (e.g., Aulerich, Ringer, and Iwamoto 1974; Wobeser, Neilson, and Schiefer 1976; Wren et al. 1987; Charbonneau et al. 1976). Results from these studies were used to develop mammalian TRVs.

7.2.1.2.4 Selenium—Selenium is a critical nutrient and component of several enzymes. Often selenium is found in high concentrations in areas in which soil has been derived from Cretaceous rocks (Eisler 1985). The recommended screening benchmark concentration for phytotoxicity in soil for selenium of 1 mg/kg was used as the TRV for terrestrial plants (Will and Suter 1995).

In animals, selenium deficiency is generally a greater threat to health than selenium poisoning (Eisler 1985). Selenium deficiency has been documented in a variety of species including fish, quail, ducks, poultry, rats, dogs, domestic grazing animals, antelope, monkeys, and humans (Eisler 1985). Selenium also can reduce the toxicity of other heavy metals such as thallium, arsenic, and copper (Wilber 1980).

Selenium has been reported to cause reproductive impacts such as growth retardation and decreased fertility, especially in birds (TOXNET 1994). Malformations in chickens and waterfowl have been widely reported (EPA 1993). The effects of sodium selenite in chickens, mallards, and black-crowned night herons were evaluated in studies by Ort and Latshaw (1978), Heinz et al. (1987), and Smith et al. (1988) to derive TRVs for avian receptors.

Selenium accumulates to high concentrations in certain species of plants (Eisler 1985). Livestock species ingesting these plants have been reported to exhibit toxic symptoms. Prolonged exposure to more moderate levels of selenium also results in deleterious effects (TOXNET 1994). In a study of the effects of selenium on rats (Rosenfeld and Beath 1954), selenium did not affect reproduction. Because no effect on growth in rats has been reported (Halverson, Palmer, and Guss 1966), a reproductive endpoint was selected to develop a TRV. Selenium doses as low as 3.2 mg/kg body weight have resulted in death in sheep (Eisler 1985). A TRV was developed for mammalian herbivores using these data.

7.2.1.2.5 Thallium—Thallium is a nonvolatile heavy metal element that is not used extensively by industry and is mainly introduced into the environment as a waste product of other metals. Thallium may be bioconcentrated by living organisms (Callahan et al. 1979). Thallium adversely affects protein synthesis and inhibits a number of enzymes. Toxic to plants, thallium inhibits chlorophyll formation and seed germination. The recommended toxicological benchmark of 1 mg/kg for thallium was used as the TRV for terrestrial plants (Will and Suter 1995).

A study of the acute toxicity of thallium in game birds including quail (Shaw 1933) formed the basis for the TRV for avian functional groups. In a study of three immature golden eagles *(Aquila chrysaetos)*, the acute oral lethal dose of 50% of the exposed organisms was estimated to be between 60 and 120 mg/kg (Bean and Hudson 1976). Using the lower end of this range as the quantified critical exposure, a TRV for raptorial birds at the INEEL was derived.

Thallium is slightly more toxic to mammals than mercury. Rats exposed to thallium have shown effects on various neurological (Manzo et al. 1992) and reproductive (Formigli et al. 1986) endpoints. Because of the clear ecological relevance of reproductive impairment, a quantified critical exposure was selected from the study of thallium-induced testicular toxicity (Formigli et al. 1986).

7.2.1.3 Risk Characterization. Risk characterization is the final step of the WAG 5 ERA process. The risk evaluation determines whether risk is indicated from the contaminant concentrations and the calculated dose for the INEEL functional groups, threatened or endangered species, and species of concern and considers the uncertainty inherent in the assessment. For a WAG ERA, the risk characterization step has two components: a description of the estimation of risk and a summary of the results.

Risk is estimated by comparing the calculated dose to the TRV. If the dose from the contaminant does not exceed its TRV (i.e., if the hazard quotient [HQ] is less than 1.0 for nonradiological contaminants), adverse effects to ecological receptors from exposure to that contaminant are not expected and no further evaluation of that contaminant is required. Hence, the HQ is an indicator of potential risk. Hazard quotients are calculated using the following equation:

$$HQ = \frac{Dose}{TRV} \tag{6}$$

where

HQ	=	Hazard quotient (unitless)
Dose	=	Dose from all media (mg/kg/day or pCi/g/dy)
TRV	=	Toxicity reference value (mg/kg/day or pCi/g/day).

Hazard quotients for WAG 5 were derived for all contaminants, functional groups, threatened or endangered species, and species of concern identified in WAG 5 for each site of concern. The largest observed HQ across all functional groups within WAG 5 varies by at least three orders of magnitude. When information is not available to derive a TRV, then an HQ cannot be developed for that particular contaminant and functional group or species combination.

An HQ greater than the threshold value of 1 indicates that exposure to a given contaminant, at the concentrations and for the duration and frequencies of exposure estimated in the exposure assessment, may cause adverse health effects in exposed populations. However, the level of concern associated with

exposure may not increase linearly as the HQ values exceed the threshold value. Therefore, the HQs cannot be used to represent a probability or a percentage because an HQ of 10 does not necessarily indicate that adverse effects are 10 times more likely to occur than an HQ of 1. It is only possible to infer that the greater the HQ, the greater the concern about potential adverse effects to ecological receptors.

In general, the significance of an HQ exceeding 1 depends on the perceived "value" (i.e., ecological, social, or political) of the receptor (or species represented by that receptor), the nature of the endpoint measured, and the degree of uncertainty associated with the process as a whole. Therefore, the decision to take no further action, order corrective action, or perform additional assessment must be determined on a site-, chemical-, and species-specific basis. With the exception of threatened or endangered species (EPA 1992b), the unit of concern in ERA is usually the population as opposed to the individual. Therefore, exceeding conservative screening criteria does not necessarily mean that significant adverse effects to populations of receptors are likely.

Eight sites with HQs in excess of 1 were identified in the WAG 5 ERA. As shown in Table 5, an additional screening was performed in which contaminants were eliminated from further evaluation for either of two reasons: (1) the exposure point concentration did not exceed 10 times the background concentration, or (2) the HQ was less than 10. The INEEL-wide ecological risk assessment to be conducted in the WAG 10 comprehensive investigation will consider those WAG 5 sites eliminated in the additional screening: PBF-10, PBF-21, PBF-22, and PBF-26. Information from the INEEL-wide evaluation will be considered in the 5-year reviews for WAG 5. If indicated, additional remediation to protect ecological receptors from contamination at these sites will be considered.

Four sites, ARA-01, ARA-12, ARA-25, and PBF-16, were retained for evaluation of remedial alternatives in the Comprehensive Feasibility Study (Holdren et al. 1999) to address ecological HQs in excess of 10. Because these sites are small, it is less expensive to remediate than it is to characterize further. Three of these sites, ARA-01, ARA-12, and ARA-25, also exceed human health risk thresholds.

Principal sources of uncertainty apply to the use of data not specifically collected for ERA and in the development of the exposure assessment. Uncertainties inherent in the exposure assessment are associated with estimation of receptor ingestion rates, selection of acceptable HQs, estimation of site usage, and estimation of risk assessment parameters (e.g., plant uptake factors and bioaccumulation factors). Additional uncertainties are associated with the depiction of site characteristics, the determination of the nature and extent of contamination, and the derivation of TRVs. A large area of uncertainty is the inability to evaluate risk to many receptors because of the lack of appropriate toxicity data for many chemicals. This is especially a problem for certain receptors such as reptiles. In addition, because of the conservative nature of assumptions made to compensate for the lack of site-specific uptake and bioaccumulation factors, ecologically based screening levels for some chemicals are lower than their sample quantitation and detection limits. In the WAG 5 analysis, this occurs for metals, PCBs, and some other organics. All of these uncertainties likely influence risk estimates. The major sources and effects of uncertainties in the ERA are reviewed in Table 6.

7.2.1.4 Transition to the INEEL-wide Ecological Risk Assessment The third phase of the ERA process is the WAG 10 (OU 10—04) EPA, which will integrate WAG ERAs to evaluate risk to INEEL-wide ecological resources. This assessment will evaluate effects resulting from past contamination and their potential for adversely impacting INEEL-wide ecological resources including residual impacts from completed interim or remedial actions.

Table 5. Results of WAG 5 ecological contaminant screening against 10 times background concentrations and concentrations equivalent to hazard quotient of 10.

Site	Contaminant	Maximum Concentration (mg/kg)	95% UCL (mg/kg)	10x INEEL Background (mg/kg)	Maximum Hazard Quotient	Comment	WAG 5 Remediation?
ARA-01	Antimony	1.68E+01	—	4.80E+01	1.00E+01	Below 10 x background	no
	Arsenic	2.58E+01	—	5.80E+01	2.00E+01	Below 10 x background	no
	Cadmium	3.80E+00	—	2.20E+01	1.00E+03	Below 10 x background	no
	Copper	2.55E+01	—	2.20E+02	1.00E+01	Below 10 x background	no
	Lead	4.39E+01	—	1.70E+02	6.00E+01	Below 10 x background	no
	Selenium	**2.77E+01**	**—**	**2.20E+00**	**3.00E+02**	**—**	**YES**
	Thallium	**5.92E+01**	**3.70E+01**	**4.30E+00**	**3.00E+02**	**—**	**YES**
	Vanadium	6.80E+01	—	4.50E+02	2.00E+02	Below 10 x background	no
	Zinc	2.33E+02	—	1.50E+03	2.00E+01	Below 10 x background	no
ARA-12	Cadmium	6.52E+00	—	2.20E+01	2.48E+03	Below 10 x background	no
	Chromium(III)	4.69E+02	—	3.30E+02	9.31E+00	HQ < 10	no
	Copper	**6.23E+02**	**—**	**2.20E+02**	**3.00E+02**	**—**	**YES**
	Lead	1.58E+02	—	1.70E+02	3.38E+02	Below 10 x background	no
	Manganese	5.70E+02	—	4.90E+03	3.90E+01	Below 10 x background	no
	Mercury	**1.40E+00**	**—**	**5.00E-01**	**9.00E+01**	**—**	**YES**
	Selenium	**2.70E+00**	**—**	**2.20E+00**	**3.00E+01**	**—**	**YES**
	Zinc	3.76E+02	—	1.50E+03	5.29E+01	Below 10 x background	no
ARA-25	Arsenic	2.58E+01	—	5.8E+01	2.00E+01	Below 10 x background	no
	Cobalt	1.04E+02	—	1.10E+02	9.00E+01	Below 10 x background	no
	Copper	**2.27E+02**	**—**	**2.20E+02**	**4.00E+01**	**—**	**YES**
	Lead	**1.43E+03**	**—**	**1.70E+02**	**9.00E+02**	**—**	**YES**
	Manganese	1.40E+03	—	4.90E+03	6.00E+00	Below 10 x background	no
	Mercury	9.70E-02	—	5.00E-01	3.00E+00	Below 10 x background	no
	Nickel	3.88E+01	—	3.50E+02	6.00E+00	HQ < 10	no
	Selenium	6.59E-01	—	2.20E+00	3.00E+00	HQ < 10	no
	Silver	7.24E+00	—	NA	2.00E+00	HQ < 10	no
	Vanadium	1.04E+02	—	4.50E+02	1.00E+02	Below 10 x background	no
	Zinc	8.55E+02	—	1.50E+03	3.00E+01	Below 10 x background	no
PBF-10[a]	Chromium(III)	3.09E+02	—	3.30E+02	1.00E+01	Below 10 x background	no
PBF-16	Lead	3.21E+01	—	1.70E+02	6.00E+01	Below 10 x background	no
	Mercury	**7.10E-01**	**—**	**5.00E-01**	**5.00E+01**	**—**	**YES**
PBF-21[a]	Cobalt	1.26E+01	—	1.10E+02	6.00E+00	Below 10 x background	no
	Copper	2.33E+01	—	2.20E+02	2.00E+00	Below 10 x background	no
PBF-22[a]	Arsenic	1.22E+01	—	5.80E+01	8.33E+00	Below 10 x background	no
	Copper	4.84E+01	—	2.20E+02	2.06E+01	Below 10 x background	no
	Lead	6.84E+01	—	1.70E+02	4.40E+01	Below 10 x background	no
	Mercury	2.70E-01	—	5.00E-01	1.82E+01	Below 10 x background	no
	Nickel	4.10E+01	—	3.50E+02	1.37+01	Below 10 x background	no
	Selenium	1.70E+00	—	2.20E+00	1.88E+01	Below 10 x background	no
PBF-26[a]	Arsenic	7.90E+00	—	5.80E+01	7.90E+00	Below 10 x background	no
	Chromium(III)	6.40E+01	—	3.30E+02	1.95E+00	Below 10 x background	no

Table 5. (continued).

Site	Contaminant	Maximum Concentration (mg/kg)	95% UCL (mg/kg)	10x INEEL Background (mg/kg)	Maximum Hazard Quotient	Comment	WAG 5 Remediation?
	Copper	2.34E+02	1.10E+02	2.20E+02	9.98E+01	95% UCL below 10 x background	no
	Lead	4.30E+01	—	1.70E+02	9.79E+01	Below 10 x background	no
	Mercury	3.40E-01	—	5.00E-01	2.30E+01	Below 10 x background	no
	Nickel	4.50E+01	—	3.50E+02	1.50E+01	Below 10 x background	no
	Zinc	2.59E+02	—	1.50E+03	3.65E+01	Below 10 x background	no

a. Sites PBF-10, PBF-21, PBF-22, and PBF-26 will be evaluated in the INEEL-wide ecological risk assessment.

Table 6. Source and effects of uncertainties in the ecological risk assessment.

Uncertainty Factor	Effect of Uncertainty (level of magnitude)	Comments
Ingestion rates (soil, water, and food)	May overestimate or underestimate risk (moderate).	Ingestion estimate used for terrestrial receptors are based on data in the scientific literature. Food ingestion rates are calculated by using allometric equations available in the literature (Nagy 1987). Soil ingestion values are generally taken from Beyer, Connor, and Gerould (1994).
Acceptable hazard quotients	May overestimate or underestimate risk (high).	The magnitude of the hazard quotient indicates the level of concern for a functional group or species based on perceived importance.
Concentration factors and plant uptake factors	May overestimate or underestimate risk, and the magnitude of error cannot be quantified (high).	Few bioaccumulation factors or plant uptake factors are available in the literature because they must be both contaminant- and receptor-specific. In the absence of more specific information, values for these parameters are obtained from Baes et al. (1984) for metals and elements, and from Travis and Arms (1988) for organics.
Toxicity reference values (TRVs)	May overestimate (high) or underestimate (moderate) risk.	To compensate for potential uncertainties, the assessment, various adjustment factors are incorporated to extrapolate toxicity from the test organism to other species.
Conservative TRVs may be below background concentrations	May overestimate (high) risk.	Because of compensation for potential uncertainties, the calculation of TRVs (see above comment) may result in risk being shown at INEEL background concentrations and give an erroneous indication of risk to certain receptors.
Lack of appropriate toxicity data to derive TRVs	Results in the inability to evaluate risk for many receptors and chemicals.	Those receptor groups and chemicals that could not be evaluated are data gaps in the assessment.
Use of functional grouping	May overestimate (moderate) risk.	Functional groups were designed as an assessment tool to ensure that the ERA address all species potentially present at a facility. A hypothetical species is developed using input values that represent the greatest exposure of the combined functional group members.
Site use factor	May overestimate (high) or underestimate (low) risk.	The site use factor is a percentage of the site of concern area compared to the home range of the receptor species. When the home range is not known for a species, a default value of 1.0 is used. This can result in an overestimate of the risk at small sites.

The INEEL-wide ecological risk assessment to be conducted in the WAG 10 comprehensive investigation will consider those WAG 5 sites eliminated in the additional screening: PBF-10, PBF-21, PBF-22, and PBF-26 (see Table 5). Further evaluation of these sites was deferred to WAG 10 for either of two reasons: (1) the exposure point concentrations do not exceed 10 times the background concentrations, or (2) the HQs are less than 10. The INEEL-wide ERA will be conducted as a component of the comprehensive RI/FS for OU 10-04. The WAG 10 comprehensive investigation will be referenced during the 5-year review process for WAG 5 to determine whether the decisions implemented by WAG 5 are still protective of the environment. Future remediation may be necessary if the WAG 10 INEEL-wide assessment indicates that a cumulative ecological risk is exceeded for a population of receptors or if land use changes.

7.3 Risk Assessment Summary

Unexpectedly high risks were estimated in the WAG 5 baseline risk assessment for Ra-226 at several sites. Further investigation revealed that reported Ra-226 concentrations were artificially high. In most cases, gamma-ray spectroscopy was the analytical method used to quantify Ra-226 concentrations. However, this method does not provide sufficient resolution to discriminate Ra-226 from U-235, a naturally occurring radioisotope. Therefore, a correction factor was developed (Giles 1998b). For those sites at which the corrected Ra-226 concentrations were at or below background values, Ra-226 was eliminated as a contaminant of potential concern in soil after the baseline risks were estimated (Holdren et al. 1999). The sites that were affected by the correction factor were ARA-01, ARA-02 (in soil around the septic tanks, but not in the seepage pit sludge), ARA-16, and ARA-23. The appropriate background values for Ra-226 are 1.2 pCi/g for analytical methods that avoid U-235 interference and 2.1 pCi/g for results that include interference from U-235 (Giles 1998a).

Risk estimates for the future residential scenario and ecological risks were used to identify sites for remediation. After the modifications to the baseline risk assessment for Ra-226, seven sites were identified for evaluation of remedial alternatives in the feasibility study: ARA-02 Sanitary Waste System (the seepage pit sludge is the primary remediation target), ARA-16, and ARA-23 for human health risks; PBF-16 for ecological risks; and ARA-01, ARA-12, and ARA-25 for both human health and ecological risks. At five of these sites, ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16, soil is the only medium that will be remediated. At ARA-02 and ARA-16, residual waste and subsurface structures also will be removed. Table 7 summarizes the risk assessment for these seven sites, which are described below:

Table 7. Individual sites and contaminants of concern addressed by the selected remedy for WAG 5.

Site	Contaminants of Concern	Exposure Pathway	Risk	Hazard Quotient
Future Residential Exposure Scenario				
ARA-01 (soil)	Arsenic	Dermal absorption from soil	2E-04 (2 in 10,000)	1
ARA-02 (seepage pit sludge)	Lead	Ingestion of soil	NA[a]	NA[a]
	Aroclor-1242	Dermal absorption from soil and ingestion of soil	1E-05[b]	NA[c]
	Ra-226	External radiation exposure	2E-03 (2 in 1,000)	NA
	Cs-137	External radiation exposure	7E-05[b] (7 in 100,000)	NA
	U-235	External radiation exposure	9E-05[b](9 in 100,000)	NA
	U-238	External radiation exposure	3E-05[b] (3 in 100,000)	NA
ARA-12 (soil)	Ag-108m	External radiation exposure	2E-03 (2 in 1,000)	NA
	Cs-137	External radiation exposure	2E-04 (2 in 10,000)	NA

Table 7. (continued)

Site	Contaminant of Concern	Exposure Pathway	Risk	Hazard Quotient
ARA-16 (soil)	Cs-137	External radiation exposure	1E-04 (1 in 10,000)	NA
ARA-23 (soil)	Cs-137	External radiation exposure	3E-04 (5 in 10,000)	NA
ARA-25 (soil)	Arsenic	Dermal absorption from soil	3E-04 (3 in 10,000)	2
	Arsenic	Ingestion of soil	9E-05[d] (9 in 100,000)	1
	Lead	Ingestion of soil	NA[a]	NA[a]
	Cs-137	External radiation exposure	2E-03 (2 in 1,000)	NA
	Ra-226	External radiation exposure	5E-03 (5 in 1,000)	NA
	Ra-226	Ingestion of soil	1E-05[d] (1 in 100,000)	NA
Current Occupational Exposure Scenario				
ARA-12 (soil)	Ag-108m	External radiation exposure	1E-03 (1 in 1,000)	NA
ARA-16 (soil)	Co-60	External radiation exposure	5E-04 (2 in 10,000)	NA
	Cs-137	External radiation exposure	3E-04 (3 in 10,000)	NA
ARA-25 (soil)	Arsenic	Dermal absorption from soil	1E-04 (1 in 10,000)	1
	Cs-137	External radiation exposure	4E-03 (4 in 1,000)	NA
	Ra-226	External radiation exposure	1E-03 (1 in 1,000)	NA
Future Occupation Exposure Scenario				
ARA-12 (soil)	Ag-108m	External radiation exposure	6E-04 (6 in 10,000)	NA
ARA-25 (soil)	Arsenic	Dermal absorption from soil	1E-04 (1 in 10,000)	1
	Cs-137	External radiation exposure	4E-04 (4 in 10,000)	NA
	Ra-226	External radiation exposure	1E-03 (1 in 1,000)	NA
Ecological Exposure Scenario				
ARA-01 (soil)	Selenium	Ecological exposure	NA	# 1 to # 300
	Thallium	Ecological exposure	NA	# 1 to # 300
ARA-12 (soil)	Copper	Ecological exposure	NA	# 1 to # 300
	Mercury	Ecological exposure	NA	# 1 to # 90
	Selenium	Ecological exposure	NA	# 1 to # 30
ARA-25 (soil)	Copper	Ecological exposure	NA	#1 to # 40
	Lead	Ecological exposure	NA	# 1 to # 900
PBF-16 (soil)	Mercury	Ecological exposure	NA	# 1 to # 50

a. Risk and hazard quotients could not be estimated for lead because human health toxicity data are not available. However, concentrations in excess of the EPA screening level of 400 mg/kg (EPA 1994b) will be remediated.

b. The cumulative risk for Aroclor-1242, Cs-137, U-235, and U-238 in the seepage pit is greater than 1E-04. Therefore, these constituents were identified as contaminants of concern.

c. Remedial decisions cannot be based on a hazard quotient for Aroclor-1242, a polychlorinated biphenyl, because EPA-approved reference doses are not available. However, Aroclor-1242 will be remediated in conjunction with the cleanup of the seepage pit sludge.

d. The cumulative risk for arsenic and Ra-226 in the ingestion of soil pathway for ARA-25 equals 1E-04. Therefore, arsenic was identified as a contaminant of concern for the soil ingestion pathway. Radium-226 is a contaminant of concern for both the external exposure and soil ingestion pathways.

- Contaminated soil sites: ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16

  – Site ARA-01 (ARA-I Chemical Evaporation Pond) will be remediated to address human health risk from arsenic and potential risks to ecological receptors from exposure to selenium and thallium in soil.

  – Site ARA-12 (ARA-III Leach Pond) will be remediated to address human health risks from Ag-108m and Cs- 137 and ecological risks from copper, mercury, and selenium in surface and subsurface soil. The area of elevated gamma activity to the southwest of the site also will be remediated.

  – Site ARA-23 (ARA-I and ARA-II Radiologically Contaminated Soil) will be remediated to address the human health risks from Cs-137. The site includes the radiologically contaminated soil around ARA-I and ARA-II and the remaining reactor foundation and the remaining underground utilities within the facility fences.

  – Site ARA-25 (ARA-I Contaminated Soil Beneath the ARA-626 Hot Cells) will be remediated to address human health risks from Ra-226, Cs- 137, and arsenic and to address ecological risks from copper and lead.

  – Site PBF-16 (SPERT-II Leach Pond) will be remediated to address the ecological risks from mercury in surface soil.

- Site ARA-02 (ARA-I Sanitary Waste System) will be remediated to address the human health risks from the contaminants of concern (COCs) Aroclor-1242, Ra-226, Cs-137, U-235, and U-238 in the seepage pit sludge. The analytical results for the soil around the system (i.e., outside of the seepage pit and around the septic tanks) indicate that soil concentrations are below risk-based concentrations.

- Site ARA-16 (ARA-I Radionuclide Tank) will.be remediated to address the human health risks from Cs-137 in the soil surrounding the tank. Because the ARA-16 tank is still in place and contains principal threat waste that could pose a risk should a release to the environment occur, the waste in the tank, the tank itself, and the associated piping also will be removed.

In addition to the contaminants with quantified risks in Table 7, PCBs and lead in the ARA-02 seepage pit sludge and lead in the ARA-25 soil also will be remediated. Human health risks associated with these contaminants were not quantifiable because approved reference doses are not available. Calculations using preliminary reference doses for PCBs at ARA-02 indicate that the noncarcinogenic hazard indices for dermal absorption and soil ingestion exceed 1. Though toxicity data are not available for lead, the concentrations detected at ARA-02 and ARA-25 exceed the EPA 400 mg/kg screening level (EPA 1994b).

The GWSCREEN results indicated that WAG 5 does not contain sources of contamination that have the potential to produce risk greater than 1E-04 or an HQ greater than 1 for groundwater exposure pathways (e.g., groundwater ingestion) (Holdren et al. 1999, Section 4.3). In addition, residential scenario cumulative risk estimates and hazard indices were less than IE-04 and 1, respectively, for the combined sources within WAG 5 for the air and groundwater exposure pathways.

8. CONTAMINATED SOIL SITES ARA-01, ARA-12, ARA-23, ARA-25, AND PBF-16

Remedial action is required for five contaminated soil sites: the ARA-I Chemical Evaporation Pond (ARA-01), the ARA-III Radioactive Waste Leach Pond (ARA-12), ARA-I and ARA-II Radiologically Contaminated Soils (ARA-23), ARA-I Soils Beneath the ARA-626 Hot Cells (ARA-25), and the SPERT-II Leach Pond (PBF-16). Though risks for the five contaminated soil sites were analyzed individually, they were considered collectively for the analysis of remedial alternatives. Therefore, Sections 8.1 through 8.5 each address a single site, including a summary of the site investigations, nature and extent of contamination, and baseline risk estimates. Subsequent sections present the analysis of alternatives for the entire group. Remedial action objectives, remedial alternatives, and the selected remedy are presented. More detailed information about the contaminated soil sites can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

8.1 Site ARA-01: ARA-I Chemical Evaporation Pond

The ARA-01 Chemical Evaporation Pond will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below. More detailed information about the evaporation pond can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

The ARA-01 site is a shallow, unlined surface impoundment, roughly 30 x 90 m (100 x 300 ft) in size, that was used to dispose of laboratory wastewater from the ARA-I Shop and Maintenance Building (ARA-627), Located southeast of ARA-I, the pond was constructed in 1970 by excavating soil to create a shallow topographic depression. Basalt outcrops are present within and immediately adjacent to the pond. The subsurface immediately beneath the pond consists of fracture and rubble zones. No interbed was found within the first 36 m (118 ft).

From 1970 to 1988, the pond received process discharges that contained small quantities of radioactive substances, acids, bases, and volatile organic compounds. Since 1988, the pond has been dry except during spring runoff and heavy precipitation. Aerial photographs of ARA-01 before and after the D&D of the ARA-I facility are shown in Figure 10.

8.1.1 Site Investigations

The ARA-01 Chemical Evaporation Pond was identified as an RI/FS site in the FFA/CO (DOE-ID) 1991). The ARA-01 RI/FS (Stanisich et al. 1992) considered data from 1982 sampling and from additional samples collected in 1990 to provide data for the ARA-01 BRA. To determine local background concentrations for metals, 10 additional samples were collected south of the pond in an area unaffected by ARA activities. The combined data from the samples collected from the pond included concentrations of volatile organic compounds, arsenic, chromium(III), chromium(VI), cadmium, beryllium, Cs-134, Cs- 137, Co-60, Pu-239, and U-234 in excess of background values (Stanisich et al. 1992). The samples with the highest contaminant concentrations were collected adjacent to the pond inlet.

The ARA-01 BRA (Stanisich et al. 1992) indicated that risks associated with surface exposure pathways were all below levels of concern. However, data were not adequate to analyze the risks associated with the groundwater exposure pathways. Therefore, the ARA-01 ROD (DOE-ID 1992a) documented the conclusion that remedial action is not necessary to protect human health and the environment from surface pathway exposures, and stipulated that additional evaluation of subsurface

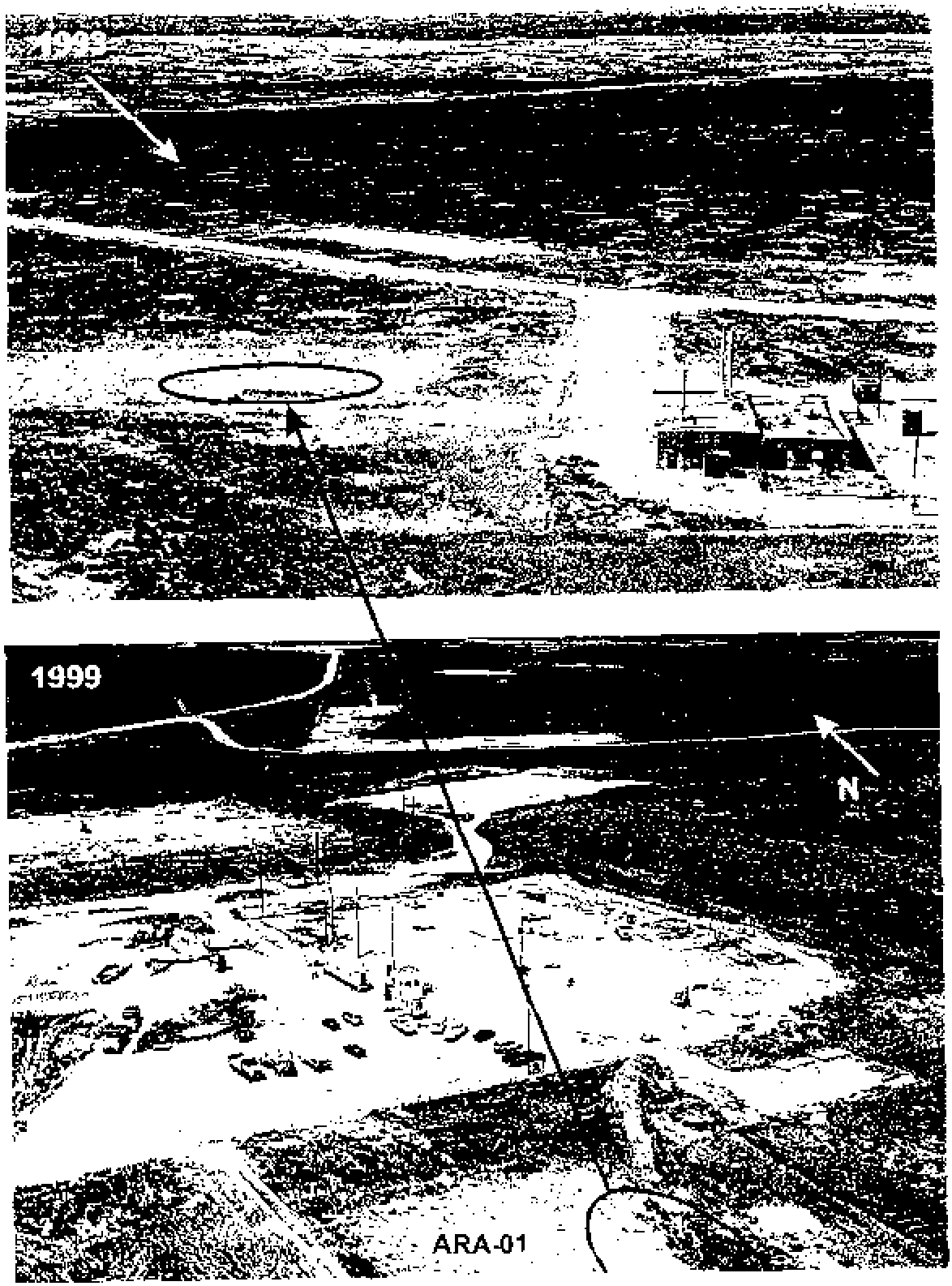


Figure 10. Aerial photographs of Site ARA-01 before and after the decontamination and dismantlement of the ARA-1 facility.

conditions and the groundwater pathway would be conducted in a future investigation (e.g., the WAG 5 Comprehensive RI/FS).

Consequently, a data need was identified in the WAG 5 Work Plan (DOE-ID 1997a) to determine the vertical extent of contamination. To meet this data need, two boreholes were drilled. Biased locations were selected for the boreholes (i.e., the location of the highest previously detected Cs-137 concentration and in the area of the pond with the lowest elevation) to maximize the likelihood of detecting the highest contaminant concentrations present in the pond. The boreholes were drilled to depths of 28.7 m (94 ft) and 36 m (118 ft) without encountering an interbed. At 36 m (118 ft), the drill string and bit became stuck in the second borehole and only part of the drill string, the top 10.7 m (35 ft), was recovered. Therefore, no subsurface samples were obtained from either borehole (Wilson-Lopez 1997). However, in situ gamma and beta surveys were completed. The gamma measurements were collected from the surface to the bottom of each borehole. An average Cs-137 concentration of 0.38 ±0.03 pCi/g to a depth of 0.9 m (3 ft) below ground surface was detected, with no gamma concentrations detected below 0.9 m (3 ft). No other gamma-emitting radionuclides were detected. The in situ beta measurements were collected starting at a depth of 1.2 m (4 ft) from the surface (i.e., below the well casing) and continuing to the bottom of each borehole. No beta emitters (e.g., Sr-90) were detected above background concentrations in either borehole (Giles 1997).

A second task identified in the Work Plan (DOE-ID 1997a) was to collect samples for analysis of alpha emitters (e.g., Pu-239 and U-234) and Sr-90. A grid was established over the site on 3-m (10-ft) centers. Nineteen locations were selected at random from the grid, and samples were collected from two depths per location for a total of 38 samples. The complete data sets for the samples collected in 1997 are given in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999, Appendix E).

8.1.2 Nature and Extent of Contamination

The location of ARA-01 relative to ARA-I, soil profiles for the COCs, and the source volume used in the risk assessment are illustrated in Figure 11. The figure shows the contaminant concentrations at depths below the surface. Surface sediments are shallow at ARA-01, with a maximum thickness of 1 m (3.5 ft) and an average thickness of 0.5 (1.5 ft). A constant surface soil thickness of 0.6 m (2 ft) was used in the risk assessment. Vertically, the contamination is limited to the surficial sediments, as evidenced by the results of the borehole logging and the analysis of surface soil samples. Laterally, the contamination is contained within the bounds of the pond. The maximum detected arsenic concentration is 25.8 mg/kg compared to a background value of 5.8 mg/kg. For selenium, the maximum detected and background concentrations are 27.7 mg/kg and 0.22 mg/kg, respectively. Thallium was detected at a maximum concentration of 59.2 mg/kg, and the INEEL background value is 0.43 mg/kg. Background values for all three contaminants were taken from Rood, Harris, and White (1996).

8.1.3 Summary of Site Risks

The 1997 samples yielded concentrations of Am-241, Cs-137, Sr-90, U-235, Pu-238, Pu-239/240, Ra-226, arsenic, lead, and thallium in excess of contaminant screening levels for human health, and concentrations of antimony, arsenic, cadmium, chromium, copper, lead, selenium, silver, thallium, vanadium, and zinc above screening levels for the ecological risk assessment. The results of the human health and ecological risk assessments are given below.

8.1.3.1 Human Health Risk Assessment Summary. Arsenic is identified as a COC based on human health risk estimates. A summary of the information about the human health COC in soil at ARA-01 is given in Table 8.

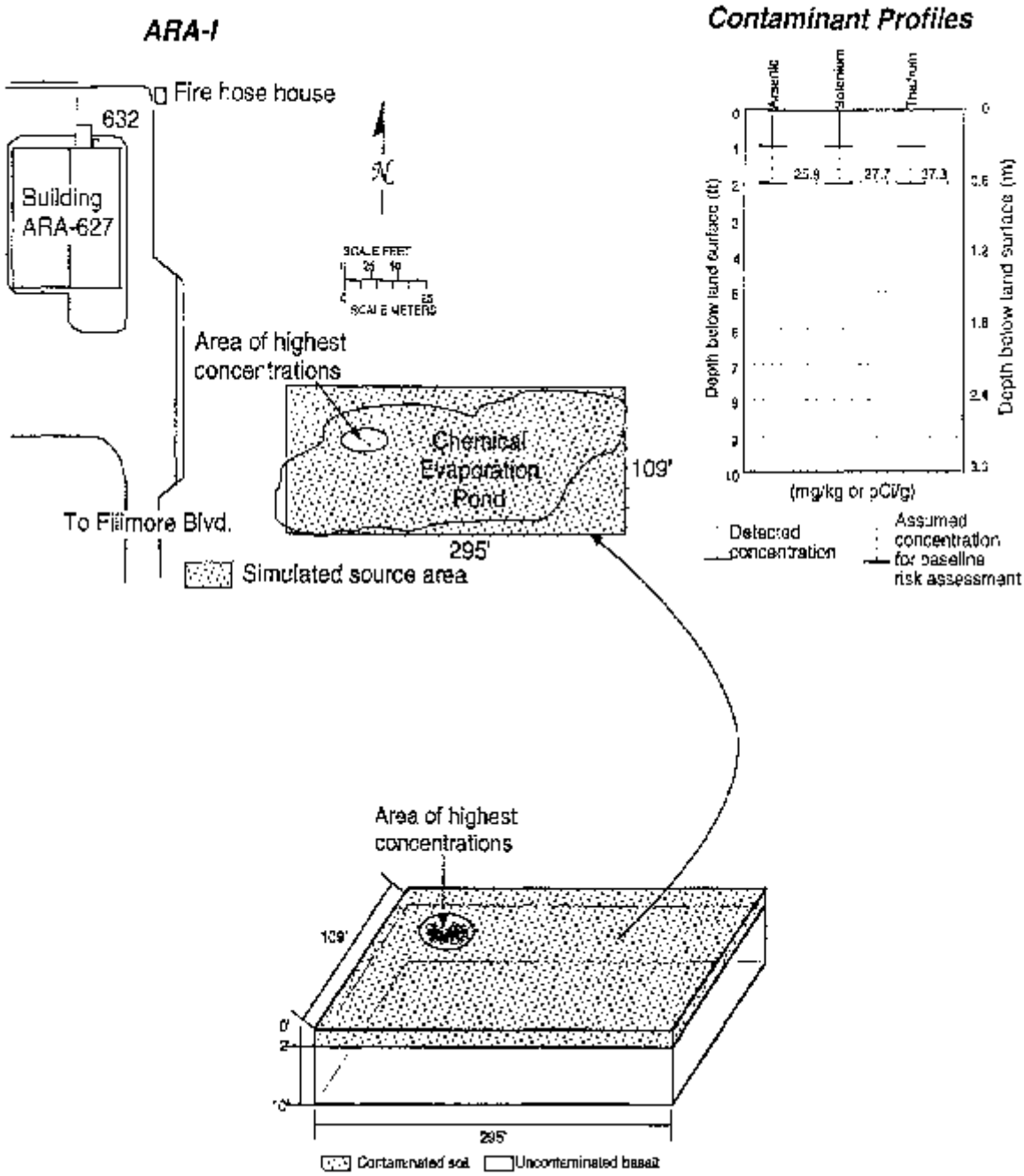


Figure 11. Site ARA-01, ARA-I Chemical Evaporation Pond.

Table 8. Soil concentrations for the contaminant of concern at ARA-01.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure
Arsenic	11	25.8	7/35	5.8[a]	22.1	UCL[b]

a. The background value for composited samples is from Rood, Harris, and White (1996).

b. The UCL is the 95% upper confidence limit on the mean soil concentration.

The total risk for all pathways for the current occupational scenario is 1E-04 (1 in 10,000), primarily from exposure to arsenic. The noncarcinogenic hazard index for the current occupational scenario is less than 1.0.

The total estimated risk for all pathways for the 100-year future residential scenario is 2E-04 (2 in 10,000) from arsenic. The noncarcinogenic hazard index of 1.0 for the future residential scenario is from arsenic.

The total estimated risk for all pathways for the 100-year future occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the future occupational scenario is less than 1.0.

8.1.3.2 Ecological Risk Assessment Summary. Selenium and thallium were identified as COCs for ARA-01 based on HQs for ecological receptors. A summary of the information about the ecological COCs in soil at ARA-01 is given in Table 9.

The HQs for exposure to selenium in surface soil at ARA-01 range from 2 for avian insectivores (AV210) and avian omnivores (AV422) to 300 for mammalian insectivores (M222). Mammalian herbivores (including the pygmy rabbit) also have HQs exceeding 1.0.

The HQs for exposure to thallium in surface and subsurface soil range from 2 for avian omnivores (AV422) to a maximum of 300 for mammalian insectivores (M222). The bat species and pygmy rabbit, both classified by the State of Idaho as species of special concern, also are potentially at risk from exposure to thallium in soil at this site.

Table 9. Soil concentrations for the contaminant of concern at ARA-01.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)[a]	Exposure Point Concentration (mg/kg)	Statistical Measure[b]
Selenium	14.8	27.7	7/35	0.22	27.7	Maximum
Thallium	13.5	59.2	21/35	0.43	37.3	UCL

a. The background value for composited samples is from Rood, Harris, and White (1996).

b. The UCL is the 95% upper confidence limit on the mean soil concentration. When the number of samples was too small for statistical analysis, the maximum detected concentration was used for the exposure point concentration.

8.2 Site ARA-12: ARA-III Radioactive Waste Leach Pond

Remedial action is required for the ARA-12 Radioactive Waste Leach Pond to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below. More detailed information about the pond can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

The ARA-12 site is an unlined surface impoundment with approximate dimensions of 115 x 50 m (370 x 150 ft). The pond was constructed in a natural depression west of ARA-III to dispose of low-level liquid waste from reactor research operations. Liquid waste was stored temporarily in tanks, then transferred to the leach pond via an underground pipe. Effluent contained low-level radioactive material. A second, separate discharge line originated in an uncontaminated water storage tank. The pond also received facility runoff through a culvert. The ARA-III facility was an active reactor research facility from about 1959 to 1965. From 1966 to 1987, activities at ARA-III were limited to component and instrumentation testing, instrumentation development and fabrication, and chemical research. Waste associated with these activities was not disposed of in the leach pond, and the only discharges to the pond during this period were from the water storage tank and facility runoff. The facility was shut down in 1987, leaving the pond dry except during spring runoff and heavy precipitation. In 1991, the culvert was plugged in preparation for D&D operations at ARA-III, and in 1993, the tanks and waste lines to the leach pond were removed. Aerial photographs of Site ARA-12 before and after the D&D of the ARA-III facility are shown in Figure 12.

8.2.1 Site Investigations

A Track 2 evaluation was initiated in 1993 and completed in 1994 (Pickett et al. 1994). Radiological and topographical surveys were performed, and soil samples were collected and analyzed. The outer dimensions of the pond were estimated at 115 x 50 m (377 x 164 ft). A smaller area of approximately 21 x 61 m (69 x 200 ft), which received the majority of the wastewater, still contained remnants of enhanced vegetation. The 1993 data were combined with historical information to evaluate nonintrusive (i.e., the construction of a basement is not considered) 100-year future residential and current occupational exposure scenarios defined in the Track 2 guidance (DOE-ID 1994). Future residential intrusive and future occupational scenarios were not assessed. The evaluated contaminants included Ag-108m, Cs-137, U-235, Am-241, Co-60, Pu-238, U-234, chromium, cadmium, lead, and Aroclor-1254. A total risk of 2E-03 (2 in 1,000), primarily from direct exposure to Ag-108m, Cs-137, and U-238, was estimated for the 100-year future residential nonintrusion scenario.

The ARA-12 surface soil was surveyed in 1997 with the global positioning radiometric scanner (GPRS). Elevated gamma levels were detected within ARA-12 and an area just west of the site boundary. Because the area is debris-filled and nearly inaccessible to the GPRS, a germanium spectrometer (Ge-spectrometer) was deployed to determine the extent of the contamination. The data from the GPRS were analyzed by incorporating the assumption that Cs-137 was the source of elevated gamma levels. Based on this assumption, concentrations greater than 45 pCi/g were indicated. However, subsequent analytical results from soil samples collected in these areas indicated that Ag-108m is the source of the elevated gamma levels (Giles 1999b).

8.2.2 Nature and Extent of Contamination

The location of ARA-12 relative to ARA-III, soil profiles for the COCs, and the source volume used in the risk assessment are illustrated in Figure 13. Contaminant concentrations were detected throughout most of the soil profile to a depth of 5 to 7 ft. The highest surface soil gamma levels detected

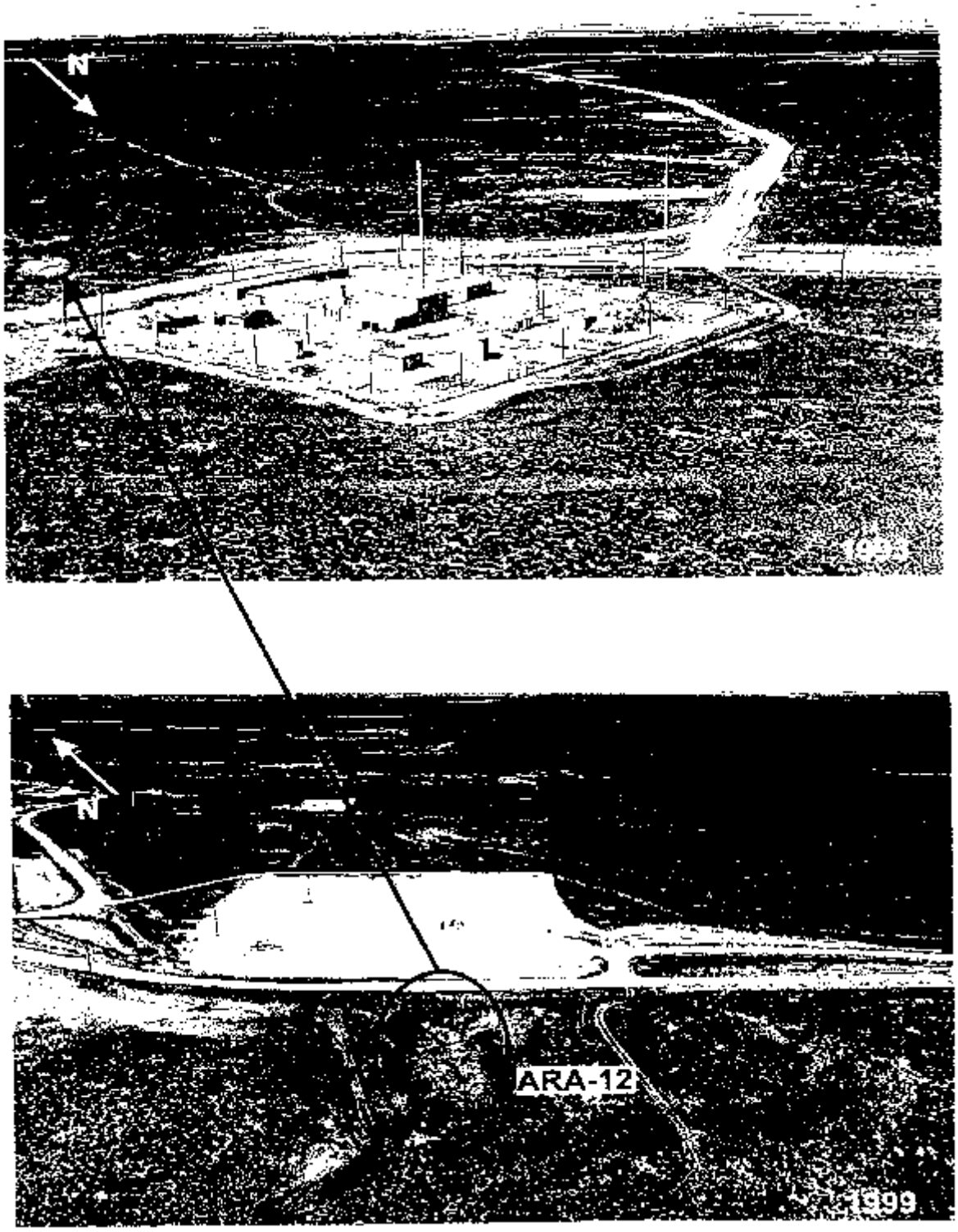


Figure 12. Aerial photographs of Site ARA-12 before and after the decontamination and dismantlement of the ARA-III facility.

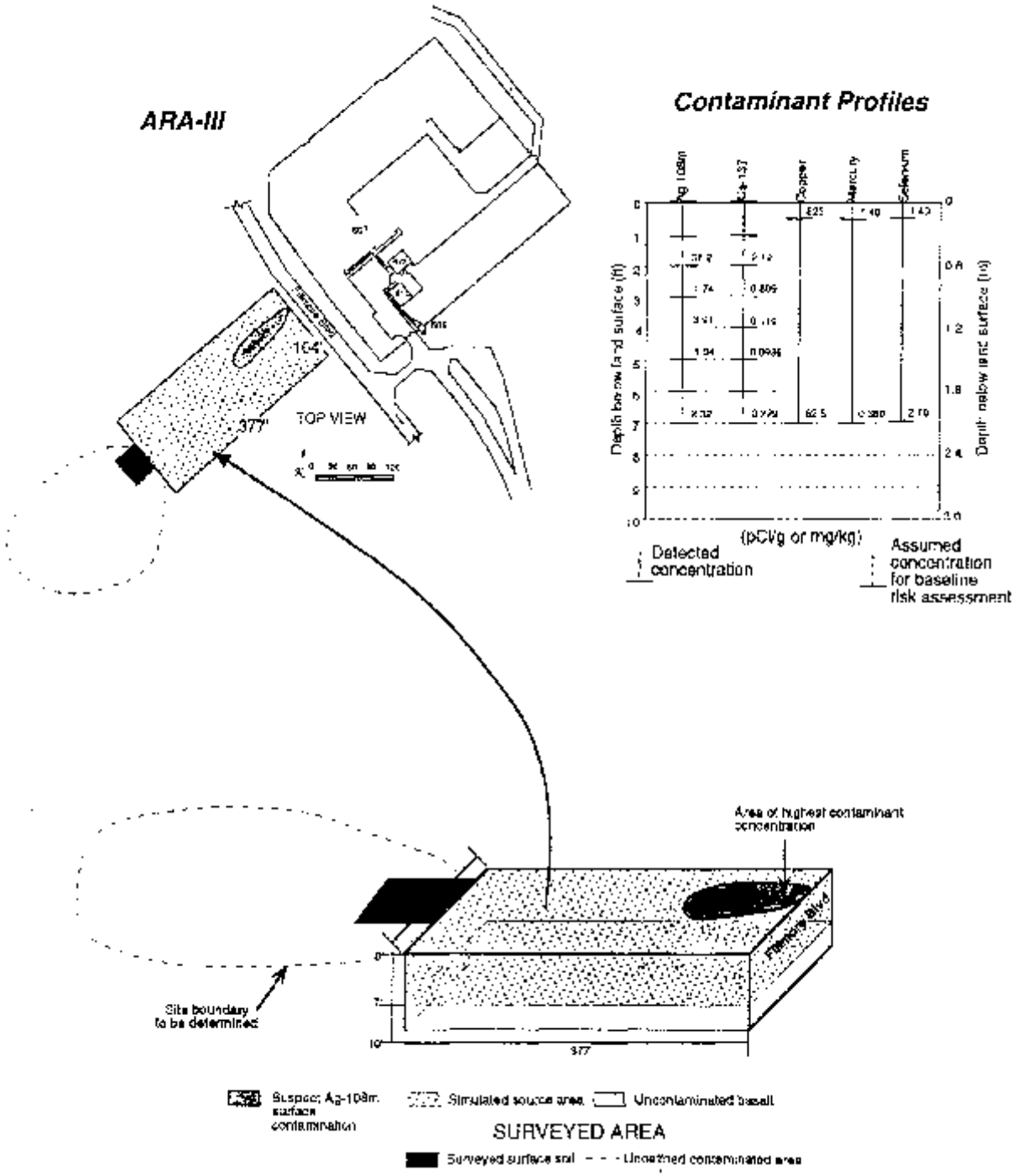


Figure 13. Site ARA-12 ARA-III Radioactive Waste Leach Pond.

with the GPRS are outside of the pond boundary at the southwest corner. This area will be remediated as a part of ARA-12.

The maximum detected concentration of Ag-108m is 67.2 pCi/g. Because Ag-108m is not naturally occurring, any detected concentration is above an assumed background value of zero. The maximum copper concentration at ARA-12 is 623 mg/kg in surface soil compared to the INEEL background concentration of 22 mg/kg (Rood, Harris, and White 1996). Mercury was detected at 1.40 mg/kg in surface soil at ARA-12, which is two orders of magnitude higher than the INEEL background soil concentration of 0.05 mg/kg (Rood, Harris, and White 1996). The selenium concentration in soil at ARA-12 is 1.37 mg/kg, and the INEEL background concentration is 0.22 mg/kg (Rood, Harris, and White 1996).

8.2.3 Summary of Site Risks

The ARA-12 site was retained for quantitative risk analysis in the comprehensive RI/BRA to evaluate the human health risks from chromium, lead, manganese, Ag-108m, Am-241, Co-60, Cs-137, Pu-238, U-234, and U-238 and the ecological risks from arsenic, benzo(a)pyrene, cadmium, chromium, copper, lead, manganese, mercury, selenium, silver, and zinc (Holdren et al. 1999). The human health and ecological risk assessments are summarized below.

8.2.3.1 Human Health Risk Assessment. Silver-108m (Ag-108m) is identified as a COC for ARA-12 based on human health risk estimates (Holdren et al. 1999). A summary of the information about the human health COC in soil at ARA-12 is given in Table 10.

Table 10. Soil concentrations for the human health contaminant of concern at ARA- 12.

Contaminant of Concern	Half-life (years)	Minimum Concentration (pCi/g)	Maximum Concentration (pCi/g)	Frequency of Detection	Background Concentration (pCi/g)	Exposure Point Concentration (pCi/g)	Statistical Measure
Ag-108m	130[a]	0.23	67.2	17/17	0[b]	20.8	UCL[c]

a. The estimated half-life for Ag-108m was recently modified from 130 years, the value used in the baseline risk assessment (Holdren et al. 1999), to 418 years (Firestone and Shirley 1999).

b. Because Ag – 108m is not naturally occurring and is not associated with fallout from historical atomic testing, the assumed background value is zero.

c. The UCL is the 95% upper confidence limit on the mean soil concentration.

Using the concentrations detected in the 1993 Track 2 investigation (Pickett et al. 1994), the total estimated risk for all pathways for the 100-year future residential scenario is 2E-03 (2 in 1,000). The primary contribution is 2E-03 (2 in 1,000) from Ag-108m. The noncarcinogenic hazard index for the future residential exposure is less than 1.0.

Risk for the 100-year future residential scenario also was evaluated using the data from the GPRS surface soil survey. The gamma levels were converted to concentrations using the assumption that Cs-137 was the source of the elevated gamma readings. Calculations produced an average Cs-137 concentration estimate of 47.4 pCi/g for ARA-12. Using this concentration, the estimated risk for external exposure to Cs-137 for the 100-year future residential scenario is 2E-04 (2 in 10,000). Therefore, Cs-137 was initially identified as a COC for ARA-12. Subsequently, however, results from confirmation samples indicated that Ag-108m is the source of the elevated gamma levels at ARA-12, not Cs-137 (Giles 1999b).

The total estimated risk for all pathways for the current occupational scenario is 1E-03 (1 in 1,000). The primary contributions are 1E-03 (1 in 1,000) from Ag-108m and 2E-04 (2 in 10,000) from Co-60. The noncarcinogenic hazard index for the current occupational exposure is less than 1.0.

The total estimated risk for all pathways for the 100-year occupational scenario is 6E-04 (6 in 10,000). The primary contribution is 6E-04 (6 in 10,000) from Ag-108m. The noncarcinogenic hazard index for the future occupational exposure is less than 1.0.

8.2.3.2 Ecological Risk Assessment. Copper, mercury, and selenium were identified as COCs for ARA-12 based on HQs for ecological receptors. A summary of the information about the ecological COCs in soil at ARA-12 is given in Table 11.

The HQs for copper at ARA-12 range from 1 to 300 for avian insectivores and mammals including the pygmy rabbit and bats. The HQs for mercury range from 1 to 90 for plants and for avian herbivores (AV-121 and 122) and mammals including the pygmy rabbit and bats. The HQs for selenium range from 1 to 30 for avian insectivores (AV221, 222, and 222A) and mammalian species including the three bat species of special concern.

Table 11. Soil concentrations for the ecological contaminants of concern at ARA-12.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration[a] (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[b]
Copper	12.9	623	24/24	22	62.5	UCL
Mercury	0.24	1.4	7/24	0.05	0.36	UCL
Selenium	0.25	2.7	6/23	0.22	2.7	Maximum

a. The background value for composited samples is from Rood, Harris, and White (1996).

b. The UCL is the 95% upper confidence limit on the mean soil concentration. When the number of samples was too small for statistical analysis, the maximum detected concentration was used for the exposure point concentration.

8.3 Site ARA-23: Radiologically Contaminated Surface Soils and Subsurface Structures Associated with ARA-I and ARA-II

Remedial action is required for the ARA-23 radiologically contaminated soils to address the risk to human health posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below. More detailed information about the site can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

The ARA-23 site is a 17-ha (42-acre) windblown contamination area surrounding ARA-I and –II. The site also contains subsurface structures remaining after D&D within the ARA-I and ARA-II facilities. Soil was radiologically contaminated by the 1961 SL-1 accident and subsequent cleanup. Minor amounts of contamination may have been added by other ARA operations. Over time, winds dispersed the contamination over an area roughly 100 hectares (240 acres) in size, but soil concentrations over most of the area are significantly less than risk-based remediation goals. The long axis of the roughly oval-shaped site is consistent with the generally southwest-to-southeast winds common at the INEEL. Aerial photographs of the ARA-I and ARA-II facilities before and after D&D are given in Figure 14.

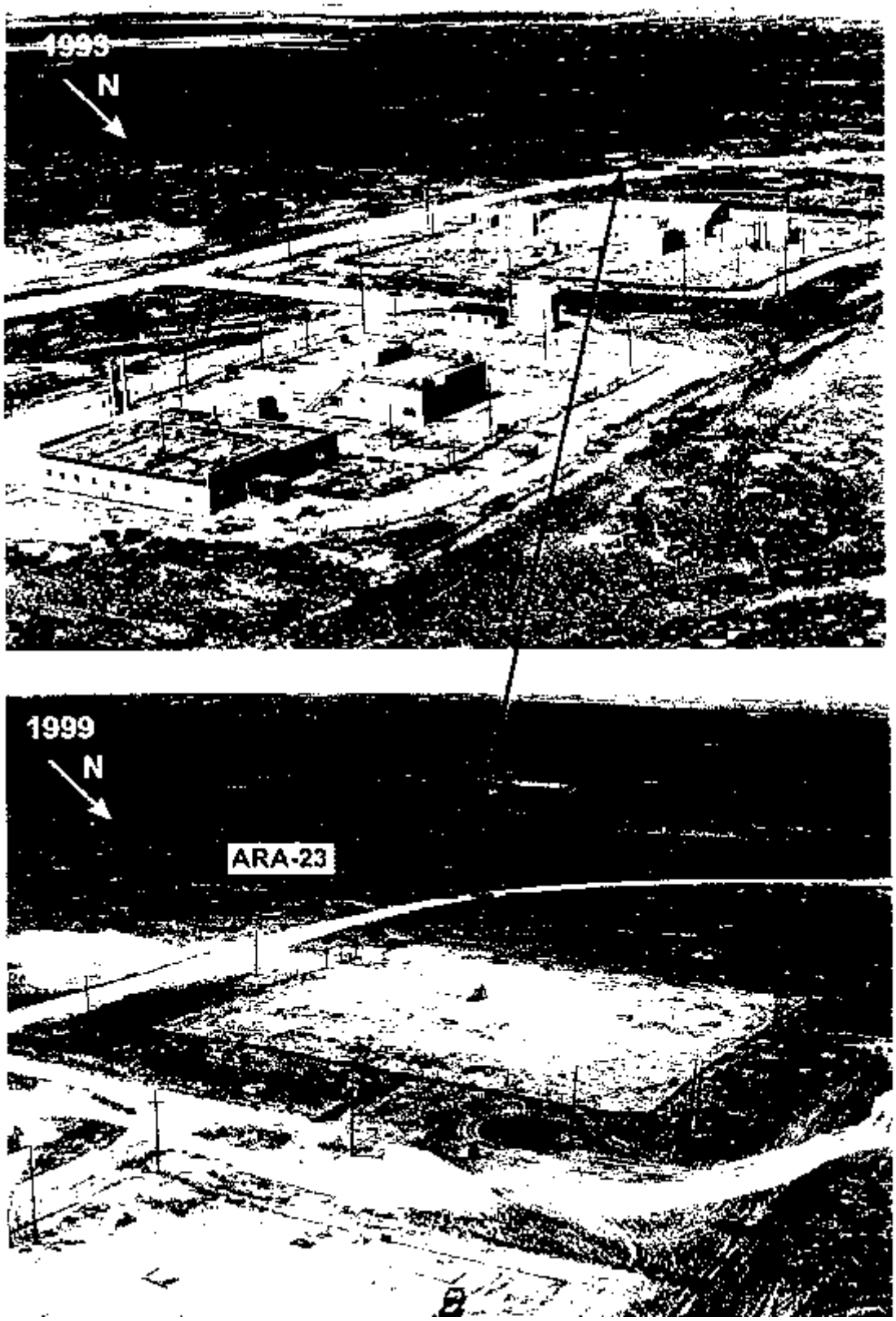


Figure 14. Aerial photographs of the ARA-I and ARA-II facilities before and after decontamination and dismantlement, including a portion of Site ARA-23.

8.3.1 Site Investigations

The windblown contamination site was originally defined as the subsurface structures (e.g., reactor building foundation and underground utilities) within the ARA-I and ARA-II facility fences and all radiologically contaminated surface soil in the area defined by an aerial survey isopleth (Jorgensen 1995). Site ARA-06, the SL-1 Burial Ground, was excluded from ARA-23. A Track 1 investigation was initiated for ARA-23 in 1993 but was not finalized because the site was reassigned to OU 10-06 for evaluation. The OU 10-06 evaluation, which excluded the areas within the ARA-I and ARA-II facility fences, was only partially completed before ARA-23 was reassigned to WAG 5 for final disposition.

As documented in the ROD for the SL-1 Burial Ground (DOE-ID 1996b), the boundary of ARA-06 was expanded outward from the SL-1 Burial Ground perimeter fence to include approximately 40% of ARA-23. Based on dose equivalent rates (Jorgensen 1995), no unacceptable risks were identified for this area and remedial actions specified in the SL-1 ROD (DOE-ID 1996b) excluded all soil outside of the SL-1 Burial Ground fence.

The data gaps identified in the WAG 5 Work Plan (DOE-ID 1997a) comprised the horizontal and vertical extent of Cs-137 in the windblown soil area and the presence of other radionuclides such as Co-60, Eu-152, Eu-154, Sr-90, and uranium isotopes. To fill the data gaps identified in the Work Plan, historical sample data from surface soil at ARA-23 were interpolated (i.e., kriged) to generate concentration isopleths. Verification samples were collected at 19 approximately equally spaced locations along the 10-pCi/g isopleth for Cs-137 at depths of 0 to 15 cm (0 to 6 in.) and 15 cm to 0.6 m (6 in. to 2 ft) for a total of 38 samples. The analytical results are presented in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999, Appendix E).

In addition, a surface gamma-radiation survey using a vehicle-mounted GPRS and a hand-held Ge-spectrometer (Josten 1997) was conducted over the entire windblown contamination site (i.e., ARA-23 and ARA-06) to determine the approximate lateral extent and concentrations of Cs-137. The GPRS was used to survey areas accessible by vehicle. The Ge-spectrometer wag used for areas requiring walk-over survey techniques. Approximately 69,000 in situ gamma-radiation measurements were collected with the GPRS. The highest value recorded at the site was 117,961 counts per second. Eighty-eight measurements were taken with the Ge-spectrometer at a rocky, debris-filled area that was inaccessible to the GPRS, and 14 additional measurements were collected at a selected set of calibration points. Data from the GPRS survey and the Ge-spectrometer were combined into a common database, and maps were compiled showing position, data-point distribution, bulk gamma radiation, and Cs-137 concentrations.

Though a conclusion of the SL-1 investigation was that surface soil within the Burial Ground fence and in the surrounding area were not contaminated (DOE-ID 1996b), the GPRS survey detected elevated gamma levels within these areas. Therefore, the entire region with elevated gamma levels was evaluated in the BRA for ARA-23.

8.3.2 Nature and Extent of Contamination

The location of ARA-23 relative to ARA-I and ARA-II; the soil profile for Cs-137, the COC; and the source volume used in the risk assessment are illustrated in Figure 15. Contaminant concentrations were detected throughout most of the soil profile to a depth of 0.6 m (2 ft). The Cs-137 concentrations measured by the GPRS at ARA-23 are illustrated in Figure 16.

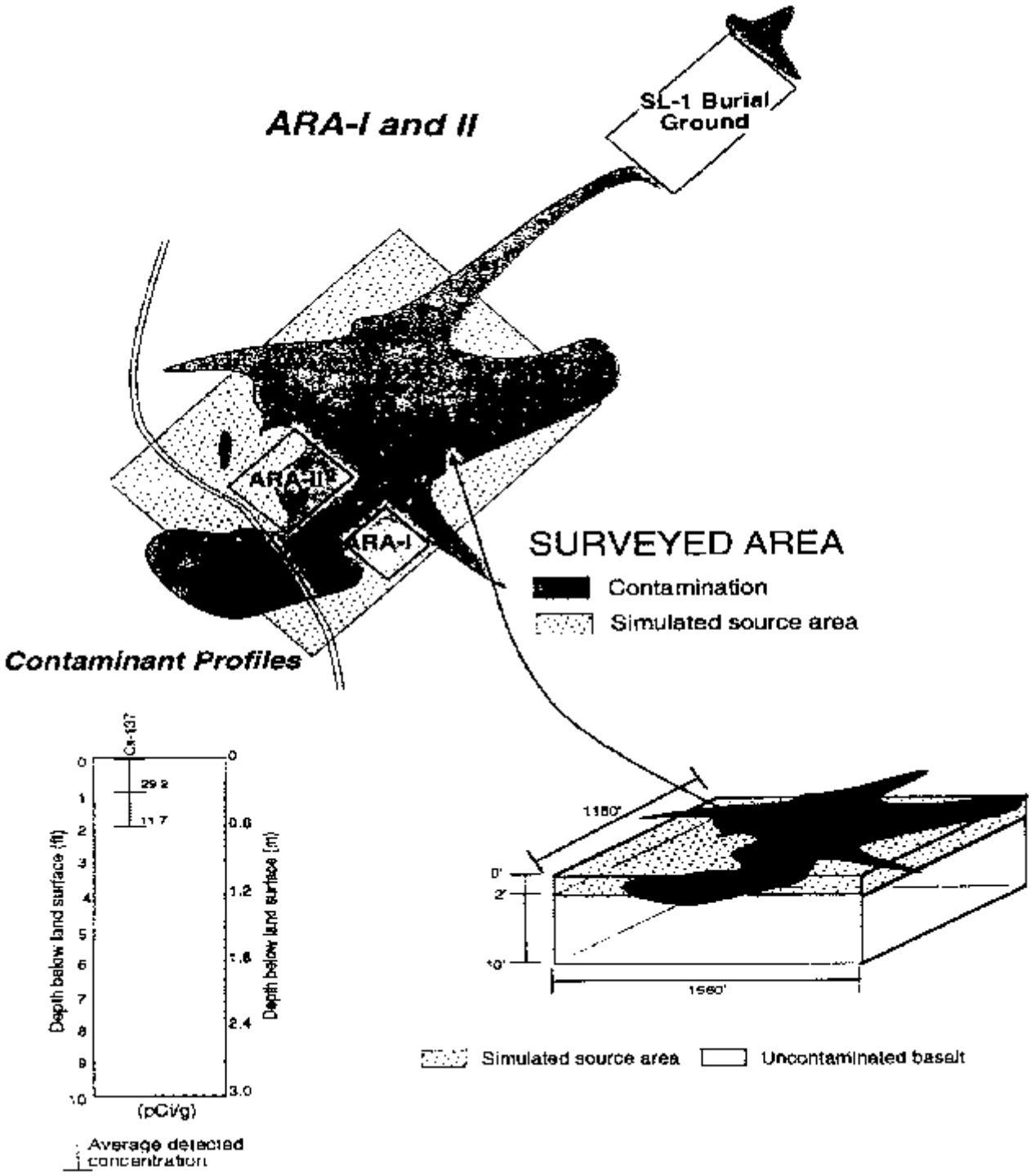


Figure 15. Site ARA-23, ARA-I and -II radiologically contaminated soils and subsurface structures.

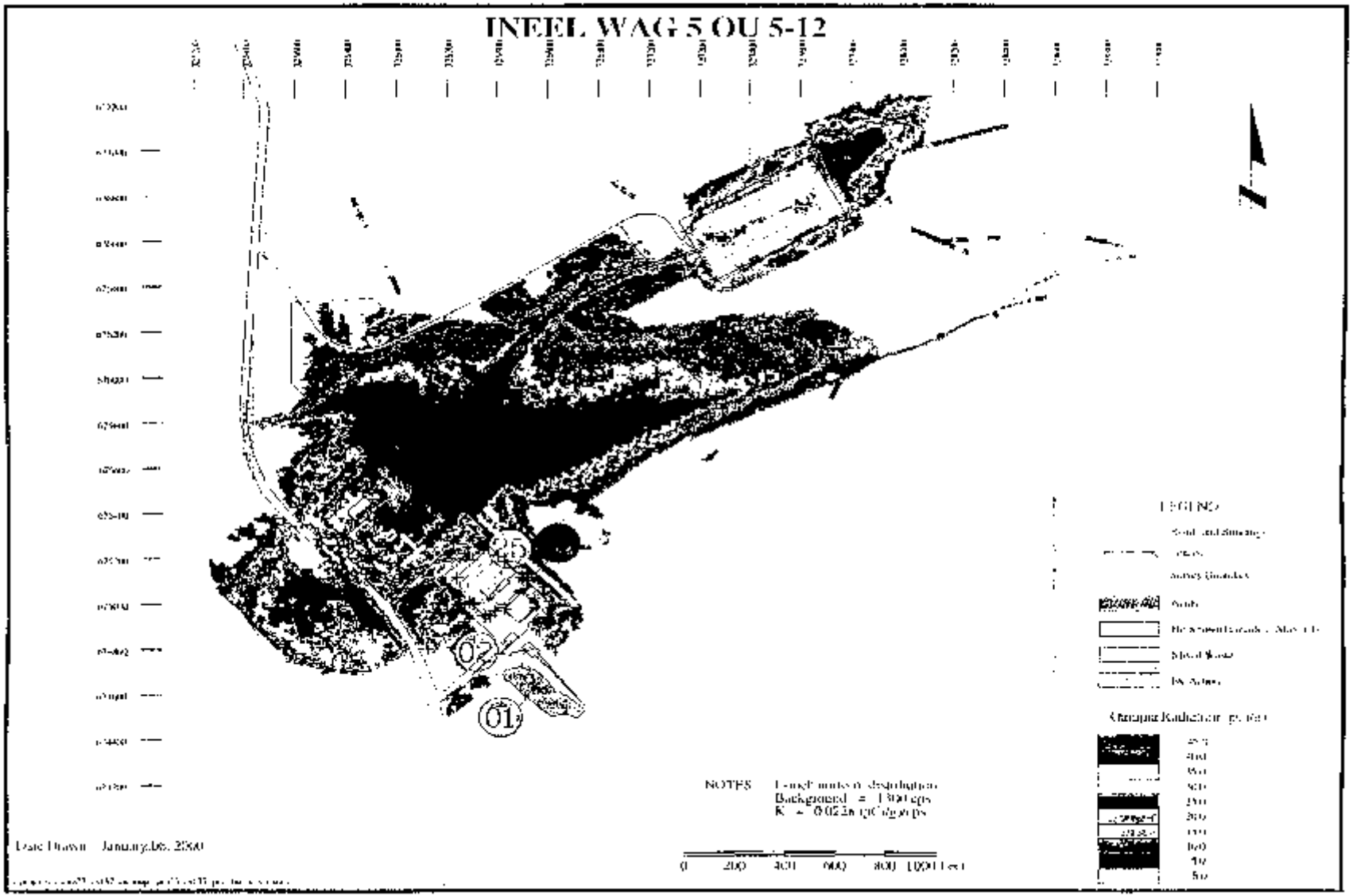


Figure 16. ARA–23 in situ gamma survey and estimated Cs-137 concentrations in the top 1 in. of soil.

8.3.3 Summary of Site Risks

The ARA-23 site was retained for quantitative risk assessment in the comprehensive BRA to evaluate the human health risk potential from Am-241, Cs-137, Ra-226, Sr-90, Th-230, and U-235 detected in the soil. The site also was retained for qualitative risk evaluation of Cs-137 data obtained with the GPRS. Because ARA-23 encompasses the ARA-I and ARA-II facilities and the SL-1 Burial Ground, 15 other sites (i.e., ARA-01, -02, -03, -04, -05, -06, -07, -08, -09, -10, -11, -16, -17, -19, and -25) fall within the boundaries of the windblown contamination area as originally defined. Several of these sites were retained for quantitative analysis in the RI/BRA (Holdren et al. 1999). Others were eliminated from further evaluation. However, residual soil contamination at these 15 sites probably was generated by the same sources as the ARA-23 contamination. Therefore, all residual soil contamination in ARA-23 not specifically addressed for another individual site will be addressed as part of the RD/RA with ARA-23.

8.3.3.1 Human Health Risk Assessment. Cesium-137 was identified as a COC for ARA-23 based on human health risk estimates. A summary of the information about the COC in soil at ARA-23 is given in Table 12. The noncarcinogenic hazard index is not applicable to radionuclides because all radionuclides are classified as probable carcinogens. The carcinogenic risk estimates are presented below for the evaluated exposure scenarios.

Table 12. Soil concentrations for the contaminant of concern at ARA-23.

Contaminant of Concern	Half-life (years)	Minimum Concentration (pCi/g)	Maximum Concentration (pCi/g)	Frequency of Detection	Background Concentration (pCi/g)	Exposure Point Concentration (pCi/g)	Statistical Measure
Cs-137	30	0.27	2,140	175/176	0.82[a]	88.5[b]	Average

a. The background value for composited samples is from Rood, Harris, and White (1996).
b. The surface survey data were used to calculate the exposure point concentration for the 100-year future residential scenario.

Based only on the analytical results, the estimated total risk for all pathways for the 100-year future residential scenario is 1E-04 (1 in 10,000). Cesium-137 is the primary contributor. However, risks are probably underestimated because the samples are not representative of the highest contaminant concentrations at the site.

The GPRS data were used to estimate external exposure risks for the 100-year future residential scenario and to support the decision to remediate this site. Calculations produced an average Cs-137 concentration estimate of 88.5 pCi/g for ARA-23. The estimated risk from the external exposure pathway only for the 100-year future residential scenario is 5E-04 (5 in 10,000). Risk is also underestimated based on the GPRS data because the measurements to determine background were included in the calculations of the average concentration and because only one exposure pathway was evaluated. Because the risk is probably underestimated at the 10^{-4} order of magnitude, the site was identified for remediation.

The estimated total risk based on sampling for all pathways for the current occupational scenario is less than 1E-04. Occupational scenario risks would be much higher based on the GPRS data.

The estimated total risk based on sampling for all pathways for the 100-year occupational scenario is less than 1E-04. Occupational scenario risks would be much higher based on the GPRS data.

8.3.3.2 Ecological Risk Assessment. The ARA-23 site was screened from evaluation in the EPA because the only contaminants above background levels are radionuclides. As discussed in Section 7.2, all radionuclides were eliminated in the contaminant screening for the EPA.

8.4 Site ARA-25: ARA-I Soil Beneath the ARA-626 Hot Cells

Remedial action is required for the ARA-25 Soil Beneath the ARA-626 Hot Cells-to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below. More detailed information about the site can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

The ARA-25 site comprises contaminated soil that was discovered beneath the ARA-626 Hot Cells during the D&D of the ARA-I facility in 1998. The contamination was found near the hot cell floor drains. The contaminated area immediately around the drains measures approximately 2.4x 3.7 m (8 x 12 ft). However, other isolated hot spots beneath the building also were discovered. Therefore, a cumulative size of 4.9 x 7.3 m (16 x 24 ft) was estimated for the site.

The ARA-I hot cells were constructed in 1959 and used until the facility was shut down in 1988. In addition to liquid radioactive waste such as wash water from the ARA-I hot cells, chemicals from materials testing and research and metal-etching processes were used at the facility. Stainless steel piping connected the floor drains to the ARA-729 Radionuclide Tank (Site ARA-16), which contains PCB-contaminated, RCRA F-listed mixed waste (40 CFR 261, Subpart D) and transuranic radionuclides. The pipes are included in the remediation of Site ARA-16 and are not a component of the ARA-25 site. Aerial photographs of Site ARA-25 before and after the D&D of ARA-I are shown in Figure 17.

8.4.1 Site Investigations

As part of the ongoing D&D activities at ARA I, radiologically contaminated concrete floor slabs were cut out of the ARA-626 Hot Cells. Because the concrete was poured directly on the soil, the undersides of the slabs (about 15 cm [6 in.] thick) were covered completely with soil. The soil that sloughed off the underside of the concrete slabs and the rebar protruding from the concrete were surveyed for radioactivity. Initial contamination levels of 50,000 disintegrations per minute were identified.

In 1998, the hot cells were removed and the concrete floor slab and underlying soil were sampled. Three soil samples were collected in the area of the floor drains, and three samples were taken of the concrete. The fixed contamination on the concrete was not evaluated for risk, but will be removed as part of the remediation of WAG 5. After sampling, a fixative was applied to the soil exposed under the concrete slabs and the roof of the hot cell building was placed on the ground over the area for shielding. Results from the analysis of the soil samples demonstrate that the contaminated soil at ARA-25 is not classified as RCRA-hazardous waste. Through review of process knowledge and analytical data, DOE, EPA, and IDHW have determined that ARA-25 soil is not classified as hazardous waste (Rose 1999).

8.4.2 Nature and Extent of Contamination

The soil profiles for the COCs and the source volume used in the risk assessment and the location of ARA-25 relative to ARA-I are illustrated in Figure 18. Because sampling was limited to the surface soil near the drains, the risk assessment incorporated the assumption that the maximum detected concentrations extend from the surface down to the basalt interface at a depth of 1.5 m (5 ft) over a total area of 4.9 x 7.3 m (24 x 16 ft).

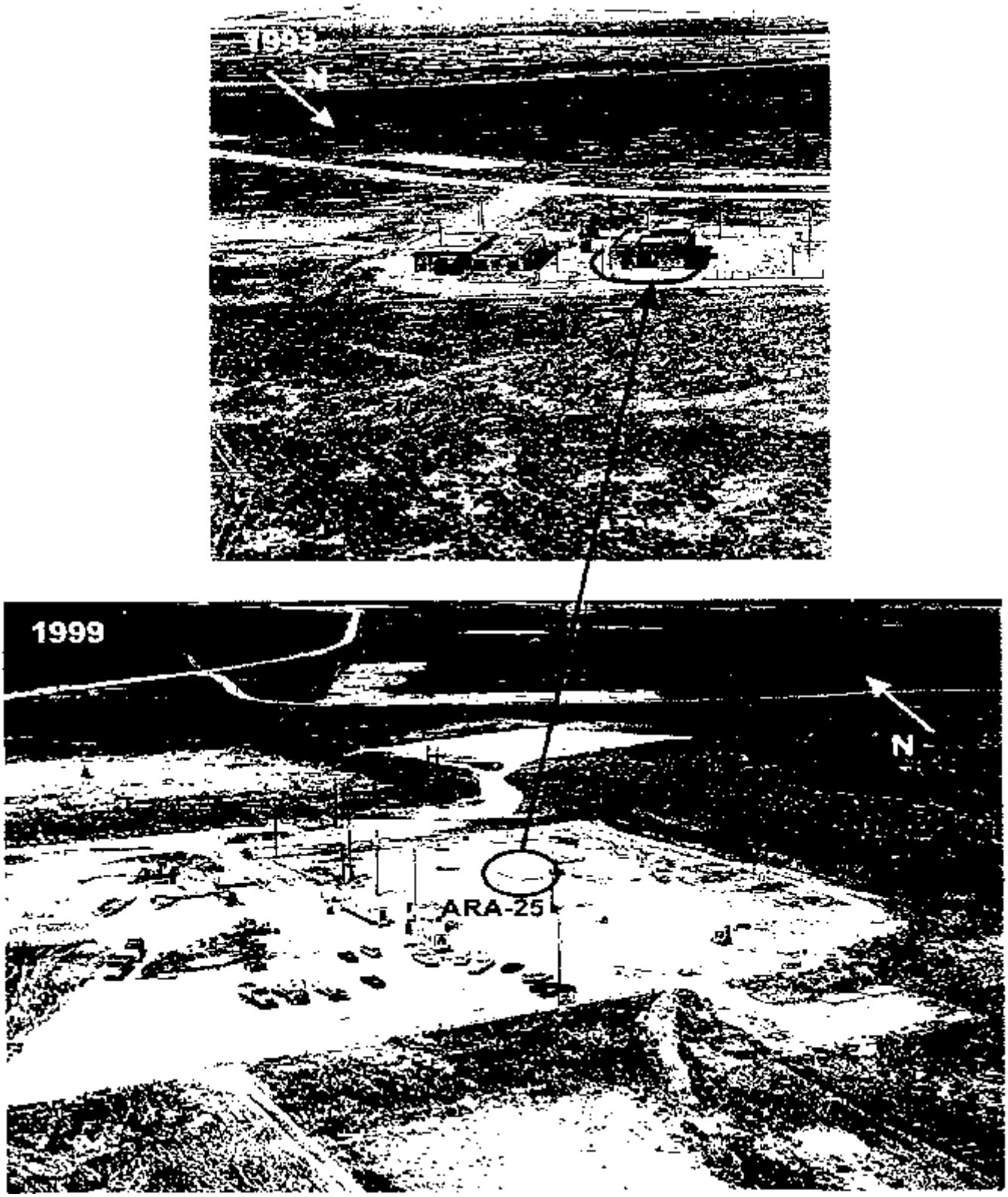


Figure 17. Aerial photographs of Site ARA-25 before and after the decontamination and dismantlement of the ARA-I facility.

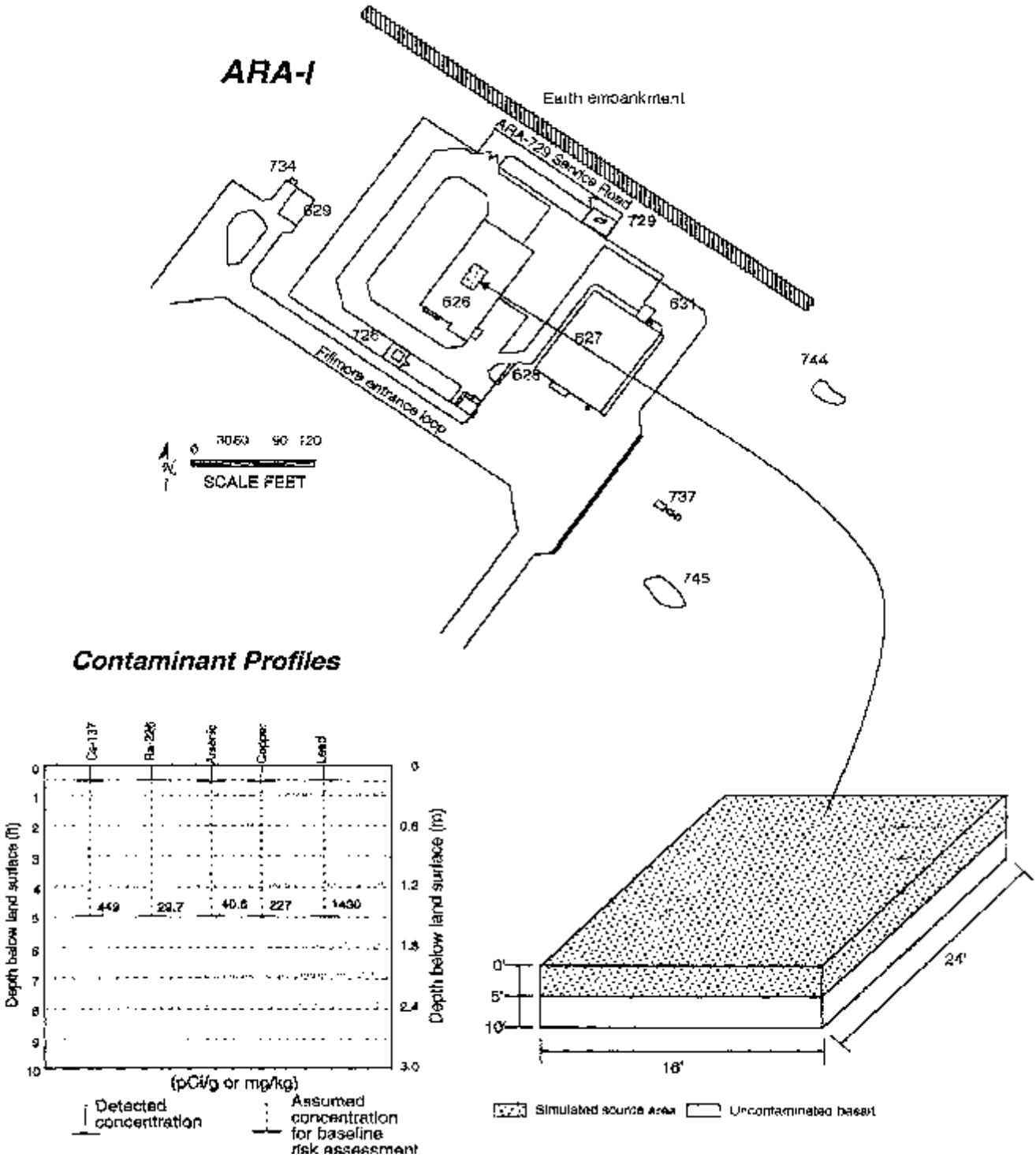


Figure 18. Site ARA-25, ARA-I contaminated soil beneath the ARA-626 hot cells.

In the three soil samples, the ranges of contaminant concentrations are 3.6 to 40.6 mg/kg compared to a background concentration of 5.8 mg/kg for arsenic, 115 to 227 mg/kg compared to a background value of 22 mg/kg for copper, 3.5 to 1,430 mg/kg for lead compared to a background value of 17 mg/kg, 226 to 449 pCi/g compared to a background value of 0.8 pCi/g for Cs-137, and 5.4 to 29.7 pCi/g for Ra-226 compared to a background value of 2.1 pCi/g (Giles 1998a). Background concentrations for arsenic, copper, lead, and Cs-137 were taken from Rood, Harris, and White (1996).

8.4.3 Summary of Site Risks

The analytical results showed concentrations of arsenic, lead, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Ra-226, and Sr-90 in excess of human health screening levels in the soil. Arsenic, chromium, cobalt, and copper were detected in concentrations above ecological screening levels. Therefore, the site was retained for quantitative risk assessment in the WAG 5 comprehensive BRA (Holdren et al. 1999). The human health and ecological risk assessments are summarized below.

8.4.3.1 Human Health Risk Assessment. Arsenic, lead, Cs-137, and Ra-226 were identified as COCs for ARA-25 based on human health risk estimates. A summary of the information about the human health COCs in soil at ARA-25 is given in Table 13.

Table 13. Soil concentrations of the contaminants of concern at ARA-25.

Contaminant of Concern	Half-life (Years)	Minimum Concentration (pCi/g or mg/kg)	Maximum Concentration (pCi/g or mg/kg)	Frequency of Detection	Background Concentration (pCi/g or mg/kg)	Exposure Point Concentration (pCi/g or mg/kg)	Statistical Measure[a]
Cs-137	30	226	449	3/3	0.82[b]	449	Maximum
Ra-226	1,600	14.3	29.7	2/3	1.2 or 2.1[c]	29.7	Maximum
Arsenic	NA	8.98	40.6	3/3	5.8	40.6	Maximum
Lead	NA	3.54	1,430	3/3	17	1,430	Maximum

a. The number of samples was too small for statistical analysis (i.e., calculation of 95% upper confidence limits on the means). Therefore, the maximum detected concentrations were used for the exposure point concentrations.

b. The background value for composited samples is from Rood, Harris, and White (1996).

c. The average INEEL background concentration is 1.2 pCi/g for analysis that accounts for U-235 and 2.1 pCi/g to include interference from U-235 (Giles 1998a).

The total estimated risk for all pathways for the 100-year future residential scenario for the soil under the hot cells is 7E-03 (7 in 1,000), with the major contributors to the risk being 5E-03 (5 in 1,000) from Ra-226, 2E-03 (2 in 1,000) from Cs-137, and 4E-04 (4 in 10,000) from arsenic. The noncarcinogenic HQ for residential exposure is 3.0, and arsenic is the only contributor.

The total estimated risk for all pathways for the current occupational scenario is 5E-03 (5 in 1,000). The major contributors are 4E-03 (4 in 1,000) from Cs-137, 1E-03 (1 in 1,000) from Ra-226, and 1E-04 (1 in 10,000) from arsenic. The hazard index for the current occupational exposure is less than 1.0.

The total estimated risk for all pathways for the 100-year future occupational scenario is 2E-03 (2 in 1,000). The primary contributions are 1E-03 (1 in 1,000) from Ra-226, 4E-04 (4 in 10,000) from Cs-137, and 1E-04 (1 in 10,000) from arsenic. The noncarcinogenic hazard index for the future occupational exposure is less than 1.0.

The risks from lead could not be quantified in the human health risk assessment because toxicity data for lead are not available. However, the maximum concentration of lead detected at ARA-25, 1,430 mg/kg, exceeds the EPA 400 mg/kg screening level (EPA 1994b). Therefore, lead is identified as a COC and will be targeted during remediation.

8.4.3.2 Ecological Risk Assessment. Copper and lead were identified as COCs for ARA-25 based on the results of the ERA. A summary of the information about the ecological COCs in soil at ARA-25 is given in Table 14.

Table 14. Soil concentrations for the ecological contaminants of concern at ARA-25.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
Copper	115	227	3/3	22[b]	227	Maximum
Lead	3.54	1,430	3/3	17[b]	1,430	Maximum

a. The number of samples was too small for statistical analysis (i.e., calculation of 95% upper confidence limits on the means). Therefore, the maximum detected concentrations were used for the exposure point concentrations.
b. The background value for composited samples is from Rood, Harris, and White (1996).

The HQ for copper at ARA-25 range from less than or equal to 1 to 5 for avian insectivores (AV210A, AV221, AV222, AV222A), 3 to 10 for mammalian herbivores including the pygmy rabbit (M121, M122, M122A, M123) and less than or equal to 1 to 40 for mammalian insectivores (including an HQ of 2 for all bats). The HQ is 4 for mammalian omnivores (M422). No TRV data are available to assess reptilian receptors (R222, R322).

The HQ for lead at ARA-25 range from 2 to 30 for avian herbivores (AV121, AV122) and from 20 to 900 for avian insectivores (AV210A, AV221, AV222, AV222A). The HQ range from less than or equal to 1 to 4 for mammalian herbivores (M121, M122, M122A, M123), including an HQ of 1 for the pygmy rabbit, and from less than or equal to 1 to 20 for mammalian insectivores (including an HQ of less than or equal to 1 for bats). The HQ are from less than or equal to 1 to 3 for mammalian omnivores (M422, M422A). The HQ for lead for plants is 1. No TRV data are available to assess reptilian receptors (R222, R322).

8.5 Site PBF-16: SPERT-II Leach Pond

Remedial action is required for the PBF-16 SPERT-II Leach Pond to address the risk to ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below. More detailed information about the pond can be found in the WAG 5 Comprehensive RI/FS report (Holds et al. 1999).

The PBF-16 site is a fenced, unlined surface impoundment, with approximate dimensions of 70 x 51 m (230 x 167 ft), located south of the SPERT-II Reactor Building. From 1959 to 1964, the leach pond was used for disposal of demineralize effluent, water softener waste, emergency shower drain water, and discharges from the floor drains from the reactor building. From 1964 until 1990, the only discharge to the pond was clean water from the PBF maintenance shop air compressor (Hellman-Mason et al. 1994). The compressor was removed in 1994 and no water has been discharged to the SPERT-II

Leach Pond for several years (Gerber 1999). An aerial photograph of the PBF-16 was not available. A sketch of the PBF-16 pond relative to an aerial photograph of the Waste Engineering Development Facility (i.e., SPERT-II) is shown in Figure 19.

8.5.1 Site Investigations

The SPERT-II leach pond was sampled in 1982 and again in 1983. The 1982 characterization (E.G.&G 1982) consisted of collecting 18 soil samples, two water samples, and several vegetation samples. All samples were analyzed for radionuclides. The radioactivity levels were within background values. The pond was sampled again in 1983 to determine the presence and concentrations of hazardous substances. Lead and mercury were detected in concentrations exceeding background values with maximum concentrations of 32 mg/kg for lead and 0.71 mg/kg for mercury (Hellman-Mason et al. 1994). No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997a). Therefore, no additional samples of the pond were collected. The site was evaluated in the WAG 5 Comprehensive RI/FS using the data collected in 1982 and 1983.

8.5.2 Nature and Extent of Contamination

The soil profile for mercury and the source volume used in the risk assessment and the location of PBF-16, the SPERT-II Leach Pond, relative to the Waste Engineering Development Facility, are illustrated in Figure 20. The maximum detected mercury concentration of 0.71 mg/kg was assumed for the entire soil interval to a depth of 10 ft. The background concentration at the INEEL for composited mercury samples is 0.05 mg/kg (Rood, Harris, and White 1996).

8.5.3 Summary of Site Risks

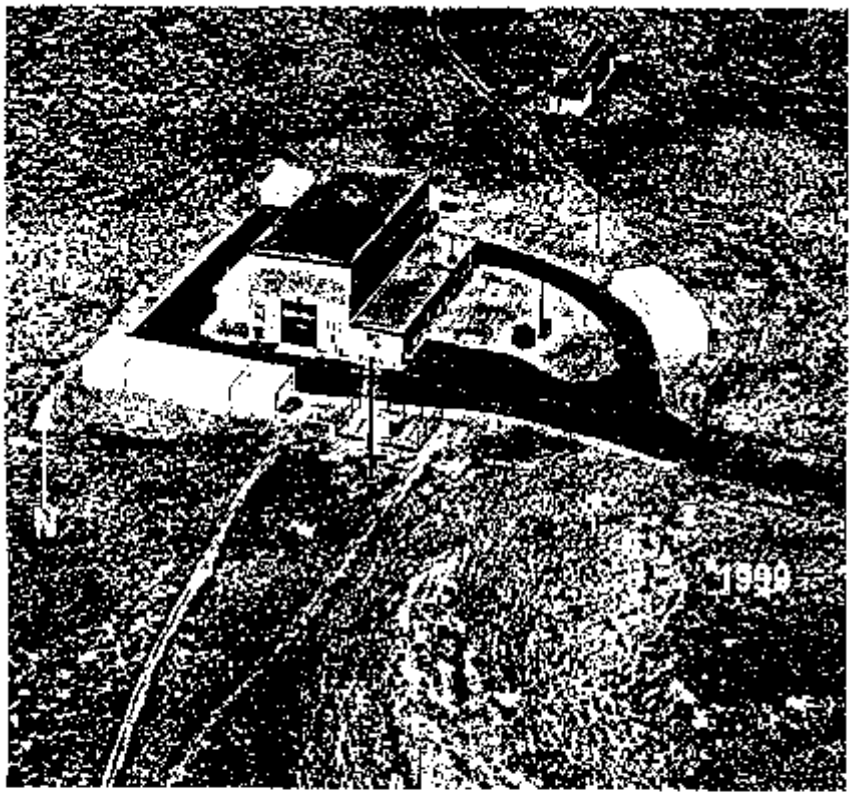
The SPERT-II Leach Pond was screened from evaluation in the human health risk assessment (Holds et al. 1999). Mercury was detected at 0.71 mg/kg and eliminated from evaluation based on comparison to the risk-based soil concentration of 23 mg/kg (EPA 1995). Though lead was detected at 32 mg/kg, risk could not be quantified because toxicity data for lead have not been developed. However, the maximum detected lead concentration is considerably less than the EPA 400-mg/kg screening level (EPA 1994b). Therefore, lead was not identified as a COC based on human health risk.

Mercury was identified as a COC for PBF-16 based on the results of the ERA (Holdren et al. 1999). The HQ for mercury range up to 50 for mammalian insectivores at PBF-16. Avian and mammalian herbivores have HQ that exceed 1.0 including an HQ of 10 for the pygmy rabbit. Because HQ that exceed 10 are associated with the site, remediation will be implemented to protect ecological receptors. A summary of the information about the COC in soil at PBF-16 is given in Table 15.

Table 15. Soil concentrations for the contaminant of concern at PBF-16.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure
Mercury	ND[a]	0.71	ND	0.05[b]	0.71	Maximum

a. ND = not determined. Records of the 1983 sampling by decontamination and dismantlement personnel were not located. The maximum concentration was taken from the Track 2 report (Hellman-Mason et al. 1994).
b. The background value for composited samples is from Rood, Harris, and White (1996).



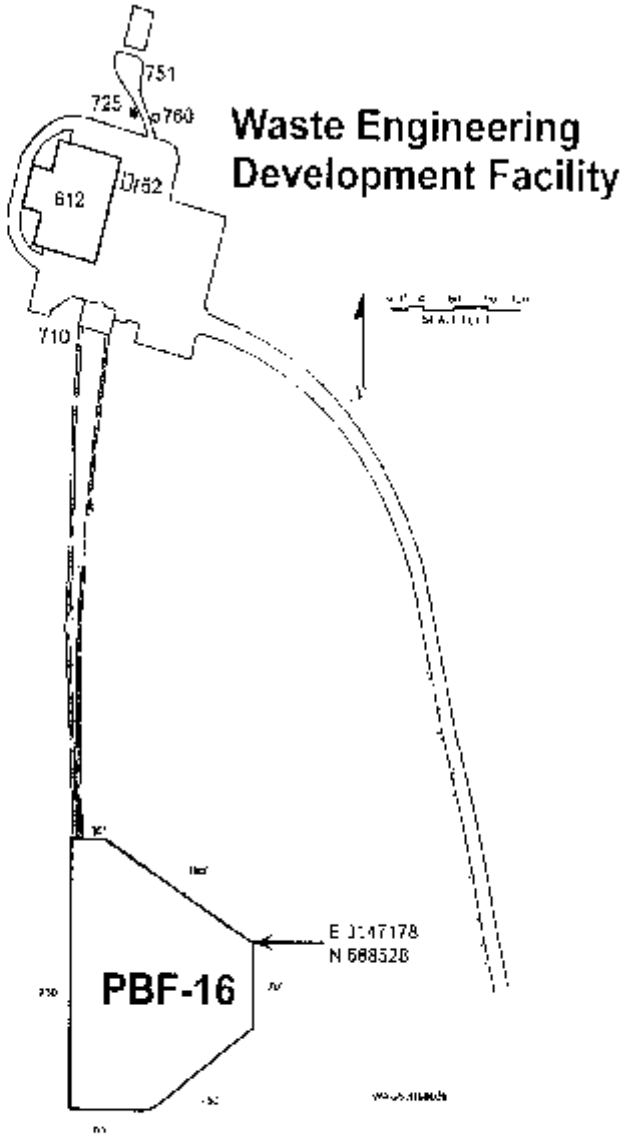


Figure19. Sketch of Site PBF-16 relative to an aerial photograph of the Waste Engineering Development Facility (i.e., SPL R1-H)

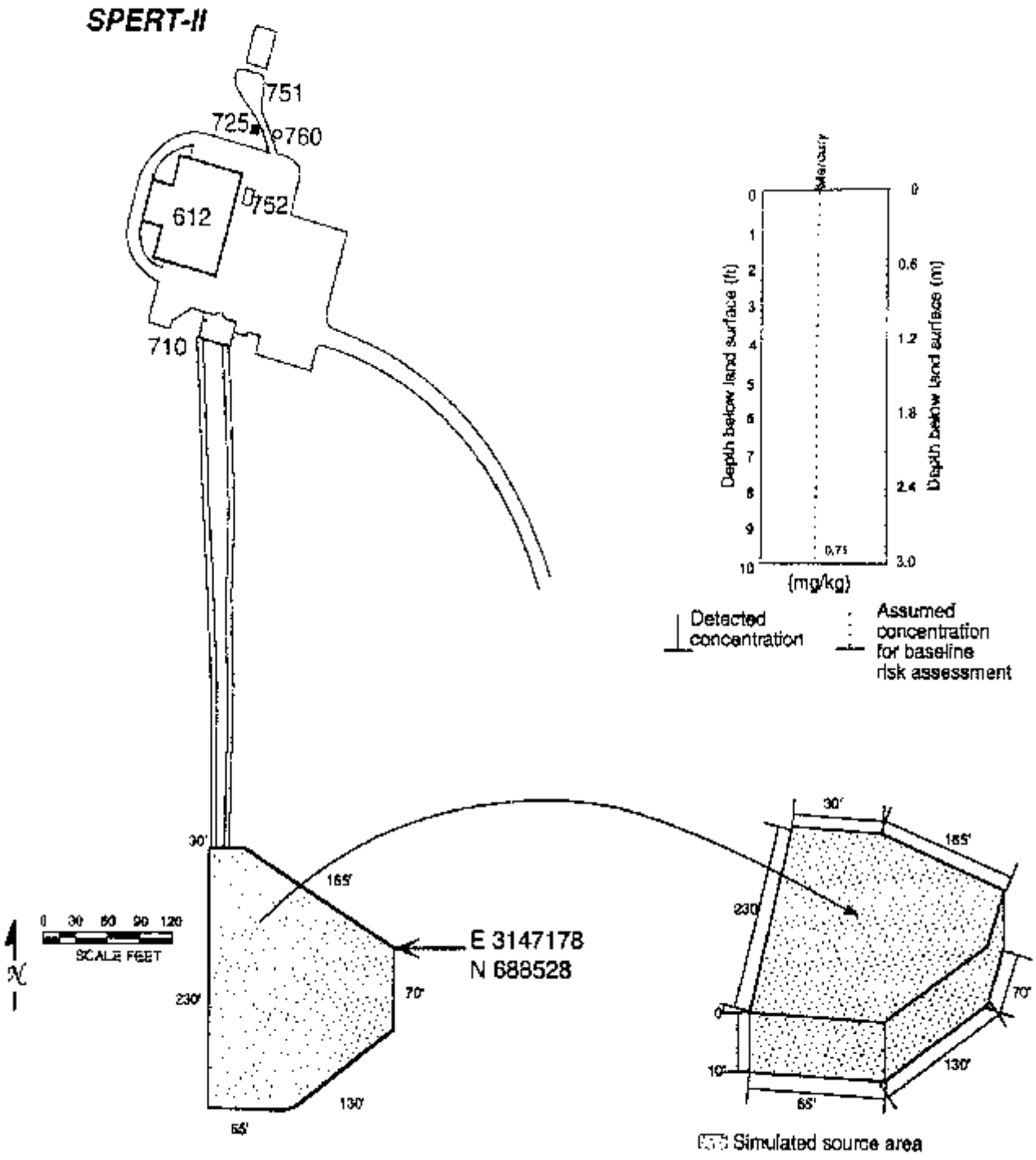


Figure 20. Site PBF-16, SPERT-II Leach Pond.

8.6 Remediation Objectives for the Contaminated Soil Sites

Remediation objectives based on the unacceptable risks discussed above were developed for the contaminated soil sites ARA-01, ARA-12, ARA-23, ARA-25, and PB-16 (Sections 8.1.3, 8.2.3, 8.3.3, 8.4.3, and 8.5.3). Human health risk in excess of 1E-04 is posed primarily by external exposure to ionizing radiation. The radioactive contaminants of concern are Ag-108m, Cs-137, and Ra-226. Dermal adsorption of arsenic and ingestion of Ra-226, arsenic, and lead pose secondary human health risks. Ecological hazard quotients greater than 10 are from exposure to selenium, thallium, copper, mercury, and lead in the soil. A summary of the risks for the contaminated soil sites is provided in Table 7.

The following land-use assumptions were used in the development of the remedial action objectives for WAG 5 rededication:

- Institutional controls until 2095 will include current security controls, site access controls, radiological controls, and worker monitoring

- For 2095 and beyond, homes could be built anywhere within WAG 5 and a water supply well could be drilled adjacent to the home.

The following remedial action objectives were developed to protect human health and the environment for the contaminated soil sites:

- Inhibit direct exposure to radio nuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and future residents

- Inhibit dermal adsorption of contaminants of concern that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of 2 or greater for current and future workers and future residents

- Inhibit ecological receptor exposures to contaminated soil with concentrations of contaminants greater than or equal to 10 times background values and that result in an HQ greater than or equal to 10.

To meet these objectives, remediation goals were established. The remediation goals for the contaminated soil sites and the basis for each goal are provided in Table 16. These goals are at the upper end of the acceptable risk range because conservative parameters were used in the risk assessment, because risk from background concentrations at the INEEL exceed 1E-06, and because EPA radiation standards, which apply to risks from exposure to radionuclides, are generally set at a risk level of 1 in 10,000.

Remediation goals can be satisfied by either cleaning up to the identified contaminant concentration (see Table 16) or by removing all soil down to the basalt interface. Removing soil down to basalt will be protective because surface exposure pathways will be eliminated. The RI/FS for WAG 5 (Holdren et al. 1999) showed that groundwater exposure pathways pose a cumulative risk less than 1E-04 and a hazard index less than 1 for the baseline no action alternative. Removal of contaminated soil from WAG 5 will further reduce the potential groundwater risk. Therefore, remediation to retrieve residual contamination that may have migrated into the fractured basalt would not be justified. The estimated soil volumes exceeding cleanup goals for the contaminated soil sites are provided in Table 17. An approximate total of 39,000 m^3 (i.e., 1.4 million ft^3 or about 51,000 yd^3) of contaminated soil will be remediated.

Table 16. Remediation goals for WAG 5 contaminated soil sites.

Site	Contaminant of Concern	Soil Concentration Remediation Goal[a]	Derivation	Reference	Risk Scenario
ARA-01	Arsenic	10 mg/kg[B]	1E-04 dermal absorption risk	Calculated[b]	100-year future residential
	Selenium	2.2 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
	Thallium	4.3 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
ARA-12	Ag-108m	0.75 pCi/G[C]	1E-04 external exposure risk	Giles (1999a)	100-year future residential
	Copper	220 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
	Mercury	0.5 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
	Selenium	2.2 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
ARA-23	Cs-137	23 pCi/g	1E-04 external exposure risk	From (1996)	100-year future residential
ARA-25	Arsenic	5.8 mg/kg[d]	Background concentration	Rood, Harris, and White (1996)	100-year future residential
	Cs-137	23 pCi/g	1E-04 external exposure risk	From (1996)	100-year future residential
	Ra-226	2.1 or 1.2 P.I./[GC]	Background concentration	Giles (1993a)	100-year future residential
	Copper	220 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological
	Lead	400 mg/kg	EPA	Statutes[f]	Ecological and human health
PB-16	Mercury	0.5 mg/kg	10 times background	Rood, Harris, and White (1996)	Ecological

a. Except as noted, remediation goals are calculated values based on 10 times the background concentration reported by Rood, Harris, and White (1996) for ecological contaminants of concern, and 100 times the 1E-06 risk-based concentration reported by Fromm (1996) for radio nuclides for the hypothetical residential scenario 100 years in the future.

b. Arsenic is the only human health contaminant of concern at ARA-01. Therefore, a remediation goal based on a 1E–04 risk for a single contaminant was calculated. Carcinogenic risk estimates and noncarcinogenic hazard indices are linearly related to the soil concentration used in the risk calculations. The maximum detected arsenic concentration of 40.6 mg/kg at ARA-25 equates to a dermal absorption risk of 4E-04 and a hazard quotient of 3 in the 100-year future residential scenario. The arsenic remediation goal was calculated by dividing the maximum concentration by the risk (or hazard quotient), then multiplying by the threshold value (i.e., 1E-04 for carcinogens, 1 for noncarcinogens). For carcinogens, the calculation for the remediation goal is RG = [(40.6 mg/kg)/(4E-04)] x (1E-04) = 10.1 mg/kg. For noncarcinogens, the calculation is RG = [(40.6 mg/kg)/3] x 1 = 13.5 mg/kg. The arsenic remediation goal for ARA-01 is the lesser, more protective, of the two values, rounded to 10 mg/kg.

c. The calculation for the remediation goal, presented in Giles (1999a), is based on the revised half-life of 418 years for Ag-108m (Firestone and Shirley 1999).

d. ARA-25 has three human health contaminants of concern, excluding lead. Remediation goals for two of the three contaminants (i.e., arsenic and Ra-226) are background values. For the third, Cs-137, the 1E-04 risk-based concentration is given.

e. The remediation goal is the average INEEL background value for Ra-226 reported by Giles (1998a) because the 1E-04 risk-based concentration derived from Fromm (1996), 0.55 pCi/g, is below the INEEL average background concentration. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235. Otherwise, a goal of 1.2 pCi/g will be used. Further details are available in Giles (1998a).

f. On July 14, 1994, the EPA issued guidance recommendations for lead in paint, dust, and soil under the authority of Section 1021, Title X of the Housing and Community Development Act of 1992, and Section 403 of the Toxic Substance Control Act. The current approach to addressing lead in soil at CERCLA and RCRA sites was established in Office of Solid Waste and Emergency Response Directive 9555.4-12 (EPA 1994b).

Table 17. Areas, depths, and volumes of contaminated soil for WAG 5 contaminated soil sites.

Site	Site Name	Soil Area		Soil Depth		Soil Volume	
		(m^2)	(ft^2)	(m)	(ft)	(m^3)	(ft^3)
ARA-01	ARA-I Chemical Evaporation Pond	2,987	32,155	0.6	2	1,821	64,310
ARA-12	ARA-III Radioactive Waste Leach Pond and Ag-108m Contaminated Soil	5,011	53,933	0.3	1	1,503	53,933
ARA-23	ARA-I and -II Radiologically Contaminated Surface Soil and Subsurface Structures	233,187	2,510,000	0.15	0.5	35,538	1,255,000
ARA-25	ARA-I Contaminated Soil Beneath the ARA-626 Hot Cells	36	384	1.5	5	54	1,920
PBF-16	SPERT-II Leach Pond	279	3,000	1.4	4.5	382	13,500
Total		241,500	2,599,472			39,298	1,388,663

8.7 Description of Alternatives for the Contaminated Soil Sites

Five remedial alternatives were developed for the contaminated soil sites: Alternative 1, no action; Alternative 2, limited action; Alternative 3, excavation, consolidation, and containment with an engineered barrier within WAG 5; Alternative 4, removal and disposal; and Alternative 5, removal, ex situ soil sorting, and disposal. Two alternatives, Alternative 2, limited action, and Alternative 3a (a subcategory of Alternative 3), excavation, consolidation, and containment within WAG 5 with a native soil cover, were screened out in the feasibility study because they did not provide adequate ecological protection or sufficient human health protection beyond the 100-year period of institutional control. Though Alternative 1, no action, does not satisfy threshold criteria, it was retained for detailed evaluation to serve as the baseline for comparing other remedial action alternatives.

8.7.1 Alternative 1, No Action

The no action alternative, Alternative 1, consists of soil, air, and groundwater monitoring. No active remediation would be performed under this alternative to alter existing site conditions.

8.7.2 Alternative 3b, Excavation, Consolidation, and Containment with an Engineered Barrier

Implementation of Alternative 3b, excavation, consolidation, and containment with an engineered barrier within WAG 5, would involve the excavation of soil present in concentrations greater than remediation goals, consolidation of the soil on a site within the WAG 5 area, and containment with an engineered barrier. Conventional excavation equipment, soil vacuuming equipment, or a combination of both would be used under this alternative. Verification sampling would be conducted to ensure that all contamination at concentrations exceeding remediation goals was removed. Excavated areas more than 0.3 m (1 ft) deep would be backfilled with uncontaminated soil or sloped to promote drainage. Shallow excavations would be contoured to blend with the existing landscape. Institutional controls would be required because the remediation goals are based on the soil concentrations equivalent to a risk of 1E-04 100 years in the future. In addition, the consolidated soil area would require management.

With the soil contamination consolidated into a single area within WAG 5, an engineered barrier would be used to inhibit contaminant migration and limit exposures to protect human health and the environment. The barrier would be designed to meet the remedial action objectives for protecting human and ecological receptors from exposures to contaminated soil. The cap would consist of a 0.3-m (1-ft) layer of basalt cobbles underlain and overlain by 0.2-m (8-in.) layers of gravel and covered with a 0.6-m (2-ft) layer of basalt riprap. Environmental monitoring, cap-integrity monitoring, and maintenance (e.g., repairing any observable degradation such as cracks, erosion, and biotic intrusion) would be conducted on an annual basis. Access restrictions such as fencing and signs also would be maintained. Air monitoring and groundwater monitoring would be performed under INEEL Site-wide programs.

8.7.3 Alternatives 4a and 4b, Removal and Disposal

Removal and disposal Alternatives 4a and 4b for WAG 5 contaminated soil sites would deploy conventional construction equipment, soil vacuuming equipment, or a combination of both, to excavate contaminated soil. The contaminated soil would be disposed of at the INEEL or at a permitted off-Site facility. A combination of verification sampling and radiological surveying would be conducted at the removal sites to ensure that all contamination at concentrations exceeding remediation goals was removed. Following cleanup, the excavations exceeding 0.3 m (1 ft) in depth would be backfilled with uncontaminated soil or sloped to promote drainage. Shallow excavations would be contoured to blend with the existing landscape. Under Alternative 4a, the excavated soil would be disposed of at the INEEL, while excavated soil would be disposed of off the INEEL under Alternative 4b. Disposal at the INEEL CERCLA Disposal Facility (ICDF) or another facility on the INEEL is considered in Alternative 4a while a private disposal facility located off the INEEL is addressed in Alternative 4b.

8.7.4 Alternatives 5a and 5b, Removal, Ex Situ Sorting, and Disposal

The removal, ex situ treatment, and disposal alternative was developed for the radiologically contaminated soil with concentrations that exceed human health remediation goals (i.e., Sites ARA-12, ARA-16, ARA-23, and ARA-25). Conventional construction equipment would be used to excavate the soil. The soil would be processed through a segmented-gate separation apparatus to sort the soil into two categories: above the remediation goal criteria and below the remediation goal criteria. Soils with concentrations less than the remediation goals would be returned to the excavation, and soil with concentrations above the remediation goals would be shipped for disposal. Under this alternative, soil from the sites with an ecological risk only, ARA-01 and PBF-16, would be excavated and disposed of with the radiologically contaminated soil.

Following remediation, the excavations exceeding 0.3 in (1 ft) in depth would be backfilled with uncontaminated soil or sloped to promote drainage. Shallow excavations would be contoured to blend with the existing landscape. Alternatives 5a and 5b differ only in the final disposal location of the contaminated soil. Disposal at the ICDF or another facility within the INEEL is considered in Alternative 5a while a private disposal facility located off the INEEL is addressed in Alternative 5b.

During June 1999, a treatability study was conducted to determine whether the segmented gate system technology could segregate excavated soil to the specified remediation goal of 23 pCi/g for Cs-137 and to confirm the feasibility study cost estimate for processing WAG 5 soil. Both sediment-type and windblown deposition soil were tested. Sites ARA-12 and ARA-25 are sites with sediment-type deposition, and ARA-16 and ARA-23 are sites with windblown deposition. Testing results demonstrated that the system could not sort either contaminated soil type to the 23-pCi/g Cs-137 level. The system could, however, successfully sort at the higher, industrial use level of 110 pCi/g. However, because the remediation goal was established for residential use, the segmented gate system would not be effective in meeting the remediation objectives.

8.7.5 Comparison of Elements and Distinguishing Features of Each Alternative

The relative performance of each alternative is described in Table 18.

8.8 Comparative Analysis of Alternatives for the Contaminated Soil Sites

The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43[f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

8.8.1 Overall Protection of Human Health and the Environment

Alternatives 4a, removal and disposal on the INEEL; 4b, removal and disposal off the INEEL; 5a, removal, ex situ sorting, and disposal on the INEEL; and 5b, removal, ex situ sorting, and disposal off the INEEL, provide the most overall protection of human health and the environment and are equivalent relative to human health protection. Alternative 3b, excavation, consolidation, and containment using an engineered barrier, would meet human health and ecological risk remedial action objectives, but is regarded as less effective than 4a, 4b, 5a, or 5b because of uncertainties that the engineered barrier would provide sufficient protection from the longer-lived radionuclide Ag-108m. and because contaminated media would remain within WAG 5.

8.8.2 Compliance with Applicable or Relevant and Appropriate Requirements

The applicable or relevant and appropriate requirements (ARARs) for Alternative 1, no action, would not be met. Alternatives 3b, excavation, consolidation, and containment using an engineered barrier; 4a, removal and disposal on the INEEL; 4b, removal and disposal off the INEEL; 5a, removal, ex situ sorting, and disposal on the INEEL; and 5b, removal, ex situ sorting, and disposal off the INEEL, would meet ARARs and are ranked equally.

8.8.3 Long-Term Effectiveness and Permanence

Alternative 1, no action, would provide the least long-term effectiveness and permanence. Alternatives 4a, removal and disposal on the INEEL; 4b, removal and disposal off the INEEL; 5a, removal, ex situ sorting, and disposal on the INEEL; and 5b, removal, ex situ sorting, and disposal off the INEEL, would provide the highest degree of long-term effectiveness and permanence because contaminated soil would be removed from WAG 5. Engineering or administrative controls at the individual sites would not be required if all soil above remediation goals were removed. Alternative 3b, excavation, consolidation, and containment using an engineered barrier, would be less effective and permanent and also would require monitoring, maintenance, and 5-year reviews during the institutional control period.

8.8.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Only Alternatives 5a, removal, ex situ sorting, and disposal on the INEEL; and 5b, removal, ex situ sorting, and disposal off the INEEL, would reduce the volume of radiologically contaminated soil requiring disposal and were rated highest among the alternatives relative to this criterion.

Table 18. Detailed analysis summary of remediation alternatives for WAG 5 contaminated soil sites.

Criteria	Alternative 1 No Action	Alternative 3b Excavation, Consolidation, and Containment Using an Engineered Barrier	Alternative 4a Removal and Disposal on the INEEL	Alternative 4b Removal and Disposal off the INEEL	Alternative 5a Removal, Ex Situ Sorting, and Disposal on the INEEL	Alternative 5b Removal, Ex Situ Sorting, and Disposal off the INEEL
Overall protection of human and the environment						
Human health protection	Would not reduce risk.	Cap would prevent exposure to contaminated soil for 400 years.	Would eliminate potential exposure to contaminated soil by Removing contamination from WAG 5.	Would eliminate potential exposure to contaminated soil by removing contamination from WAG 5.	Would eliminate potential exposure to contaminated soil by removing contamination from WAG 5.	Would eliminate potential exposure to contaminated soil by removing contamination from WAG 5.
Environmental protection	Allows continued ecological exposures.	Cap would prevent exposure to contaminated soil for 400 years.	Would eliminate potential ecological exposure to contaminated soil by removing contamination from WAG 5.	Would eliminate potential ecological exposure to contaminated soil by removing contamination from WAG 5.	Would eliminate potential ecological exposure to contaminated soil by removing contamination from WAG 5.	Would eliminate potential ecological exposure to contaminated soil by removing contamination from WAG 5.
Compliance with applicable or relevant and appropriate requirements (ARARs)						
Action-specific						
Idaho Fugitive Dust Emissions—IDAPA 16.01.01.650 et seq.	Would not meet ARAR.	Would meet ARAR by eliminating potential for windblown-soil contamination.	Would meet ARAR by eliminating potential for windblown-soil contamination.	Would meet ARAR by eliminating potential for windblown-soil contamination.	Would meet ARAR by eliminating potential for windblown soil contamination	Would meet ARAR by elimination potential for windblown soil contamination.
Idaho Hazardous Waste Management Act—IDAPA 16.01.05.004 et seq.	Not applicable	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.
Resource Conservation and Recovery Act — 40 CFR 264 and 268	Not applicable	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.	Would meet ARAR.
Idaho Toxic Air Pollutants—IDAPA 16.01.210, .585, and .586	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
NESHAP-40 CFR 61.91 and .92	Would meet ARAR.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Location-specific						
Storm water Discharges —40 CFR 122.26	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.

Table 18. (continued).

Criteria	Alternative 1 No Action	Alternative 3b Excavation, Consolidation, and Containment Using an Engineered Barrier	Alternative 4a Removal and Disposal on the INEEL	Alternative 4b Removal and Disposal off the INEEL	Alternative 5a Removal, Ex Situ Sorting, and Disposal on the INEEL	Alternative 5b Removal, Ex Situ Sorting, and Disposal of the INEEL
Native American Graves Protection and Repatriation Act—25 USC 32	Would meet ARAR.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary
National Archeological and Historic Preservation Act—36 CFR 800	Would meet ARAR.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.
Radiation Protection of the Public and Environment—DO E Order 5400.5	Would not meet TBC because no controls would be implemented.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of engineering and institutional controls and best management practices.
Long-term effectiveness and permanence						
Magnitude of residual risk	No change from existing risk.	Source-to-receptor pathways would be eliminated while cap remains in place.	No residual risk would remain at WAG 5.	No residual risk would remain at WAG 5.	No residual risk would remain at WAG 5.	No residual risk would remain at WAG 5.
Adequacy and reliability of controls	No control and, therefore, no reliability.	Barrier is estimated to provide control over contaminated soil for at lease 400 years	Disposal facility is assumed to provide adequate and reliable control over soil disposed of for the period of institutional controls.	Disposal facility is assumed to provide adequate and reliable control over soil disposed of for the period of institutional controls.	Disposal facility is assumed to provide adequate and reliable control over soil disposed of for the period of institutional controls.	Disposal facility is assumed to provide adequate and reliable control over disposed soil for the period of institutional controls.
Reduction of toxicity, mobility, or volume through treatment						
Treatment process used	Not applicable	Not applicable	Not applicable	Not applicable	Soil separation	Soil separation
Amount destroyed or treated	Not applicable	Not applicable	Not applicable	Not applicable	All soil contaminated with Cs-137 above the remediation goal would be subjected to treatment, which is more than 94% of the soil to be remediated.	All soil contaminated with Cs-137 above the remediation goal would be subjected to treatment, which is more than 94% of the soil to be remediated.

Table 18. (continued).

Criteria	Alternative 1 No Action	Alternative 3b Excavation, Consolidation, and Containment Using an Engineered Barrier	Alternative 4a Removal and Disposal on the INEEL	Alternative 4b Removal and Disposal off the INEEL	Alternative 5a Removal, Ex Situ Sorting, and Disposal on the INEEL	Alternative 5b Removal, Ex Situ Sorting, and Disposal on the INEEL
Reduction of toxicity, mobility, or volume	Not applicable	Not applicable	Not applicable	Not applicable	Based on results of the treatability study conducted in June 1999, less than 2% reduction in soil volume could be achieved	Based on results of the treatbility study conducted in June 1999 (Giles 1999b), less than 2% reduction in soil volume could be achieved
Irreversible treatment	Not applicable	Not applicable	Not applicable	Not applicable	Yes	Yes
Type and quantity of residuals remaining after treatment	Not applicable	Not applicable	Not applicable	Not applicable	Based on results of the treatability study, more than 98% of the soil that would require disposal would still be above the remediation goal after treatment.	Based on results of the treatability study, more than 98% of the soil that would require disposal would still be above the remediation goal after treatment.
Statutory preference for treatment	Not applicable	Not applicable	Not applicable	Not applicable	Meets preference.	Meets preference.
Short-term effectiveness						
Community protection	Would not increase potential risks to the public.	Would not increase potential risks to the public.	Would not increase potential risks to the public.	Would be slight increasein potential risks to the public during off-Site transportation.	Would not increase potential risks to the public.	Would be slight increase in potential risks to the public during off-Site transportation.
Worker protection	Not applicable	Workers would be protected by administrative and engineering controls.	Workers would be protected by administrative and engineering controls.	Workers would be protected by administrative and engineering controls.	Workers would be protected by administrative and engineering controls.	Workers would be protected by administrative and engineering controls.
Environmental impacts	No change from existing conditions.	Limited to disturbances from vehicle and material transport activities associated with excavation, transportation, and barrier construction. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from vehicle and material transport activities associated with excavation and transportation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from vehicle and material transport activities associated with excavation and transportation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from vehicle and material transport activities associated with excavation and transportation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from vehicle and material transport activities associated with excavation and transportation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.
Time until action is complete	Not applicable	Approximately 18 to 24 months	Approximately 18 to 24 months	Approximately 18 to 24 months	Approximately 18 to 24 months	Approximately 18 to 24 months

Table 18. (continued).

Criteria	Alternative 1 No Action	Alternative 3b Excavation, Consolidation, and Containment Using an Engineered Barrier	Alternative 4a Removal and Disposal on the INEEL	Alternative 4b Removal and Disposal off the INEEL	Alternative 5a Removal, Ex Situ Sorting, and Disposal on the INEEL	Alternative 5b Removal, Ex Situ Sorting, and Disposal off the INEEL
Implementability						
Ability to construct and operate	No construction or operation would be implemented	Would involve available construction technology.	Would involve available excavation and transportation technology.	Would involve available excavation and transportation technology.	Would involve available excavation, treatment and transportation technology.	Would involve available excavation, treatment, and transportation technology.
Ease of implementing additional action if necessary	May require repeat of feasibility study and record of decision process	Additional remedial actions would be difficult because the barrier is intended to prevent access to contamination. Barrier would require removal.	Additional remedial action would not be necessary because all contaminated soil and debris would be removed.	Additional remedial action would not be necessary because all contaminated soil and debris would be removed.	Could require additional excavation and transportation of soil.	Could require additional excavation and transportation of soil.
Ability to monitor effectiveness	Monitoring of conditions is readily implemented.	Barrier performance can be monitored through radiation surveys and can be visually assessed on the basis of physical integrity.	The effectiveness in removing all contaminated materials associated with the site would be easily monitored.	The effectiveness in removing all contaminated materials associated with the site would be easily monitored.	The effectiveness in removing all contaminated materials associated with the site would be easily monitored.	The effectiveness in removing all contaminated materials associated with the site would be easily monitored.
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required.	Disposal of a landfill within WAG 5 may not be accepted by agencies.	No difficulties identified.	No difficulties identified.	No difficulties identified.	No difficulties identified.
Availability of services and capacity	None required.	Barrier design and services reside within DOE and are considered readily available to the INEEL.	Services would be available either on the INEEL or through subcontractor. Disposal capability is assumed to exist at the INEEL.	Services would be available either on the INEEL or through subcontractor.	Services would be available either at the INEEL or through subcontractor. Disposal capability is assumed to exist on the INEEL.	Services would be available either on the INEEL or through subcontractors.
Availability of equipment, specialists, and materials	None required.	Equipment and materials are readily available at the INEEL or within surrounding communities.	Equipment and materials would be readily available at the INEEL or within the surrounding community.	Equipment and materials would be readily available at the INEEL or within the surrounding community.	Equipment and materials would be either available on the INEEL through subcontractors or would be purchased. Trained specialists would be available within the communities surrounding the INEEL.	Equipment and materials would be either available at the INEEL through subcontractors or would be purchased. Trained specialists would be available within the communities surrounding the INEEL.
Availability of technology	None required.	Readily available at the INEEL.	Readily available at the INEEL.	Readily available at the INEEL.	Available through subcontractors.	Available through subcontractors.

Table 18. (continued).

Criteria	Alternative 1 No Action	Alternative 3b Excavation, Consolidation, and Containment Using an Engineered Barrier	Alternative 4a Removal and Disposal on the INEEL	Alternative 4b Removal and Disposal off the INEEL	Alternative 5a Removal, Ex Situ Sorting, and Disposal on the INEEL	Alternative 5b Removal, Ex Situ Sorting, and Disposal off the INEEL
Cost (net present value, 5% discount rate)[a]						
Capital Cost	$1 million	$10 million	$14 million	$29 million	$20 million	$27 million
Operation and Maintenance Cost	$7 million	$8 million	NA	NA	NA	NA
Total Cost	$8 million	18 million	$14 million	$29 million	$20 million	$27 million

a. Details of the cost estimates are provided in the RI/FS report (Holdren et al. 1999, Appendix K).

8.8.5 Short-Term Effectiveness

Alternative 1, no action, would be the most effective in the short term because no actions resulting in additional worker exposure would occur. No off-Site exposures would occur because none of the sites are located near inhabited areas and public roads in the vicinity are sufficiently distant to preclude exposure. No additional environmental impacts would result from this alternative other than the extant conditions. Contaminant migration from surface soil via wind and water erosion is of concern. Therefore, the no action alternative would not satisfy remedial action objectives.

Alternative 3b, excavation, consolidation, and containment using an engineered barrier, and Alternative 4a, removal and disposal on the INEEL, are considered equally effective for short-term protection because both involve about the same degree of soil excavation and transport. Alternative 4b, removal and disposal off the INEEL, is considered slightly less effective because of some increase in potential risk to the public in the event of an accident during transportation to an off-Site disposal facility. Alternative 5a, removal, ex situ sorting, and disposal on the INEEL, and Alternative 5b, removal, ex situ sorting, and disposal off the INEEL, would be less effective than Alternatives 3b, 4a, and 4b in the short term because additional worker exposure would result from the increased handling of radiologically contaminated soil during the separation process. In the short term, Alternative 5b is the least effective of these options because of the potential risk to the public from off-Site transportation.

8.8.6 Implementability

Each of the alternatives is technically implementable. Alternative 1, no action, would be the most implementable because it would require no change in existing site conditions. Alternatives 3b, excavation, consolidation, and containment using an engineered barrier; 4a, removal and disposal on the INEEL; and 4b, removal and disposal off the INEEL, are equally implementable. All use conventional excavation equipment and rely on construction techniques that are known to be effective. Alternatives 5a, removal, ex situ sorting, and disposal on the INEEL, and 5b, removal, ex situ sorting, and disposal off the INEEL, are considered less implementable because of the lack of effectiveness of the segmented gate system in reducing the volume of radiologically contaminated soil at WAG 5 sites.

8.8.7 Cost

Alternative 4a, removal and disposal on the INEEL, is the least costly. Alternative 1, no action, is higher in cost because of long-term monitoring of the sites during the period of institutional control. Alternatives 3b, excavation, consolidation, and containment using an engineered barrier; 4b, removal and disposal off the INEEL; 5a, removal, ex situ sorting, and disposal on the INEEL; and 5b, removal, ex situ sorting, and disposal off the INEEL, have increased capital and operating and maintenance costs over those of Alternatives 1 and 4a. Alternative 3b is the most costly because of the capital costs involved in constructing the engineered barrier.

8.8.8 State Acceptance

The IDHW has been involved in the development and review of the OU 5-12 Comprehensive RI/FS report (Holdren et al. 1999), the Proposed Plan (DOE-ID 1999b), and this ROD. All comments received from IDHW on these documents have been resolved and the documents revised accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered. The IDHW concurs with the selected remedial alternative contained in this ROD for the contaminated soil sites and is a signatory to the ROD with DOE and EPA.

8.8.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held May 17 through 19, 1999 (see Section 3). The 30-day public comment period was May 10, 1999, through June 9, 1999. The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDHW assisted in the development of the responses.

In general, the public was supportive of the preferred alternative for the contaminated soil sites. One stakeholder representing the Sho-Ban tribe questioned the need for removing the soil from 42 acres at the ARA-23 site because the irreplaceable native ecosystem would be destroyed. As indicated in the Responsiveness Summary, removal of the contaminated soil is required to satisfy the CERCLA threshold criteria for protection of human health and the environment and compliance with the regulations.

8.9 Selected Remedy for the Contaminated Soil Sites

The selected remedy for the WAG 5 contaminated soil sites is Alternative 4a, removal and disposal of the contaminated soil at the INEEL. This remedy was selected based on the results of the comparative analysis of alternatives. Alternative 4a is the least costly alternative that meets threshold criteria (i.e., the remedy provides overall protection of human health and the environment and satisfies ARARs), is easily implemented because the required equipment already exists at the INEEL, and the long-term effectiveness is high because contamination will be permanently removed from the sites. The estimated time required to complete remediation is 18 to 24 months. The following activities will be conducted to complete remediation of the five contaminated soil sites ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16:

- Soil contaminated with concentrations in excess of the remediation goals will be removed using conventional earth-moving equipment (e.g., scrapers and backhoes). Remediation goals are identified in Table 16.

- Real-time analyses will be used before and during excavation to delineate the extent of contamination for removal. Soil sampling and laboratory analysis will be used to verify that remediation goals have been satisfied.

- Areas that have been excavated to depths greater than 0.3 m (1 ft) will be backfilled with uncontaminated soil or sloped to promote drainage. All excavations will be contoured to match the surrounding terrain and vegetated.

- Contaminated soil will be characterized and sent to the ICDF or another location within the INEEL for permanent disposal.

- Institutional controls consisting of signs, access controls, and land-use restrictions will be maintained until remediation is complete. Post-remediation institutional control requirements will be identified based on the results of post-remediation sampling. Institutional controls will not be required after remediation if all contaminated media are removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued bases on the results of a 5-year review.

- Five-year reviews will be conducted for remediated sites with institutional controls.

Removal of contaminated soil will be achieved using conventional excavation equipment. The relatively shallow depths of contaminated soils at WAG 5 sites will allow for excavation using front-end loaders, backhoes, and soil vacuum equipment.

Areas planned for excavation will be gridded, characterized, and excavated in discrete depth intervals. Real-time gamma surveys and real-time inductively coupled plasma spectrometry will be used both before and during excavation to delineate the extent of contamination for removal and to reduce the volume of uncontaminated soil removed. Excavation will proceed only to the depths at which contamination above the remediation goals is encountered. Sampling and analysis of soils underlying clean intervals will be used to verify that all soil with contaminant concentrations above the remediation goals is removed.

Current radiological control practices will be implemented to minimize radiation exposure to the operators. Radiological controls could consist of limiting the amount of time an operator can work in the area, requiring personnel to wear personal protective clothing, and using distance and shielding to reduce radiation exposure. Air emissions will be controlled by the use of water sprays or soil fixatives to suppress dust during soil excavation and removal.

Dump trucks will be positioned near the excavation so that loaders and backhoes can place the contaminated soil directly into the dump truck. A tarp will be unrolled over the truck box and secured to prevent accidental release during transit. The dump trucks will transport the soil to the ICDF or another approved location on the INEEL.

Though existing paved roadways between WAG 5 and the proposed location near the Idaho Nuclear Technology and Engineering Center (INTEC) for the ICDF could be used, the transportation distance will be greatly reduced by using the existing two-track dirt road between PBF and the INTEC. The dirt road will be widened and leveled, and a gravel base will be added. Roadway modification was not evaluated in the feasibility study, but a cost-benefit study is presently under way. If it is shown that the reduction in transportation costs will justify the expense of upgrading the road, a NEPA evaluation will be conducted. Construction to upgrade the roadway as described would be initiated only after approval of the appropriate NEPA documentation.

Following remediation, excavations exceeding 0.3 m (1 ft) in depth will be backfilled with uncontaminated soil or sloped to promote drainage. Shallow excavations will be contoured to blend with the existing landscape. Sites will be vegetated in accordance with INEEL guidelines (DOE-ID 1989).

Post-remediation requirements for institutional controls at each soil site, such as signs, access controls, and deed restrictions, will be determined after soil removal. Institutional controls will not be required if all soil down to basalt is removed or if soil concentrations are comparable to background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.

8.9.1 Estimated Cost for the Selected Remedy

The estimated cost for implementing Alternative 4a, removal and disposal on the INEEL, is $13.8 million. The elements of the cost estimate are summarized in Table 19 and details of the cost estimate are provided in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999, Appendix K). The costs are presented in net present value, which allows for the equal comparison of long-term and short-term alternatives while factoring in inflation. Cost estimates are based on the use and operation of excavation equipment and disposal. Cost allowances are used to account for shielding requirements, air pollution controls, monitoring equipment and analyses, waste characterization, and packaging.

Table 19. Cost estimate summary for Waste Area Group 5 contaminated soil sites selected remedy.

Planned Activity		Cost (Fiscal Year 1998 dollars)
FFA/CO management and oversight		
	WAG 5 management	375,000
Remedial design		
	Remedial design/remedial action scope of work	54,000
	Remedial action work plan	63,000
	Packaging, shipping, transportation documentation	48,000
	Remedial action report	48,000
	Data collection and management for first 5-year review	141,000
	Safety analysis documentation	101,000
	Sampling and analysis plan	108,000
	Pre-final inspection report	8,000
	Legal review	32,000
	Total title design package	71,000
	Site characterization	1,273,000
Remedial action—construction subcontract		
	Construction subcontract	4,197,000
	Onsite soil repository disposal fee	4,243,000
Project construction management		705,000
CAPITAL COST SUBTOTAL		11,467,000
	Contingency @ 30%	3,440,000
TOTAL CAPITAL COST IN FY-98 DOLLARS		14,907,000
TOTAL CAPITAL COST IN NET PRESENT VALUE		13,797,000
Operations		
	Program management	NA
	Data collection and management for 5-year reviews	NA
	Maintenance	NA
	Decontamination and dismantlement	NA
	Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL		NA
	Contingency @ 30%	NA
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1998 DOLLARS		NA
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		NA
TOTAL PROJECT COST IN NET PRESENT VALUE		13,797,000

8.9.2 Estimated Outcomes of the Selected Remedy

Cleanup of the contaminated soil sites to meet the remediation goals (see Table 16) can be achieved by soil excavation within 24 months after remediation is initiated. Cleanup to these goals will provide protection of ecological receptors, future workers, and residents. The institutional controls will provide protection of current workers. Current land-use projections (DOE-ID 1996a) indicate that these areas are designated for continued industrial use. However, the cleanup goals also will ensure adequate protection of future residents if these areas become available for residential use after the 100-year institutional control period assumed for the risk assessment.

8.10 Statutory Determinations for the Contaminated Soil Sites

8.10.1 Overall Protection of Human Health and the Environment

Alternative 4a, removal and disposal on the INEEL, provides highly effective, long-term protection of human health and the environment. The removal of all contaminated soil from WAG 5 would eliminate potential long-term human health and environmental concerns associated with future exposure to, or contaminant migration from, uncontrolled release sites. The ICDF or other INEEL disposal facility would provide isolation of the contaminated soil (1) within a controlled area in which waste management controls are in place and (2) for at least the period of institutional control.

Alternative 4a is protective of the environment during implementation because mitigative measures to prevent contaminant migration during excavation activities would be implemented. However, short-term protection of human health is considered only moderate because workers could receive direct exposure to contaminated soil during excavation. However, all potential risks during implementation could be controlled through administrative and engineering controls. Waste generated during remedial actions would consist of only relatively small quantities of equipment decontamination fluids and discarded personal protective equipment.

8.10.2 Compliance with ARARs and To-Be-Considered Guidance

The selected remedy meets the identified ARARs as shown in Table 20. Available data indicate that no RCRA hazardous waste is present at WAG 5 contaminated soil sites. This conclusion will be verified through analysis and waste designation during excavation. If any soil is determined to be classified as RCRA-regulated waste, the RCRA ARARs listed will apply. The soil will be disposed of at a compliant facility, such as the ICDF. Therefore, the RCRA ARARs will be met. Compliance with the emission control ARARs would be ensured by implementing air monitoring and dust suppression techniques during excavation. Department of Energy Order 5400.5, “Radiation Protection of the Public and the Environment,” would be met by implementing and enforcing applicable provisions of the order. The selected alternative is, therefore, capable of complying with ARARs and to-be-considered guidance (TBC).

8.10.3 Cost Effectiveness

The selected remedy is cost-effective because it is the least costly alternative that satisfies threshold criteria. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

Table 20. ARARs and TBCs for the selected alternative—removal, and on-site disposal—for WAG 5 contaminated soil sites.

Category	Citation	Reason	Relevancy
Action Specific ARARs			
Rules for the Control of Air Pollution in Idaho	Toxic Substances IDAPA 16.01.01.161 Toxic Air Emissions IDAPA 16.01.01.585 and .586	The release of carcinogenic and noncarcinogenic contaminants into the air must be estimated before the start of construction, controlled, if necessary, and monitored during excavation and sorting of soil.	A[a]
	Fugitive Dust IDAPA 16.01.01.650 and .651	Requires control of dust at all times, especially during excavation, sorting, and removing of soil.	
	Requirements for Portable Equipment IDAPA 16.01.01.500.02	Portable equipment for sorting and removal of soil, and any portable support equipment must be operated to meet state and federal air emissions rules.	A
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Radionuclide Emissions from DOE Facilities 40 CFR 61.92	Limits exposure of radioactive contamination release to 10 mrem/year for the off-site receptor and establishes monitoring and compliance requirements.	A
	Emission Monitoring 40 CFR 61.93		
	Emission Compliance 40 CFR 61.94(a)		
Resource Conservation and Recovery Act—Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Unit	General Waste Analysis IDAPA 16.01.05.008 (40 CFR 264.13 (a)(1-3))	Analysis requirements apply only to RCRA-hazardous soil and secondary waste generated during remediation.	A
	General Inspections IDAPA 16.01.05.008 (40 CFR 264.15)	For soil sites determined to be RCRA hazardous, regular inspections must be performed during remediation.	A

Table 20. (continued).

Category	Citation	Reason	Relevancy
	Preparedness and Prevention IDAPA 16.01.05.008 (40 CRF 264, Subpart C)	Applies to soil excavation, sorting, and decontamination activities at any site determined to be RCRA hazardous.	A
	Contingency Plan and Emergency Procedures IDAPA 16.01.05.008 (40 CRF 264, Subpart D)	Applies to soil excavation, sorting, and decontamination activities at any site determined to be RCRA hazardous.	A
	Equipment Decontamination IDAPA 16.01.05.008 (40 CFR 268.114)	All equipment used during remediation must be determinated if RCRA hazardous waste is contacted.	A
	Use and Management of Containers IDAPA 16.01.05.008 (40 CFR 264.171–177)	Applicable to RCRA hazardous soil and associated hazardous secondary waste generated by remediation that is managed in containers.	A
Resource Conservation and Recovery Act—Land Disposal Restrictions	Treatment Standards IDAPA 16.01.05.011 (40 CFR 268.40 (a)(b)(e))	Any RCRA hazardous soil and associated hazardous secondary waste must meet land disposal restrictions criteria before disposal.	A
	Treatment Standards for Hazardous Debris IDAPA 16.01.05.011 (40 CFR 268.45 (a–d))		A
	Universal Treatment Standards IDAPA 16.01.05.011 (40 CFR 268.48 (a))		A
	Alternative Treatment Standards for Contaminated Soil IDAPA 16.01.05.011 (40 CFR 268.49)		A

Table 20. (continued).

Category	Citation	Reason	Relevancy
Location-Specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2 Identifying Historic Properties 36 CFR 800.4 Assessing Effects 36 CFR 800.5	The site must be surveyed for cultural and archeological resources before construction and for appropriate actions taken to protect any sensitive resources.	A
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6) Repatriation 25 USC 3005 (43 CFR 10.10)	The site must be surveyed for cultural and archeological resources before construction and for appropriate actions taken to protect any sensitive resources.	A
To-be-considered (TBC) guidance			
Radiation Protection of the Public and the Environment	DOE Order 5400.5, Chapter II (1)(a,b)	Limits the effective dose to the public from exposure to radiation sources and airborne releases.	—[b]

a. A = Applicable.
b. TBCs are not classified as applicable or relevant and appropriate.

8.10.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy provides a permanent solution because contaminated soil will be permanently removed and contained in a facility off WAG 5, which will be designed for long-term isolation and protection. All COCs at the soil sites are radionuclides and toxic heavy metals. Presently, no technology is available that can reduce the toxicity of these contaminants. Only options that can reduce contaminant mobility or reduce the volume of contaminated soil are considered effective remediation strategies. Use of technologies such as in situ vitrification and stabilization can reduce contaminant mobility but will not significantly reduce the risk from external exposure to radiation. Hence, these technologies would not meet the primary human health remedial action objectives for the radionuclide soil sites. In addition, heavy metals over long periods of time will leach from such treated soil and, hence, future protection of the environment could not be guaranteed. Therefore, the most effective alternative would involve permanent removal of the contaminated soil.

8.10.5 Preference for Treatment as a Principal Element

Treatment technologies exist to reduce the mobility of radionuclides and heavy metals in soil and also to reduce the volume of soil contaminated with these contaminants, but no technology exists that can reduce the toxicity of radionuclides and heavy metals. Natural radioactive decay is the only means by which toxicity reduction of radionuclides occurs. Technologies to reduce the mobility and volume of contaminated soil were considered in the feasibility study and evaluated to the extent determined to be technically feasible and cost-effective. However, no treatment technologies currently exist that proved to be viable and cost-effective.

Soil sorting by use of a segmented gate system was evaluated in the feasibility study and a subsequent treatability study performed during June 1999. The results of this study indicated the volume reduction of radioactively contaminated soil was insignificant (Giles 1999b). Hence, this treatment technology (Alternative 5) was eliminated from further consideration.

Though technologies are available that could remove heavy metals from soil, the volume of soil contaminated with heavy metals is small and the concentrations of heavy metals are too low to be effectively treated by any of the currently available technologies. Therefore, treatment to reduce the volume of heavy metal contaminated soil was not pursued.

Technologies to reduce contaminant mobility, such as stabilization, vitrification, and containment, also were considered in the feasibility study. Neither stabilization nor vitrification would reduce the human health risk caused by radiation exposure, nor would they permanently isolate heavy metals from the environment. Hence these technologies were eliminated from consideration.

8.10.6 Five-Year Reviews

Five-year reviews will be conducted for all sites with institutional controls. Land use will be restricted at all contaminated soil sites until remediation is implemented as prescribed in this ROD. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.

9. ARA-02 SANITARY WASTE SYSTEM

Remedial action is required for the ARA-02 Sanitary Waste System to address the potential human health risk posed by contaminated sludge. Though the entire system will be removed, the risk at the site is associated only with the residual dry sludge in the system's seepage pit. The site characteristics including the nature and extent of contamination, the summary of site risks, remedial action alternatives and the selected remedy are presented below. More detailed information about the sanitary waste system can be found in the WAG 5 Comprehensive REFS report (Holdren et al. 1999).

The ARA-02 site is a sanitary septic system comprising three septic tanks in series, a seepage pit, and the associated piping. The system was built in 1960 and serviced permanent and temporary ARA-1 buildings until 1988 when ARA-I was inactivated. The ARA-02 septic system was designed and intended exclusively for sanitary waste. No known process waste was routed to the system, and no recorded spills or documented incidents were associated with the septic system. However, periodic surveys indicated radiological contamination. The source of the contamination is unknown. The site investigations, the summary of the risk assessment, and the nature and extent of contamination for COCs are presented below. Aerial photographs of Site ARA-02 before and after the D&D of AR-I are shown in Figure 21.

9.1 Site Investigations

As part of a Track 2 investigation (Pickett et al. 1993), soil samples were collected along the main line and outside of the seepage pit and septic tanks. The contents of the tanks, seepage pit, and main line also were sampled. The septic tanks and seepage pit contained RCRA F-listed (40 CFR 261, Subpart D) mixed waste, and low concentrations of contaminants were detected in the soil along the sides of the septic tanks and seepage pit. None of the soil samples, including those obtained outside the seepage pit, yielded concentrations of RCRA hazardous constituents. Low levels of beryllium, U-234, U-238, and Sr-90 were detected during the Track 2 sampling of the pipeline between the septic tanks and the seepage pit. Samples were not analyzed for gamma-emitting radionuclldes. In addition, the liquid levels inside the tanks were observed and found to vary over time, which indicated possible leakage to the soil below (Parsons 1996). On the basis of the Track 2 risk evaluation, removal of the septic tank contents, confirmation sampling, and a reevaluation of the site in the WAG 5 Comprehensive RI/FS were recommended.

In September 1996, a time-critical removal action was implemented at ARA-02 to remove the septic tank contents and to sample the seepage pit interior (Dietz 1998). The contents of all three septic tanks were removed and placed in drums in an approved temporary accumulation area to await final disposition. The sampling information from the 1996 removal action was reviewed and incorporated into the RI/FS.

The status of the integrity of the septic system was the only data gap identified for ARA-02 in the WAG 5 Work Plan (DOE-ID 1997a). Further investigation was planned to support site characterization, risk assessment, and the evaluation of remedial alternatives. Because the septic tanks and seepage pit are some distance apart, the risk for the soil surrounding the three septic tanks was evaluated separately from the seepage pit. The pipeline between the structures was not identified as a data gap and, therefore, was not investigated further. The data collected in 1997 to evaluate the two source areas in the WAG 5 Comprehensive RI/FS are summarized below.

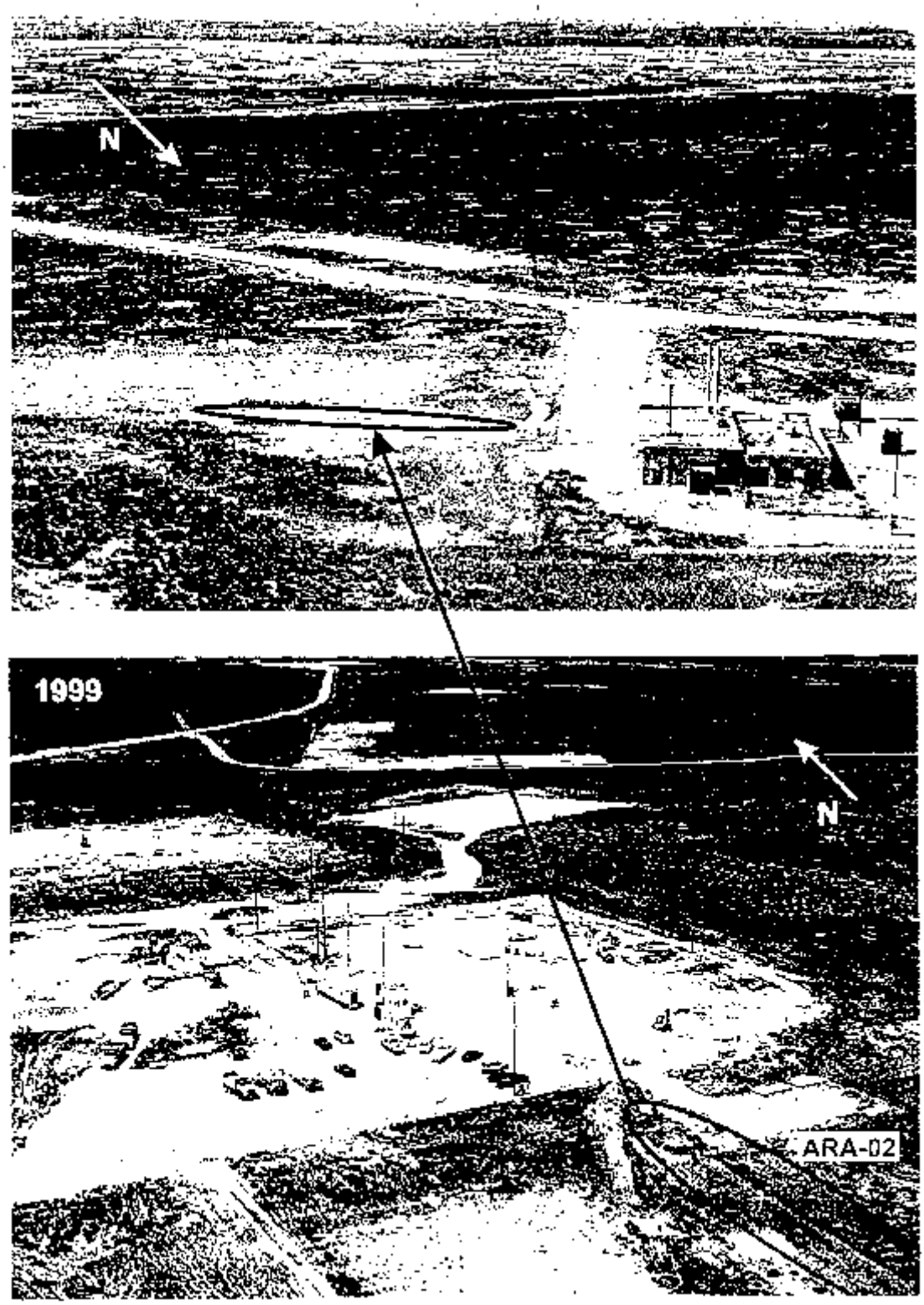


Figure 21. Aerial photographs of Site ARA-02 before and after the decontamination and dismantlement of the ARA-1 facility .

9.1.1 Investigations of the ARA-02 Septic Tank Soils

Sampling plans for the septic tank soil (DOE-ID 1997a) included collecting soil from boreholes drilled beside each of the three septic tanks and sampling the basalt interface. Boreholes were drilled, and samples were obtained from the soil adjacent to the first two septic tanks. Several attempts to drill a borehole next to the third septic tank were unsuccessful because the septic tank was blasted into basalt and the interface was only a few feet below land surface. Therefore, samples could be collected only from shallow soil rather than at the base of the tank (Wilson-Lopez 1997). Concentrations of arsenic, lead, Ra-226, Sr-90, U-234, and U-235 were detected in the septic tank soil in excess of human health contaminant screening levels. The complete sample results are given in the WAG 5 Comprehensive R/FS report (Holdren et al. 1999, Appendix E).

9.1.2 Investigations of the ARA-02 Seepage Pit

Samples were collected from both the interior of the seepage pit and from the soil outside of the pit. The seepage pit interior was sampled for radionuclides and hazardous constituents as determined by the removal action report during the time-critical removal action (Dietz 1998). Exterior soil samples were analyzed for radionuclides, toxicity characteristic leaching procedure (40 CFR 261.24) metals, PCBs, and volatile organics.

The construction details for the pit indicated that the top of the pit was 23 cm (9 in.) below the surface, the bottom was 2.4 to 2.9 m (8 to 9.5 ft) below the surface, and the pit bottom had a 20-cm (8-in.) foundation with an opening in its center to allow subsurface drainage. When the first borehole was drilled approximately 45.7 cm (18 in.) from the side of the seepage pit, samples were collected from the interval at 1 to 1.2 m (3.5 to 4 ft). However, samples could not be collected at 2.9 to 3 m (9.5 to 10 ft) because cobble had been used to surround the pit instead of dirt. A clay layer at the basalt interface was too small for an adequate sample (Wilson-Lopez 1997). A second borehole was attempted on the opposite side of the seepage pit, but no samples could be obtained because of cobble and basalt. A third attempt between the first borehole and the seepage pit wall was successful, and the clay layer at the basalt interface was thick enough to obtain an adequate sample (Wilson-Lopez 1997). Each sample and each borehole at the basalt interface were surveyed for radioactivity, and no measurable radioactivity was detected (Wilson-Lopez 1997).

Contaminants detected in the sludge at concentrations in excess of human health screening levels include Ag-108m, Am-241, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Np-237, Pu-238, Pu-239/240, Ra-226, Sr-90, Tc-99, Th-230, U-234, U-235, U-238, arsenic, cadmium, chromium, copper, lead, nickel, silver, Aroclor-1242, and diethylether. Based on process knowledge, the sludge was identified as RCRA F-listed waste. The contaminants detected in the soil surrounding the seepage pit include Am-241, Cs 13 7, Eu-152, Ra-226, U-234, U-235, U-238, arsenic, chromium, copper, lead, and nickel. Ecologically based screening levels were exceeded for barium, chromium, and copper in the soil outside of the seepage pit.

9.2 Nature and Extent of Contamination

The location of ARA-02 relative to ARA-I, contaminant profiles for the COCs, and the source volume used in the risk assessment are illustrated in Figure 22. The ARA-02 site was treated as two individual sources in the BRA: (1) the seepage pit and (2) the soil around the septic tanks. Only the contaminants in the seepage pit sludge are identified as COCs. However, the entire Sanitary Waste System will be removed during remediation of the site.

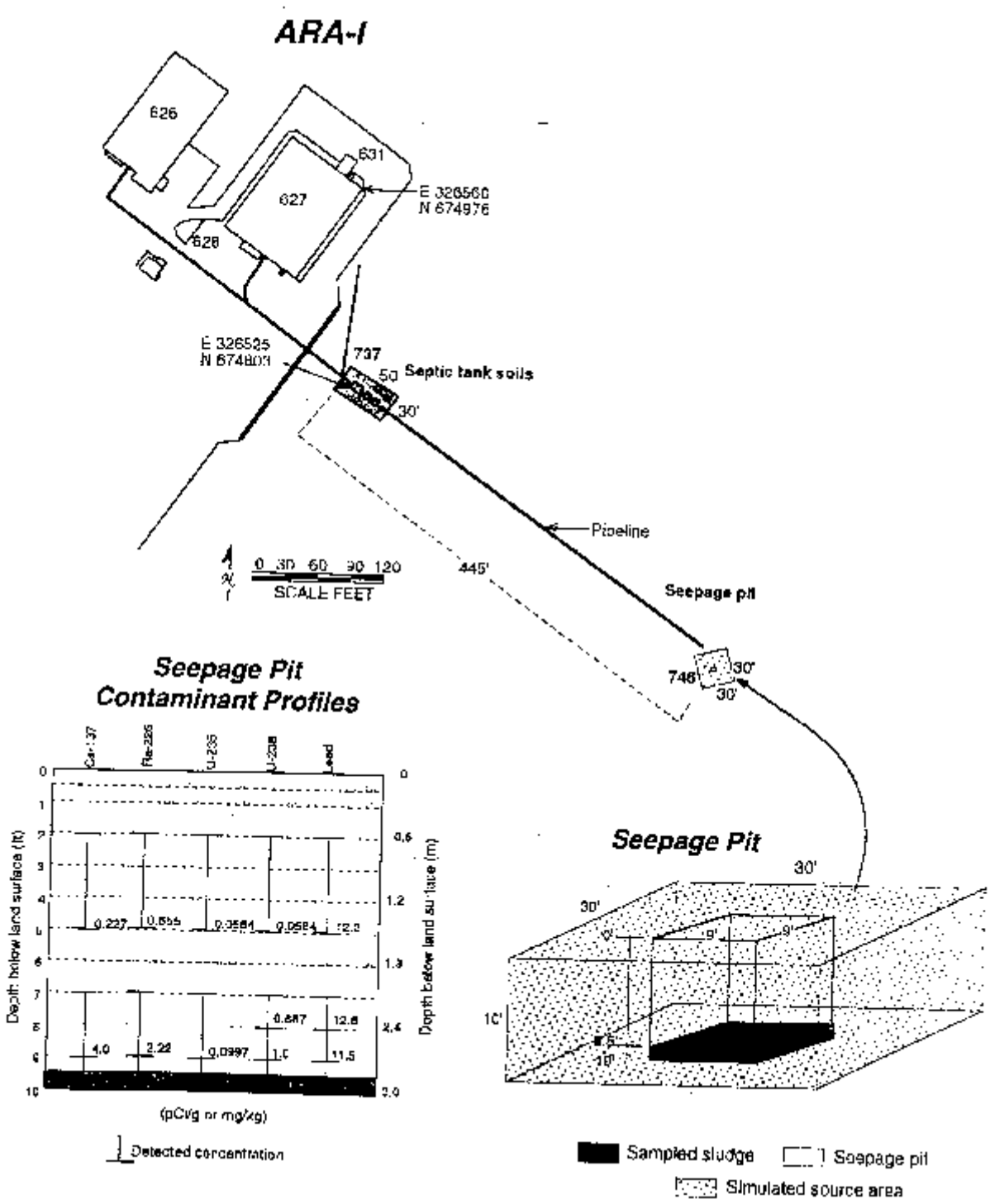


Figure 22. Site ARA-02, ARA-1 Sanitary Waste System.

The COCs in the seepage pit sludge are represented in Figure 22 as the depth interval from 2.9 to 3 m (9.5 to 10 ft). The area above 3 m (9.5 ft) is void space. The 0.6 to 1.5-m (2 to 5-ft) and 2.1 to 2.7-m (7 to 9-ft) concentrations were detected in the soil outside of the seepage pit. These concentrations are all less than remediation goals.

9.3 Summary of Site Risks

The ARA-02 seepage pit was retained for quantitative risk assessment in the WAG 5 comprehensive BRA (Holdren et al. 1999) to evaluate the human health risk from contaminants detected in the seepage pit sludge and the human and ecological risks associated with seepage pit soil.

9.3.1 ARA-02 Seepage Pit Human Health Risk Assessment

Because the septic tanks and seepage pit are separated by approximately 122 m (400 ft) of pipe, the risk for the soil surrounding the three septic tanks was evaluated separately from the seepage pit. The evaluation incorporated the assumption that the pipeline between the septic tanks and the seepage pit is not a source of environmental contamination. No COCs were identified for the septic tank soil because the total risk for all contaminants is less than 1 E-04 for the future residential scenario.

Concentrations detected in the seepage pit sludge were evaluated as concentrations in soil. Cesium-137, Ra-226, U-235, U-238, and lead were identified as COCs based on the results of the human health risk assessment. A summary of the information about the COCs in soil at ARA-02 is given in Table 2 1.

Table 21. Soil concentrations[a] for the contaminants of concern at ARA-02.

Contaminant of Concern	Half-life (years)	Minimum Concentration (pCi/g or mg/kg)	Maximum Concentration (pCi/g or mg/kg)	Frequency of Detection	Background Concentration[b] (pCi/g or mg/kg)	Exposure Point Concentration (PCi/g or mg/kg)	Statistical Measure[c]
Cs-137	30	0.23	178	14/16	0.82[d]	15.0	UCL
Ra-226	1,600	1.68	89.6	9/10	1.2 or 2.1[e]	9.6	UCL
U-235	7.0E+08	0.058	120	16/19	0	120	UCL
U-238	4.5E+09	0.687	190	14/16	1.4[d]	19.4	UCL
Aroclor-1242	NA	5.5	23.5	10/13	0	1.8	UCL
Lead	NA	11.5	1,290	14/14	17[d]	NC[f]	NC

a. The contaminant concentrations were detected in the sludge, but risk was evaluated using soil parameters,
b. The exposure point concentration is the 95% upper confidence limit on the mean soil concentration averaged over a 3-m (10-ft) soil interval.
c. The UCL is the 95% upper confidence limit on the mean soil concentration.
d. The background value for composited samples is from Rood, Harris, and White (1996).
e. The average [NEEL background concentration is 1.2 pCi/g for analysis that accounts for U-235 and 2.1 pCi/g to include interference from U-235 (Giles 1998a).
f. NC- not calculated

The total estimated risk associated with the seepage pit for all pathways for the 100-year future residential scenario is 2E-03 (2 in 1,000). The primary components are 2E-03 (2 in 1,000) from Ra-226, 913-05 (9 in 100,000) from U-23 5, 7E-05 (7 in 100,000) from Cs-137, and 3E-05 (3 in 100,000) from U-238. In addition, Aroclor-1242 and lead may pose threats to human health.

Reference doses specific to the PCB Aroclor-1242 have not been approved by the EPA. Values for Aroclor-1254 were used to assess the qualitative magnitude of the potential hazard index for Aroclor-1242. Because the estimated noncarcinogenic hazard index is greater than 1.0, Aroclor-1242 was identified as a COC.

Human health risk from lead could not be quantified because toxicity data for lead have not been developed. However, the maximum detected concentration of lead in the seepage pit sludge, 1,290 mg/kg, exceeds the EPA 400 mg/kg screening level for soil (EPA 1994b). Therefore, remediation of the seepage pit will mitigate potential adverse effects from lead.

The concentrations of Ra-226 in the ARA-02 seepage pit sludge ranged from 1.6 to 89.6 pCi/g. Because the sample concentrations are well above the INEEL background concentration of 1.2 pCi/g (Giles 1998a), a correction factor was not developed and Ra-226 was identified as a COC.

The total estimated risk for all pathways for the current occupational scenario is less than 1 E-04, and the noncarcinogenic hazard index for the current occupational scenario is less than 1.0.

The total risk estimated for all pathways for the 100-year occupational scenario is less than 1 E-04, and the noncarcinogenic hazard index for the future occupational scenario is less than 1.0.

9.3.2 ARA-02 Ecological Risk Assessment

No COCs were identified for the septic tank soil based on the results of the ERA because the threshold HQ value of 1 was not exceeded. The seepage pit sludge is not available to ecological receptors.

9.4 Remediation Objectives for the ARA-02 Sanitary Waste System

Remediation objectives based on the unacceptable risks discussed previously (Section 9-3) were developed for the ARA-02 Sanitary Waste System. No unacceptable ecological risk is associated with the system. Human health risk in excess of 1 E-04 is posed primarily by external exposure to ionizing radiation. The radioactive contaminants of concern are Cs-137, Ra-226, U-235, and U-238. Dermal adsorption and ingestion of PCBs and ingestion of lead pose secondary human health risks. A summary of the risks is provided in Table 7.

Remedial action objectives for the ARA-02 Sanitary Waste System apply only to the ARA-02 seepage pit sludge because all COCs at the site are contained within the sludge. The following remedial action objectives were developed to protect human health:

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and future residents.

- Inhibit dermal adsorption of contaminants of concern that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of 2 or greater for current and future workers and future residents.

To meet these objectives, remediation goals were established. Except for lead and the PCB Aroclor-1242, the remediation goals for ARA-02 are risk-based soil concentrations equivalent to a risk of 1E-04 in the future residential scenario. The remediation goals and the basis for each goal are provided in Table 22. These goals are at the upper end of the acceptable risk range because conservative parameters

Table 22. Remediation goals for the ARA-02 Sanitary Waste System.

Contaminant of Concern	Soil Concentration Remediation Goal	Derivation	Reference	Risk Scenario
Cs-137	8.5 pCi/g[a]	Calculated based on 1E-04 cumulative external exposure risk	Fromm (1996)	100-year future residential
Ra-226	1.2 or 2.1 pCi/g[b]	Background concentration	Giles (1998a)	100-year future residential
U-235	6.2 pCi/g[a]	Calculated based on 1E-04 cumulative external exposure risk	Fromm (1996)	100-year future residential
U-238	10.6pCi/g[a]	Calculated based on 1E-04 cumulative external exposure risk	Fromm (1996)	100-year future residential
Aroclor-1242	1mg/kg[c]	Toxic Substance Control Act	40 CFR 761.61(a)(i)(A)[c]	Unrestricted release
Lead	400 mg/kg	EPA	Statutes[d]	Human health[c]

a. The remediation goals for Cs-137, U-235, and U-238 are weighted averages based on relative risk contributions and 100 times the 1E-06 risk-based soil concentrations reported by Fromm (1996). The cumulative risk for Cs-137, U-235, and U-238 is 1E-04 at the remediation goal soil concentrations.

b. The remediation goal is the average INEEL background value for Ra-226 reported by Giles (1998a) because the 1E-04 risk-based concentration derived from Fromm (1996), 0.55 pCi/g, is below the INEEL average background concentration. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235. Otherwise, a goal of 1.2 pCi/g will be used. Further details are available in Giles (1998a).

c. The reference addresses polychlorinated biphenyl remediation waste for high-occupancy areas. Though the seepage pit sludge is not remediation waste, 1-mg/kg was identified as a protective remediation goal for the Aroclor-1242 contained in the seepage pit suldge. A noncarcinogenic risk-based remediation goal could not be developed because a reference dose for calculating a hazard quotient specific to Aroclor-1242 is not available. The toxicity of Aroclor-1242 was qualitatively assessed using the reference does for Aroclor-1254.

d. On July 14,1994, the EPA issued guidance recommendations for lead in paint, dust and soil under the authority of Section 1021, Title X of the Housing and Community Development Act of 1992; and Section 403 of the Toxic Substance Control Act. The current approach to addressing lead in soil at CERCLA and RCRA sites was established in Offices of Solid Waste and Emergency Response (OSWER) Directive 9555.4-12 (EPA 1994b). Human health risks were not quantified because approved toxicity data for risk calculations are not available.

were used in the risk assessment, because risk from background concentrations at the INEEL exceed 1E-06, and because EPA radiation standards, which apply to risks from exposure to radionuclides, are generally set at a risk level of 1 in 10,000.

Remediation goals can be satisfied by either cleaning up to the identified contaminant concentration (see Table 22) or by removing all contaminated media down to the basalt interface. Removing soil down to basalt will be protective because surface exposure pathways will be eliminated. The WAG 5 Comprehensive RI/FS (Holdren et al. 1999) showed that groundwater exposure pathways pose a cumulative risk less than 1E-04 and a hazard index less than 1 for the baseline no action alternative. Removal of contaminated media from WAG 5 will further reduce the potential groundwater risk. Therefore, remediation to retrieve residual contamination that may have migrated into the fractured basalt would not be justified.

9.5 Description of Alternatives for the ARA-02 Sanitary Waste System

Four primary remedial alternatives were developed for the ARA-02 Sanitary Waste System: Alternative 1, no action; Alternative 2, limited action; Alternative 3, removal, ex situ treatment, and disposal; and Alternative 4, in situ stabilization and encapsulation. Alternative 2, limited action, was screened out in the feasibility study because it did not provide protection of human health beyond the 100-year period of institutional control. Alternative 3b, removal, ex situ chemical stabilization, and disposal (a subcategory of Alternative 3), also was screened out in the feasibility study because chemical stabilization is not as effective as thermal treatment, the implementability is lower, and the cost is higher. Though Alternative 1, no action, does not satisfy threshold criteria, it was retained for detailed evaluation to serve as the baseline for comparing other remedial action alternatives.

9.5.1 Alternative 1, No Action

The no action alternative developed for the ARA-02 Sanitary Waste System consists of groundwater, air, and soil monitoring, Based on the WAG 5 BRA (Holdren et al. 1999), additional groundwater monitoring would not be required for ARA-02 seepage pit waste because the risk assessment modeling indicates that migration of the current contents of the seepage pit would not affect groundwater. No active remediation would be performed under this alternative to alter existing site conditions.

9.5.2 Alternative 3a, Removal, Ex Situ Thermal Treatment, and Disposal

Alternative 3a, removal, ex situ thermal treatment, and disposal, comprises excavation of the seepage pit, removal of the sludge, shipment, ex situ thermal treatment outside of WAG 5, and disposal of the treated waste. The seepage pit would be excavated using conventional construction equipment.

The seepage pit sludge can be accepted for incineration at WERF. Because the sludge is dry, no adsorbents would be necessary. Treated residuals would be stabilized if necessary to meet the disposal criteria of an off-Site permitted facility such as Envirocare in Clive, Utah. The pumice blocks, concrete septic tanks, and associated piping would be shipped for disposal to an off-Site permitted facility such as Envirocare.

9.5.3 Alternative 4, In Situ Stabilization and Encapsulation

Alternative 4, in situ stabilization and encapsulation, consists of partially filling the seepage pit with soil and then grouting the seepage pit sludge and pumice blocks in place. In addition, the three empty concrete septic tanks and associated piping would be filled with grout. Jet grouting would be used

in the seepage pit to ensure adequate mixing of the sludge with the grout material to stabilize the waste and completely encapsulate the entire seepage pit system. After the seepage pit is stabilized and encapsulated, a gravity feed system would be used to fill the remainder of the septic system with grout.

Institutional controls and environmental monitoring would be implemented to restrict access and confirm that contamination was not migrating from the site. Institutional controls include deed restrictions and construction of perimeter fencing. The environmental monitoring would include groundwater and vadose zone monitoring, radiation surveys, and soil sampling and analysis. Five-year reviews would be conducted to evaluate the effectiveness of the institutional controls and treatment and identified maintenance needs.

9.5.4 Comparison of Elements and Distinguishing Features of Each Alternative

The relative performance of each alternative is described in Table 23.

9.6 Comparative Analysis of Alternatives for the ARA-02 Sanitary Waste System

The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43[f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

9.6.1 Overall Protection of Human Health and the Environment

Alternative 1, no action, would not prevent exposures resulting in risks greater than 1E-04 or hazard indices greater than 1.0 for ARA-02. Alternative 3a, excavation, ex situ thermal treatment, and disposal, would provide the most effective long-term protection of human health and the environment because the contaminated media would be removed from WAG 5. Alternative 4, in situ stabilization and encapsulation, would be somewhat less protective within WAG 5 because the stabilized waste would remain at ARA-1.

9.6.2 Compliance with ARARs

The ARARs for Alternative 1, no action, would not be met for ARA-02. Alternative 3a, removal, ex situ thermal treatment, and disposal, and Alternative 4, in situ stabilization and encapsulation, both meet all ARARs.

9.6.3 Long-Term Effectiveness and Permanence

Alternative 1, no action, would provide the least long-term effectiveness and permanence for ARA-02. Alternative 3a, excavation, ex situ thermal treatment, and disposal, would provide the highest degree of long-tern effectiveness and permanence because the waste would be removed from WAG 5.

9.6.4 Reduction of Toxicity, Mobility, or Volume through Treatment

For ARA-02, for all considered alternatives, with the exception of Alternative 1, no action, the waste would be treated to reduce toxicity, mobility, and volume. When compared to Alternative 4, in situ stabilization and encapsulation, Alternative 3a, removal, ex, situ thermal treatment, and disposal, would provide greater reduction in toxicity, mobility, and volume.

Table 23. Detailed analysis summary of remediation alternatives for the ARA-02 Sanitary Waste System.

Criteria	Alternative 1 No Action	Alternative 3a Removal, Ex Situ Thermal Treatment, and Disposal	Alternative 4 In Situ Stabilization and Encapsulation
Overall protection of human health and the environment			
Human health protection	No reduction in risk	Would eliminate potential exposure to waste by removing contamination from WAG5.	Would eliminate potential exposure by stabilizing and encapsulating the waste
Environmental protection	Allows continued ecological exposures and risk of tank waste release	Would eliminate potential ecological exposure to waste by removing contamination from WAG 5	Would eliminate potential exposure by stabilizing and encapsulating the waste
Compliance with applicable, relevant, and appropriate requirements (ARARs)			
Action-specific			
Idaho Hazardous Waste Management Act– IDAPA 16.01.05.006, .008, and .011	Would not meet ARAR.	Would meet ARAR	Would meet ARAR.
Resource Conservation and Recovery Act– 40 CFR 262, 264, and 268	Would not meet ARAR.	Would meet ARAR.	Would meet ARAR.
Idaho Fugitive Dust Emissions–IDAPA 16.01.650 through .651	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Rules for Control of Air Pollution in Idaho– IDAPA 16.01.01.210, and IDAPA 16.01.01.585 through .586:	Not Applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
NESHAP–40 CFR 610.92 and .93	Would meet ARAR because waste is not a source of air emissions.	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Chemical-specific			
Idaho Groundwater Quality Rule–IDAPA 16.01.11.200	Would not meet ARAR	Not applicable	Would meet ARAR through monitoring
Location-specific			
Rules for Control of Air Pollution in Idaho– IDAPA16.01.01.581	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Native American Graves Protection and Repatriation Act–25 USC 32	Would meet ARAR	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.
National Archeological and Historic Preservation Act–36 CFR 800	Would meet ARAR	Would meet ARAR through surveys and assessment and action deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary.
To be considered (TBC)			
Radiation Protection of the Public and Environment–DOE Order 5400.5	Would not meet TBC because no controls would be implemented	Would meet TBC through use of administrative control.	Would meet TBC through use of administrative controls.

Table 23. (Continued).

Criteria	Alternative 1 No Action	Alternative 3a Removal, Ex Situ Thermal Treatment, and Disposal	Alternative 4 In Situ Stabilization and Encapsulation
Long-term effectiveness and permanence			
Magnitude of residual risk	No change from existing risk	No residual risk would remain at the site.	Would eliminate source-to-receptor pathways.
Adequacy and reliability of controls	No control and, therefore, no reliability.	Disposal facilities for treated waste, contaminated soil, and debris are assumed to provide adequate and reliable control for the period of institutional control.	Stabilized and waste form is estimated to provide reliable control over contamination in waste for least 1,000 years.
Reduction of toxicity, mobility, or volume through treatment			
Treatment process used	Not applicable	Incineration	Stabilization and encapsulation
Amount destroyed or treated	Not applicable	Approximately 100%	Approximately 100%
Reduction of toxicity, mobility, or volume	Not applicable	50 to 80% volume reduction, 70% mobility reduction, and 50% toxicity reduction.	20 to 50% volume increase, more than 90% mobility reduction, 0% toxicity reduction.
Irreversible treatment	Not applicable	Not reversible, but would afford long-term stability.	Not reversible, but would afford long-term stability.
Type and quantity of residuals remaining after treatment	Not applicable	No waste would be left at the site. Incinerator ash would remain after treatment of the seepage pit sludge.	Stabilized waste form, decontamination fluids, used personal protective equipment, and air pollution control filters
Statutory preference for treatment	Not applicable	Meets preference Meets preference	
Short-term effectiveness			
Community protection	Would not increase potential risks to the public.	Would be slight increase in potential risks to the public during transportation.	Would not increase potential risks to the public.
Worker protection	Not applicable	Workers would be protected by engineering and administrative controls.	Workers would be protected by engineering and administrative controls.
Environmental impacts	No change from existing conditions	Limited to disturbances from vehicle and material transport activities associated with excavation of the seepage pit. Use of containment systems with high-efficiency particulate air filtration and dust suppressants would significantly limit the potential for airborne contamination.	Limited to disturbances from vehicle and material transport activities associated with jet grouting of the seepage pit and grouting of the septic tanks and associated piping. Use of containment systems with high-efficiency particulate air filtration and dust suppressants would significantly limit the potential for airborne contamination.
Time until action is complete	No applicable	Approximately 18 to 24 months	Approximately 12 to 15 months.

Table 23. (continue).

Criteria	Alternative 1 No Acton	Alternative 3a Removal, Ex Situ Thermal Treatment, and Disposal	Alternative 4 In Situ Stabilization and Encapsulation
implementability			
Ability to construct and operate	No construction or operation.	Easy. Implementation would involve available excavation, transportation, and treatment technology.	Easy., would involve available grouting and construction technology.
Ease of implementing additional action if necessary	Could require repeat of feasibility study and record of decision process.	Easy. The incinerator residue could be stabilized or encapsulated using existing technology.	Moderately difficult. The stabilized waste form could be excavated, removed, and disposed of if required.
Abiliity to monitor effectiveness	Monitoring of conditions would be readily implemented.	Sampling of waste residue to verify treatment performance would be routine.	The effectiveness in stabilizing all contaminants would be easily monitored.
Ability to obtain approvals and coordinate with regulatory agencies.	No approvals required	Relatively easy	Relatively easy
Availability of services and capacity	None required.	Services would be available at the INEEL	Services available at the INEEL or through a subcontractor.
Availability of equipment, specialists, and materials	None required	Equipment and materials would be either available at the INEEL, through subcontractor, or would be purchased.	Equipment and materials would be available either at the INEEL, through subcontractors, or would be purchased.
Availability of technology	None required	Available at the INEEL	Available at the INEEL and commercially
Cost (net present value, 5% discount rate)[a]			
Capital Cost	$1.6 million	$2 million	$1.9 million
Operations and Maintenance Cost	$7.7 million	NA	$5.6 million
Total Cost	$9.3 million	$2 million	$7.5 million

a. Details of the cost estimates are provided in the RI/FS report (Holdren et al. 1999, Appendix K).

9.6.5 Short-Term Effectiveness

Alternative 1, no action, would be the most effective in the short term because no actions resulting in additional worker exposure would occur. No off-Site exposures will occur because none of the sites are located near inhabited areas and no public roads are in the vicinity. No additional environmental impacts will result from this alternative other than from extant conditions. In the short term, Alternative 4, in situ stabilization and encapsulation, is more effective than Alternative 3a, removal, ex situ thermal treatment, and disposal, because no potential receptors would be in direct contact with the seepage pit sludge. However, because the contamination levels in the sludge are low, the risk to workers in implementing Alternative 3a would be low.

9.6.6 Implementability

Each of the alternatives retained for detailed analysis is technically implernentable. Alternative 1, no action, would be the most implementable for ARA-02 because it would require no change from extant site conditions.

Alternative 3a, removal, ex situ thermal treatment, and disposal, and Alternative 4, in situ stabilization and encapsulation, are equally implementable. For both Alternatives 3a and 4, conventional and readily available equipment and technologies known to be effective would be used. The facilities for treatment of ARA-02 sludge under Alternative 3a presently exist at the INEEL. The jet grouting technique that would be used in Alternative 4 was developed and tested at the INEEL, and the equipment and methods required to implement the alternative are available commercially.

9.6.7 Cost

Alternative 3a, removal, ex situ thermal treatment, and disposal, is the least costly. Alternatives 1, no action, and 4, in situ stabilization and encapsulation, are higher in cost because of long-term monitoring of the site during the period of institutional control. Alternative 4 has increased capital and operating and maintenance costs over those of Alternative 3a.

9.6.8 State Acceptance

The IDHW has been involved in the development and review of the OU 5-12 RI/FS report (Holdren et al. 1999), the Proposed Plan (DOE-D) 1999b), and this ROD. All comments received from D)HW on these documents have been resolved and the documents revised accordingly. In addition, lDHW has participated in public meetings where public comments and concerns have been received and responses offered. The IDHW concurs with the selected remedial alternative for the ARA-02 Sanitary Waste System contained in this ROD and is a signatory to the ROD with DOE and EPA.

9.6.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held May 17 through 19, 1999 (see Section 3). The 30-day public comment period was May 10, 1999, through June 9, 1999, The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDHW assisted in the development of the responses.

All comments received on the Proposed Plan were considered during the development of this ROD. The public was supportive of the preferred alternative for the ARA-02 Sanitary Waste System and

generally concurred with the conclusion that removal of the waste system is required to satisfy the CERCLA threshold criteria for protection of human health and the environment and compliance with the regulations.

9.7 Selected Remedy for the ARA-02 Sanitary Waste System: Alternative 3a, Removal, Ex Situ Thermal Treatment, and Disposal

The selected remedy for the ARA-02 Sanitary Waste System is Alternative 3a, removal, ex situ thermal treatment, and disposal. This remedy was selected based on the comparative analysis of alternatives. Alternative 3a is the least costly alternative that meets threshold criteria (i.e., provides overall protection of human health and the environment and satisfies ARARs), is easily implemented because the treatment technology exists at the INEEL and is currently operational, and long-term effectiveness is high because contamination will be permanently removed from the site and treated to reduce toxicity, mobility and volume. The estimated time required to complete remediation is 18 to 24 months. The activities to implement this alternative include the following:

- Excavation and removal of the sludge and all components of the septic system
- Shipment of the structural components of the system to an acceptable disposal facility (for cost estimation purposes, Envirocare was selected as the representative facility)
- Shipment of the sludge for treatment at WERF and then shipment of treated residuals to Envirocare
- Additional sampling of the soil to be excavated, the sludge in the seepage pit, and the septic tanks, piping, and pumice blocks
- Dust control and environmental monitoring to be conducted during active remediation.

The only waste in the system is the sludge in the bottom of the seepage pit. Waste was previously removed from the septic tanks. The dry sludge remaining in the seepage pit contains low concentrations of radionuclides, heavy metals, and organics, including Aroclor-1242. Analysis indicates that this sludge is not RCRA characteristic. However on the basis of sludge analysis from the septic tanks and process knowledge, the seepage pit sludge, pumice blocks, septic tanks, and associated piping are designated RCRA F-listed (i.e., F-001) for 1,1,1-trichloroethane and trichloroethylene.

It is not known when PCB; material was introduced into the septic system, nor are the form and concentration of the original PCB material known. Therefore, the concentration of the PCB, as found in the sludge, was used to determine the regulatory status under TSCA in accordance with EPA guidance on cleanup of PCB waste under CERCLA (Clay and Fisher 1990; EPA 1990). Because the average concentration of Aroclor-1242 in the sludge is 13 mg/kg with a maximum concentration of 23 mg/kg, the sludge is not TSCA regulated. Remediation goals for the ARA-02 Sanitary Waste System are listed in Table 22.

Excavation and removal of the seepage pit and the associated septic system will require use of conventional excavation equipment such as backhoes and front-end loaders and hand digging. Soil will be removed first from around the seepage pit and septic system tanks and pipes. Because soil sample results indicate that the concentrations of all contaminants are well below the remediation goals, remediation of ARA-02 soil is not anticipated and the soil will be returned to the excavation.

After soil is removed from around the seepage pit, the pumice blocks will be removed, sampled and analyzed, then packaged for shipment to a RCRA permitted off-site disposal facility such as Envirocare. The pumice blocks comprising the walls of the seepage pit have not been sampled. Since the seepage pit was designed to allow waste to leach into the ground, it is assumed the blocks are contaminated with the same compounds detected in the sludge and at similar concentrations. Therefore, the blocks would meet RCRA land disposal criteria without treatment. However, if sampling indicates the blocks are contaminated at significantly higher levels than detected in the sludge, the disposal facility may be required to encapsulate the pumice blocks to satisfy waste acceptance criteria for disposal. Because of the porous nature of the pumice blocks, decontamination to meet the RCRA clean debris standard is not feasible.

The septic tanks and associated piping also will be removed, sampled, analyzed, and packaged for shipment to a RCRA-permitted mixed waste disposal facility off the INEEL, such as Envirocare. If the waste acceptance criteria for the ICDF or another INEEL facility allow disposal of RCRA-listed waste, the tanks and piping can be disposed of at the INEEL. Though the septic tanks and piping were not previously sampled, it is anticipated that contamination levels will be low. Septic tanks and the associated piping are typically constructed to be impervious and water tight, hence contamination should be limited to the surfaces that came in contact with the waste. Furthermore, after the contents were removed from the septic tanks during the previous removal action, the sides and bottom of the tanks were thoroughly scraped to remove all visible traces of waste (Dietz 1998). Therefore, it is anticipated that the tanks and pipes will meet RCRA land disposal criteria without further treatment. However, encapsulation at Envirocare will be performed if required to meet the waste disposal criteria.

The ARA-02 seepage pit sludge will be removed and packaged for shipment and incineration at WERF. Because the sludge is dry, no adsorbents would be necessary. The treatment residuals will be transported for disposal at a permitted disposal facility off the INEEL, such as Envirocare. If required, the treated residuals will be stabilized at WERF before shipment to meet the waste acceptance criteria for the disposal facility.

Current radiological and industrial hygiene control practices will be used to reduce radiation and exposure to toxic materials for workers. Radiological controls could consist of limiting the amount of time workers are allowed to work in the area, requiring personnel to wear personal protective clothing, and, imposing distance and shielding limits to reduce radiation exposure. Industrial hygiene controls could include use of personal protective clothing to prevent dermal exposure to contaminants and respirators to prevent inhalation of toxic substances. Air emissions will be controlled by the use of water sprays or soil fixatives to suppress dust during soil excavation and removal.

During excavation, soil sampling and analysis will be performed to verify that the COC concentrations are less than the remediation goals. If soil is discovered with contamination exceeding soil remediation goals, the contaminated soil will be disposed of in conjunction with the remediation of the contaminated soil sites (see Section 8). Following removal of the ARA-02 Sanitary Waste System, the excavated site will be backfilled with uncontaminated soil, compacted, and vegetated in accordance with INEEL guidelines (DOE-ID 1989).

9.7.1 Cost

The estimated cost for Alternative 3a, removal, ex situ thermal treatment, and disposal, is $2 million. The elements of the cost estimate are summarized in Table 24 and details of the cost estimate are provided in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999, Appendix K). The cost analysis incorporates the assumption that post-closure monitoring and maintenance will not be required.

9.7.2 Estimated Outcomes of the Selected Remedy

Removal of all seepage pit sludge, contaminated gravel, and pumice blocks will result in a cleanup that exceeds the remediation goals and provides protection of current and future workers and residents. In addition, the removal of all three septic tanks and associated piping will preclude requirements for institutional control of the site. Remediation of the site can be completed within 24 months. The ARA-02 site will be under government control for at least 100 years and current land-use plans anticipate that this site will be designated for industrial use. The complete removal of all the structural components of the septic system along with the seepage pit sludge will make the site suitable industrial use, as well as residential use if the site becomes available for residential development after the 100-year institutional control period assumed for the risk assessment.

9.8 Statutory Determinations for the ARA-02 Sanitary Waste System

9.8.1 Overall Protection of Human Health and the Environment

Alternative 3a, removal, ex situ thermal treatment, and disposal, would provide highly effective, long-term protection of human health and the environment. Removal of all seepage pit sludge would eliminate potential long-term risks from exposure or contaminant migration, and removal of the structuralcomponents of the septic system will eliminate any hazards in the future associated with potential subsidence. Treatment of the sludge in the WERF incinerator will destroy any toxic organics and reduce the volume of waste. Envirocare or the INEEL Site disposal facility will provide isolation of the treated waste and contaminated septic tanks, piping, and seepage pit pumice blocks.

Alternative 3a is protective of the environment during implementation because mitigative measures to prevent contaminant migration during excavation activities would be implemented. Short-term protection of human health is only moderate because workers could receive exposure to the seepage pit sludge and contaminated structures of the septic system during remediation. However, all potential risks during implementation could be controlled through administrative and engineering controls. Additional waste generated during remediation will consist only of small quantities of equipment decontamination fluids and discarded personal protective clothing and equipment. Therefore, Alternative 3 meets specified remedial action objectives and provides for overall protection of human health and the environment.

9.8.2 Compliance with ARARs and TBCs

The ARARs and TBCs for Alternative 3a, removal, ex situ thermal treatment, and disposal, are presented in Table 25. The substantive requirements of RCRA and Idaho Administrative Procedures Act (IDAPA) ARARs specific to hazardous waste will be met. Use of air-monitoring and dust-suppression techniques during construction and excavation will ensure compliance with emissions ARARs. Control of off-gases generated during the thermal treatment process will be the responsibility of the treatment vendor and is not relevant to actions conducted within WAG 5. The site will be surveyed for cultural and archeological resources and appropriate actions will be taken to satisfy ARARs for protection of sensitive resources. The DOE Order 5400.5 TBC would be met through administrative and engineering controls to limit exposures to allowable levels. The selected alternative is, therefore, capable of complying with ARARs and TBCs.

9.8.3 Cost-Effectiveness

The selected remedy is cost-effective because it is the least costly alternative satisfies threshold criteria. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

Table 24. Cost estimate summary for the ARA-02 sanitary waste system selected remedy.

	Planned Activity	Cost (Fiscal Years 1998 dollars)
FFA/CO management and oversight		
	WAG 5 management	375,000
Remedial design		
	Remedial design/ remedial action Scope of Work	54,000
	Remedial action work plan	63,000
	Packing, shipping, transportation documentation	48,000
	Remedial action report	48,000
	Data collection and management for first 5-year review	141,000
	Safety analysis documentation	101,000
	Sampling analysis plan	108,000
	Pre-final inspection report	8,000
	Legal review	32,000
	Total title design package	98,000
	Site characterization	20,000
Remedial action construction subcontract		
	Construction subcontract	351,000
Project construction management		80,000
Support for construction subcontract		142,000
CAPITAL COST SUBTOTAL		1,669,000
	Contingency @ 30%	501,000
TOTAL CAPITAL COST IN FISCAL YEAR 1998 DOLLARS		2,169,000
TOTAL CAPITAL COST IN NET PRESENT VALUE		2,019,000
Operations		
	Program management	NA
	Data collection and management for 5-year reviews	NA
	Maintenance	NA
	Decontamination and dismantlement	NA
	Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL		NA
	Contingency @ 30%	NA
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1998 DOLLARS		NA
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		NA
TOTAL PROJECT COST IN NET PRESENT VALUE		2,019,000

Table 25. ARARs and TBCs for the selected alternative—removal, ex situ thermal treatment and disposal—for the ARA-02 Sanitary Waste System.

Category	Citation	Reason	Relevancy
Action- specific applicable, relevant, and appropriate requirements (ARARs)			
Rules for the Control of Air Pollution in Idaho	Toxic Substances IDAPA 16.01.01.161 Toxic Air Emissions IDAPA 16.01.01.650 and .651	The release of carcinogenic and noncarcinogenic contaminants into the air must be estimated before the start of construction, controlled, if necessary, and monitored during excavation of soil, removal of seepage pit sludge, cinder blocks, septic tanks and piping, and decontamination of septic tanks and piping.	A[a]
	Fugitive Dust IDAPA 16.01.01.650 and .651	Requires control of dust at all times, especially during excavation and removal of the seepage pit sludge, cinder blocks, septic tanks, and piping.	
	Requirements for Portable Equipment IDAPA 16.01.01.500.02	Portable equipment for removal of the seepage pit and septic tank system, and any portable support equipment must be operated to meet state and federal air emissions rules.	A
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Radionuclide Emissions from DOE Facilities 40 CFR 61.92	Limits exposure of radioactive contamination release to 10 mrem/year for the off-Site receptor, and establishes monitoring and compliance requirements.	A
	Emission Monitoring 40 CFR 61.93		
	Emission Compliance 40 CFR 61.94(a)		
Resource Conservation and Recovery Act—standards Applicable to Generators of Hazardous Waste	Hazardous Waste Determination IDAPA 16.01.05.006 (40 CFR 262.11)	A hazardous waste determination is required for the septic tanks, piping, and any secondary waste disposed of on the INEEL.	A

Table 25. (continued).

Category	Citation	Reason	Relevancy
Resource Conservation and Recovery Act—Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Units	General Waste Analysis IDAPA 16.01.05.008 (40 CFR 264.13 (a)(1-3))	Analysis requirements apply to the seepage pit sludge, cinder blocks, septic tanks, piping, and secondary waste generated during remediation.	A
	General Inspections IDAPA 16.01.05.008 (40 CFR 264.15)	Regular inspections must be performed during remediation.	A
	Preparedness and Prevention IDAPA 16.01.05.008 (40 CFR 264 Subpart C)	Applies to soil excavation, waste and debris removal, and decontamination activities.	A
	Contingency Plan and Emergency Procedures IDAPA 16.01.05.008 (40 CFR 264 Subpart D)	Applies to soil excavation, waste and debris removal, and decontamination activities.	A
	Equipment Decontamination IDAPA 16.01.05.008 (40 CFR 264.114)	All equipment used during remediation must be decontaminated if hazardous waste is contacted.	A
	Use and Management of Containers IDAPA 16.01.05.008 (40 CFR 264.171-177)	Applicable to the seepage pit sludge, cinder blocks, septic tanks, piping, and any secondary hazardous waste generated during remediation and managed in containers.	A
	Tank Closure and Post Closure Care IDAPA 16.01.05.008 (40 CFR 264.197(a))	Applies to seepage pit sludge, cinder blocks, septic tanks, and piping.	A
Resource Conservation and Recovery Act—Land Disposal Restrictions	Treatment Standards IDAPA 16.01.05.011 (40 CFR 268.40 (a)(b)(e))	Seepage pit sludge, cinder blocks, septic tanks, and piping must be treating if necessary to meet land disposal restriction criteria before disposal commences.	A
	Treatment Standards for Hazardous Debris IDAPA 16.01.05.011 (40 CFR 268.45 (a-d))		A

Table 25. (continued).

Category	Citation	Reason	Relevancy
	Universal Treatment Standards IDAPA 16.01.05.011 (40 CFR 268.48 (a))		A
National Oil and Hazardous Substances Pollution Contingency Plan—Hazardous Substance Response	Procedures for Planning and Implementing Off Site Response Actions 40 CFR 300.400	Applies to all waste disposed of off the INEEL.	A
Location-specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2 Identifying Historic Properties 36 CFR 800.4 Assessing Effects 36 CFR 800.5	The site must be surveyed for cultural and archeological resources before the commencement of construction, and appropriate actions must be taken to protect any sensitive resources.	A
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6) Repatriation 25 USC 3005 (43 CFR 10.10)	The site must be surveyed for cultural and archeological resources before the commencement of construction, and appropriate actions must be taken to protect any sensitive resources.	A
To be considered (TBC) guidance			
Radiation Protection of the Public and the Environment	DOE Order 5400.5, Chapter II (1)(a, b)	Limits the effective dose to the public from exposure to radiation sources and airborne releases.	

a. A = Applicable

9.8.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy, Alternative 3, removal, ex situ thermal treatment, and disposal, provides a permanent solution because the seepage pit sludge will be permanently removed; thermally treated to reduce contaminant toxicity, mobility and volume; and disposed of in a facility off WAG 5 designed for long-term isolation and protection. In addition, all contaminated components of the septic system will be permanently removed from the site and disposed of in an equally protective facility off WAG 5. Because the septic tanks, pipes, and pumice blocks of the seepage pit are porous, decontamination of the surfaces to meet a clean debris standard is not considered practical. Though the structural components of the ARA-02 Sanitary Waste System are expected to meet the criteria for disposal at Envirocare or an INEEL facility without treatment, the waste can be easily and cost-effectively encapsulated if required. Because all contamination will be removed from WAG 5, no monitoring or maintenance will be required for the site after remediation is completed.

9.8.5 Preference for Treatment as a Principal Element

Alternative 3, removal, ex situ thermal treatment, and disposal, includes incineration of the seepage pit sludge, which is the most effective treatment available at the INEEL for destroying organics and reducing volume. If required, the waste can be stabilized at WERF to meet the waste acceptance criteria for Envirocare. Stabilization of the waste will reduce the mobility of the remaining inorganic contaminants. Therefore, the selected alternative satisfies the preference for treatment as a principal element of the selected remedy.

9.8.6 Five-Year Reviews

Five-year reviews will be conducted for all sites with institutional controls. Land use will be restricted at ARA-02 until remediation is implemented as prescribed in this ROD. Land-use controls will not be required after remediation if all contaminated sludge is removed to basalt or if contaminant concentrations are comparable to local background values for soil. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.

10. ARA-16 RADIONUCLIDE TANK

Remedial action is required for the ARA-16 Radionuclide Tank site to address the potential human health and environmental risk posed by contaminated soil and the radionuclides, toxic metals, and organics contained in the tank waste. The tank contents are classified as principal threat waste. The entire tank system will be removed to address the risk associated with contaminated soil and the threat posed by a potential release of the tank contents. The site characteristics including the nature and extent of contamination, the summary of site risks, remedial action alternatives, and the selected remedy are presented below. More detailed information about the sanitary waste system can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

The ARA-16 site is a 3,785-L (1,000-gal) stainless steel underground holding tank resting within a lidless concrete vault and covered by approximately 1.1 in (3.5 ft) of soil. From 1959 to 1988, the tank received radioactive liquid waste, including wash water from the ARA-I hot cells, and methanol, acetone, chlorinated paraffin, and mixed acids from materials testing and research and metal-etching processes. Periodically, the contents of the tank were emptied into a tank truck and transported to the INTEC (known as the Idaho Chemical Processing Plant at that time) for disposal. The ARA-I facility was formally shut down in 1988 and the tank was partially excavated. All lines into and out of the tank were cut and capped, and the contents were agitated and pumped out, leaving a small amount of residual liquid and sludge in the tank. Soil from the excavation was replaced over the tank. The site investigations, the summary of the risk assessment, and the nature and extent of contamination for the COC are presented below. Aerial photographs of Site ARA- 16 before and after the D&D of ARA-I are shown in Figure 23.

10.1 Site Investigations

Data from three investigations of the ARA-16 Radionuclide Tank contents were considered in the WAG 5 Comprehensive RI/FS (Holdren et al. 1999): the Track 1 assessment including data from the 1988 shutdown activities (Holdren 1998), sampling conducted in 1994 and reported in the WAG 5 Work Plan (DOE-ID 1997a, Appendix D), and additional characterization under the WAG 5 Work Plan reported in the RI/FS (Holdren et al. 1999). The Track 1 assessment summarized the results of the radiation surveys and procedures implemented during the 1988 shutdown of the ARA-I facility. The tank was partially excavated, all lines into and out of the tank were cut and capped, and the contents were agitated and pumped out, leaving a small amount of residual liquid and sludge in the tank. Soil from the excavation was replaced over the tank. Soil surveys conducted during partial excavation of the tank indicated beta-gamma rates between 400 to 1,000 disintegrations per minute. However, evidence about the condition of the tank was not collected and the source of the contamination was not determined. The tank contents were sampled, but radionuclides were not analyzed. Furthermore, because the tank contents were agitated before samples were collected, the two phases (liquid and sludge) were homogenized.

The contents of the tank were sampled again in 1994. Based on analytical results and process knowledge (i.e., anecdotal information), the tank waste was classified as transuranic waste (DOE- ID 1997a, Appendix D) with RCRA F-listed contaminants (40 CFR 26 1, Subpart D). Transuranic waste is defined as waste containing concentrations of at least 100 nCi of radioactivity per gram of waste where the radioactivity is attributed to alpha-emitting isotopes with atomic numbers greater than 92 and half-lives longer than 20 years. The transuranic radioisotopes Am-241, Pu-238, and Pu-239 were detected in the sludge in concentrations of 450 nCi/g, 330 nCi/g, and 290 nCi/g, respectively.

Additional samples were specified in the WAG 5 Work Plan (DOE-ED 1997a) to characterize the tank contents, but discrete samples of the liquid and sludge phases could not be obtained. The tank contained more liquid and less sludge than anticipated (Wilson-Lopez 1997). The 1997 analytical results

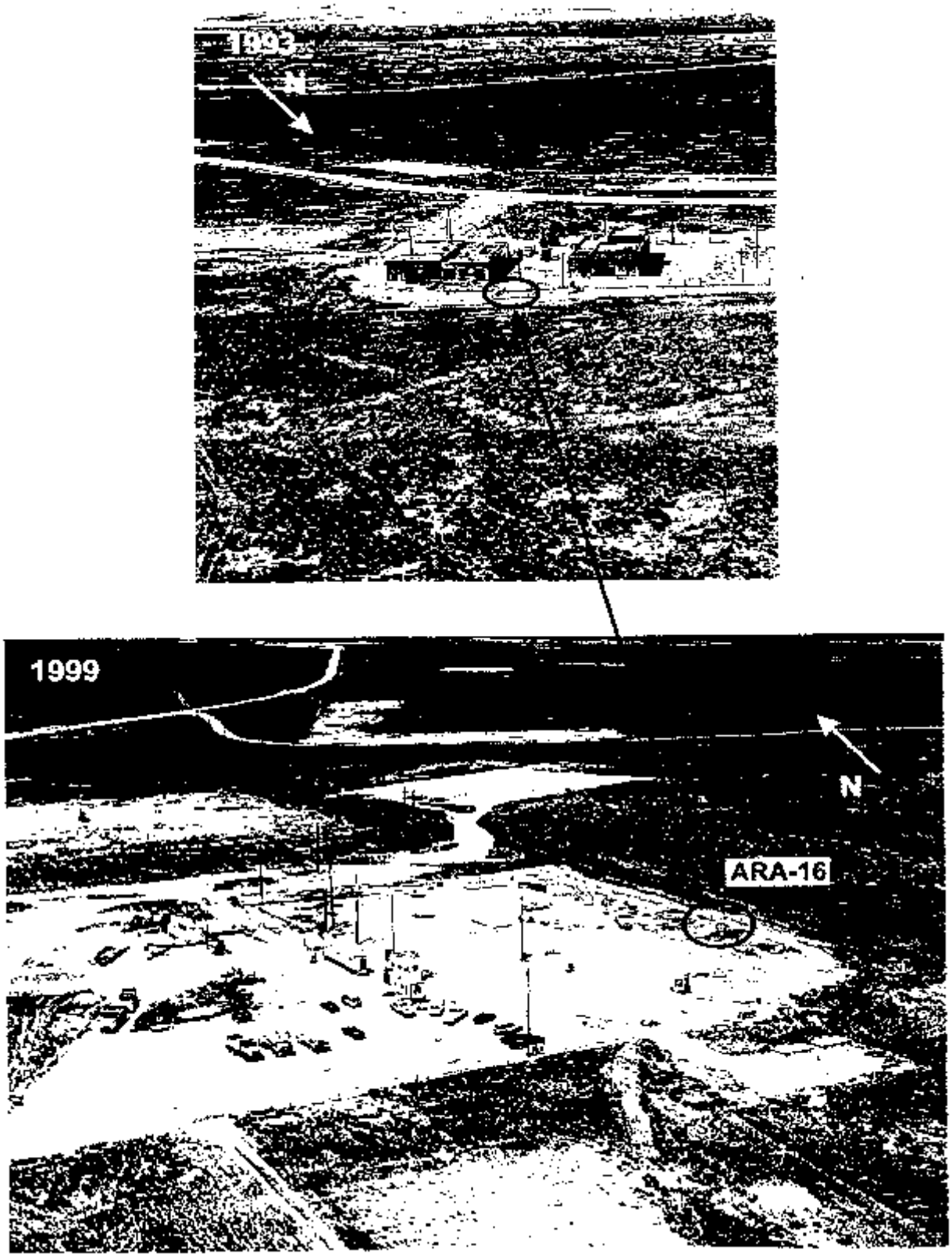


Figure 23. Aerial photographs of Site ARA-16 before and after the decontamination and dismantlement of the ARA-I facility.

are summarized in Table 26, The complete results are presented in the RI/FS report (Holdren et al. 1999, Appendix E). Based on the 1997 data, the contents of the tank are classified as RCRA F-listed mixed waste, but not as transuranic waste. The transuranic elements would be detected in higher concentrations in the sludge. Therefore, the differences between the 1994 and 1997 data are probably because of the insufficient quantity of sludge available for sampling in 1997.

Samples of the surface and subsurface soil and gravel inside the concrete vault at the ARA- 16 site also were collected in 1997. Four boreholes were drilled between the tank and the walls of the vault using a hand auger, and samples were taken at the vault bottom. Field surveys of the samples showed no radionuclides above background. The samples were sent for laboratory analysis, and the results are presented in the RI/FS (Holdren et al. 1999, Appendix E; Wilson-Lopez 1997).

Outside of the vault, three boreholes were successfully drilled to varying depths. The first borehole was drilled to a depth of only 1.5 in (5 ft) before basalt was encountered and the drilling could not proceed. The second borehole was drilled to a depth of 2.6 in (8.5 ft), and the third borehole was completed to a depth of 3.1 in (1.0 ft). Samples were collected from the surface and at the bottom of each hole. The second and third boreholes were the only locations from which samples were retrieved below the elevation of the bottom of the vault. The samples were surveyed for radioactivity with negative results (Wilson-Lopez 1997). The samples were sent for laboratory analysis. The data are presented in the RI/FS (Holdren et al. 1999, Appendix E).

Most of the contaminants detected in the tank waste were not detected outside of the tank, which indicates that the tank has not leaked. The soil contamination in the area was probably caused originally by the cleanup of the SL-1 accident and mixed into the soil around the tank during excavation and sampling. Some contamination may have been caused by small spills as the tank was periodically emptied.

10.2 Nature and Extent of Contamination

The location of ARA-16 relative to ARA-I, the contaminant profile for Cs-137 in soil, and the source volume used in the risk assessment are illustrated in Figure 24.

10.3 Summary of Site Risks for the ARA-16 Radionuclide Tank

In accordance with the risk assessment protocol (LMITC0 1995), the contents of the tank were not quantitatively evaluated in the RI/BRA because a release to the environment has not occurred. Therefore, the risk assessment was limited to evaluating the soil outside of the tank. The site was eliminated from evaluation in the ERA. The human health risk potential from chloride, sulfate, Ag-108m, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Ra-226, and Sr-90 in soil and gravel were evaluated. Cesium-137 is the only COC identified for the ARA-16 site based on human health risks. A summary of the information about the COC in soil at ARA-16 is given in Table 27.

The total estimated risk for the 100-year future residential scenario for the soil around the tank is 1E-04 (1 in 10,000) from Cs-137. The noncarcinogenic hazard quotient for residential exposure is less than 1.0.

The total estimated risk for all pathways for the current occupational scenario is 3E-04. The primary component of the risk is 3E-04 (3 in 10,000) from Cs-137, with 1E-06 (1 in 1,000,000) from Sr-90, 1E-06 (1 in 1,000,000) from Eu-154, 1E-06 (1 in 1,000,000) from Eu-152, 4E-06 (4 in 1,000,000) from Co-60, and 1E-06 (1 in 1,000,000) from Ag-108m. The hazard index for the current occupational exposure is less than 1.0.

Table 26. Chemical and radiological characteristics of ARA-16 tank waste samples collected in 1997.

	Liquid Phase		Sludge Phase	
Contamination	Minimum Concentration	Maximum Concentration	Minimum Concentration	Maximum Concentration
Anions (mg/L)				
Fluoride	0.826	1.910		34.3
Chloride	200	236		1,660
Bromide	0.348	0.385		
Nitrate				11.7
Phosphate	110	112		1,050
Sulfate	93.9	105		581
Total Cyanide (mg/L)	0.011	0.012		15.800
Metals	(Fg/L)	(Fg/L)	Dry/Wet (mg/kg)	Dry/Wet (mg/kg)
Aluminum	275	340.1	11,300/2,360	17,100/3,570
Antimony			11.8/2.48	12.1/2.52
Arsenic	13.4	14.1	1,180/0.766	2,650/0.760
Barium	1.6	4.6	215/44.9	329/68.8
Beryllium	0.3	0.3	5.58/1.17	9.58/2.00
Cadmium			28.5/5.97	16.7/3.50
Calcium	9,100	9,760	7,800/1630	11,500/2,390
Chromium	5.9	22.6	878/184	1,370/287
Cobalt			6.66/1.39	17.9/3.74
Copper	169	179.8	393/82.1	660/138
Iron	152	193	22,500/4,700	47,000/9,820
Lead	14.9	36.2	2,600/543	3,970/830
Magnesium	25,700	27,300	3,650/762	5,5601/1,160
Manganese	7.4	7.4	103/21.4	2,16/45.1
Mercury	0.42	0.6	2.07/0.434	3,35/0.700
Nickel	139	147	190/39.8	407/85.0
Potassium	13,800	14,800	1,450/304	2,280/477
Selenium			4.400/0.91	5,270/1.10

Table 26. (Continued)

Contaminate	Liquid Phase		Sludge Phase	
	Minimum Concentration	Maximum Concentration	Minimum Concentration	Maximum Concentration
			Dry/Wet	Dry/Wet
	(Fg/L)	(Fg/L)	(mg/kg)	(mg/kg)
Silver	18.3	31.1	527/110	720/151
Sodium	243,000	253.000	3,000/628	4,390/917
Sulfur			2,040/427	3,960/827
Thallium			279/0.058	308/0.064
Vanadium	9.9	11.2	84.4/17.6	159/33.3
Zinc	46.9	56.9	586/123	890/186
Polychlorinated biphenyls	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Aroclor-1260			52,000	98,000
Radionuclides	(pCi/L)	(pCi/L)	(pCi/g)	(pCi/g)
Ag-108m			2,480	6,800
Co-60	16,700	18,700	105,000	320,000
Cs-134	199,00	213,000	24,700	38,300
Cs-137	58,500,000	60,900,000	9,190,000	13,300,000
Eu-152			16,100	24,900
Eu-154			4,160	9,080
Zn-65			4,910	6,560
Pu-238	874	1,290	14,800	28,700
Pu-239/240	1,230	2,150	15,900	28,000
U-234	698	798	31,400	38,900
U-235		4.68		
U-238	15	16		464
Am-241	1,450	1,900	25,900	36,400
Stromtium-90(pCi/g)	162,000	172,000	455,000	638,000
Tritium (pCi/g)	290,000	301,000		
Toxicity characteristic leaching procedure volatile organic compounds	(µg/L)	(µg/L)	(µg/kg)	(µg/kg)
1,1-Dichloroethene				550
Trichloroethene				40,000

Table 26. (Continued)

Contaminate	Liquid Phase		Sludge Phase	
	Minimum Concentration	Maximum Concentration	Minimum Concentration	Maximum Concentration
Volatile organic compounds	(µg/L)	(µg/L)	(µg/L)	(µg/L)
1,1-Dichloroethene		190		46,000
Trans-1,2-dichloroethene		7		
1,1-Dichloroethane		360		8,300
Cis-1,2-dichloroethene		53		1,300
1,1,1-Trichloroethane	60,000	63,000	19,000,000	22,000,000
Trichloroethene	13,000	13,000	3,600,000	4,500,000
Toluene		28	160,000	210,000
1,1,2-Trichloroethene		110		2,800
Tetrachloroethene		5		7,800
Ethylbenzene				4,600
M-and P-xylenes				19,000
O-xylene				6,100
1,1,2,2-Tetrachloroethane		43		3,900

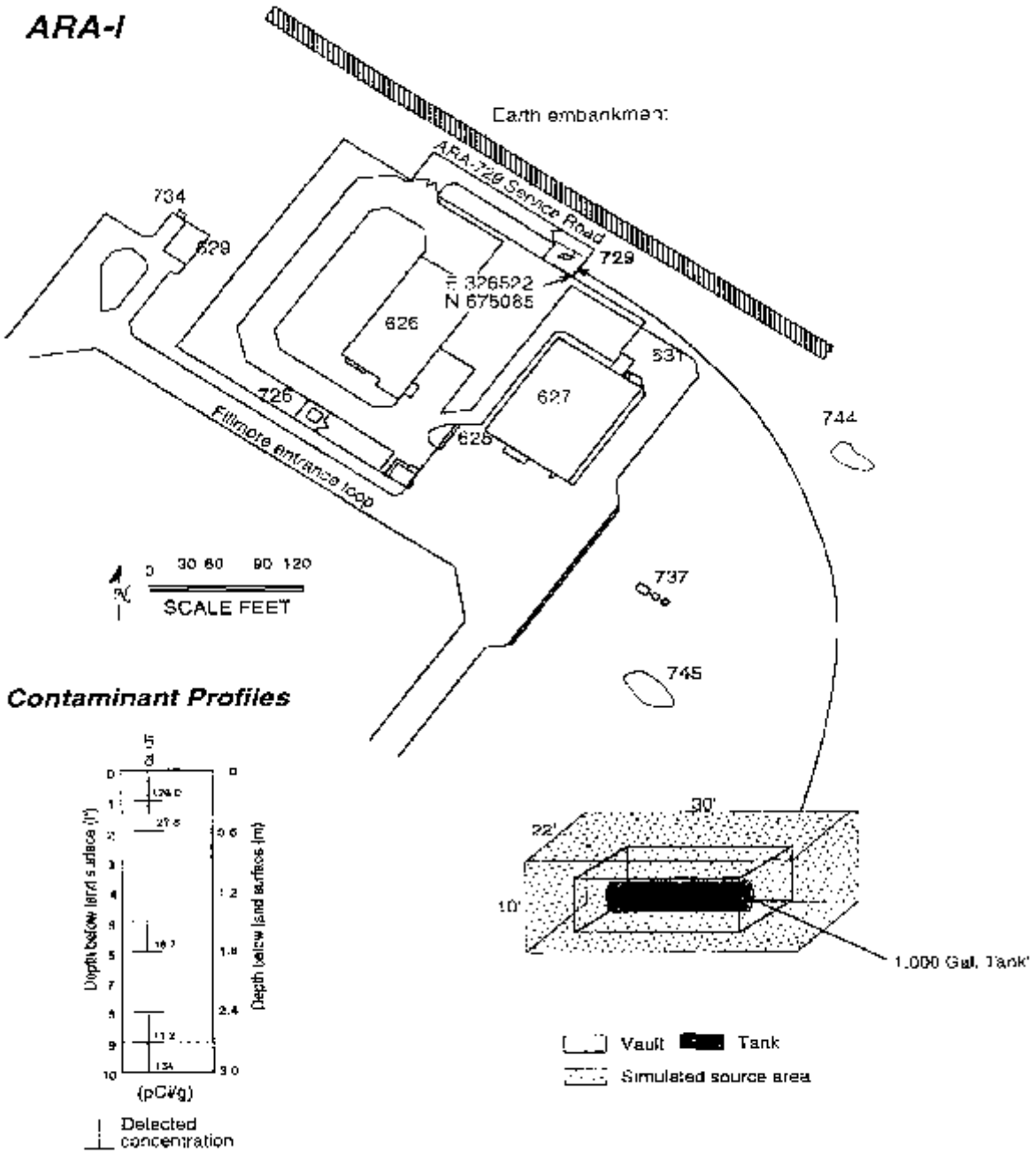


Figure 24. Site ARA-16. ARA-I radionuclide tank soil.

Table 27. Soil concentration for the contaminant of concern[a] at ARA-16.

Contaminant of Concern	Half-life (years)	Minimum Concentration (pCi/g)	Maximum Concentration (pCi/g)	Frequency of Detection	Background Concentration (pCi/g)	Exposure Point Concentration (pCi/g)	Statistical Measure
Cs-137	30	0.27	201	25/25	0.82[b]	31.8	UCL[c]

a. Because the tank contents have not been released to the environment, the identification of contaminants of concern was limited to contaminants detected in the soil. The tank contents are described in Table 26.

b. the background value for composited samples os from Rood, Harris, and White (1996).

c. The UCL is the 95% upper confidence limit on the mean soil concentration.

The total estimated risk for all pathways for the 100-year occupational scenario is 1E-04 (1 in 10,000). The primary contributor is Cs-137. The noncarcinogenic hazard index for the future occupational exposure is less than 1.0.

10.4 Remediation Objectives for the ARA-16 Radionuclide Tank

Remediation objectives based on the unacceptable risks discussed above (Section 10.3) were developed for the soil at the ARA-16 Radionuclide. Human health risk of 1E-04 is posed primarily by external exposure to ionizing radiation from Cs-137. Dermal adsorption and ingestion of PCBs pose secondary human health risks. A summary of the risks is provided in table 7. In addition, remediation will be applied to address the principal threat waste contained in the tank.

The human health threat posed by the radioactively contaminated soil and gravel in and around the ARA-16 tank vault is external exposure to ionizing radiation. No unacceptable ecological risk is

associated with this site. The remedial action objective developed for the soil and gravel is to inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and for future residents. To meet this objective, a remediation goal for Cs-137 was established (see Table 28). The goal is at the upper end of the acceptable risk range because conservative parameters were used in risk assessment, because risk from background concentrations at the INEEL exceed 1E-06, and because EPA radiation standards, which apply to risks from exposure to radionuclide are generally set at a risk level of 1 in 10,000.

The remediation goal can be satisfied by either cleaning up to the identified contaminant concentration (see Table 28) or by removing all contaminated media down to the basalt interface. Removing soil down to basalt will be protective because surface exposure pathways will be eliminated. The RI/FS for WAG 5 (Holdren et al. 1999) showed that groundwater exposure pathways pose a cumulative risk less than 1E-04 and a hazard index less than 1 for the baseline no action alternative. Removal of contaminated media from WAG5 will further reduce the potential groundwater risk. Therefore, remediation to retrieve residual contamination that may have migrated into the fractured basalt would not be justified.

Though no releases occurred from the ARA-16 tank and the tank is not leaking, the tank contents are identified as principal threat waste and could pose an unacceptable risk if released to the tank content and preclude human and ecological exposure to the ARA-16 tank contents.

Table 28. Remediation goal for the ARA-16 Radionuclide Tank site.

Contaminant of Concern[a]	Soil Concentration Remediation Goal	Derivation	Reference	Risk Scenario
Cs-137	23pCi/g[b]	1E-04 external risk	Fromm (1996)	100-year future residential

a. The ARA-16 tank is not leaking. However, the tank contents are identified as principal threat waste and could pose an unacceptable risk if released to the environment. Therefor, an additional remedial action objective was developed to prevent release of the tank contents and preclude human and ecological exposures to the ARA-16 tank contents.

b. The remediation goal for Cs-137 is equal to 100 times the 1E-06 risk-based soil concentrations reported by fromm (1996).

The following land-use assumptions were used in development of the remedial action objectives for the ARA-16 tank:

- Institutional controls before 2095 will include current security controls, site access controls, radiological controls, and worker monitoring

- For 2095 and beyond, homes could be built anywhere within WAG5 and the water supply well could be drilled adjacent to the home.

10.5 Description of Alternatives for the ARA-16 Radionuclide Tank

Five alternatives were considered for the ARA-16 radionuclide tank site. Alternative 2, limited action, was screened out in the feasibility study because the alternative did not meet the threshold criteria for protection of human health and the environment and compliance with ARARs. Alternative 5, removal, ex situ stabilization, and disposal, also was screened out in the feasibility study because implementation of the alternative has a high uncertainty, the final waste form is not likely to meet acceptance criteria for disposal in any approved landfill, and the cost is high. Though Alternative 1, no action, does not meet threshold criteria, it was retained for detailed analysis to serve as a baseline for comparing other remedial action alternatives.

10.5.1 Alternative 1, No Action

The no action alternative for the ARA-16 Radionuclide Tank consists of groundwater, air, and soil monitoring. No active remediation would be performed under this alternative to alter existing site conditions.

10.5.2 Alternative 3, In Situ Vitrification

Alternative 3 for the ARA-16 Radionuclide Tank consists of in situ vitrification. Alternative 3 has three variations: 3a, 3b1, and 3b2. Under Alternative 3a, the entire site, including the tank, tank contents, contaminated soil, and vault would be vitrified in situ. A soil cover would be placed over the site and monitoring would be implemented to detect any release of contaminants from the treated waste from. Alternative 3b1 and 3b2 will not be discussed further because they are no longer viable options for the tank. Under Alternative 3b1 and 3b2, the waste would be shipped to Test Area North where it would be treated by vitrification along with the WAG 1 V-tanks. However, since the WAG 5 Comprehensive Proposed Plan (DOE-ID 1999b) was issued, ex situ thermal treatment has been identified as a more cost-effective and practical alternative for remediation of the V-tanks at Test Area North (DOE-ID 1999a) and in situ vitrification will be implemented. Therefore, the in situ vitrification option at Test Area North is no longer viable for the ARA-16 tank waste.

10.5.3 Alternative 4: Removal, Ex Situ Thermal Treatment, and Disposal

Alternative 4 comprises removing and shipping the ARA-16 Radiounuclide Tank waste to a thermal treatment facility outside of WAG 5, disposing of the treatment residuals off the INEEL, excavating and removing the tank system, decontaminating or encapsulating the debris, and disposing of the debris either on or off the INEEL, depending on waste classification. The tank waste would be packaged in a high-integrity container for temporary storage at the RWMC until the Advanced Mixed Waste Treatment Facility (AMWTF) or another treatment facility approved for RCRA or TSCA (40 CFR 761) mixed waste, on or off the INEEL, becomes operational. The alternative incorporates the assumption that the ARA-16 tank system could be decontaminated and disposed of at the INEEL as low-level waste.

Remediation of any contaminated soil around the tank would be addressed under the contaminated soil alternatives.

10.5.4 Comparison of Elements and Distinguishing Features of Each Alternative

The relative cost and performance of each alternative is described in Table 29.

10.6 Comparative Analysis of Alternatives for the ARA-16 Radionuclide Tank

The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43([f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

10.6.1 Overall Protection of Human Health and the Environment

For the ARA-16 radionuclide tank, Alternative 1, no action, would not be protective of human health and the environment. Alternative 4, excavation, ex situ thermal treatment, and disposal, would provide the highest degree of long-term protection of human health and the environment because the contaminated media would be removed from WAG 5, treated, and disposed of in an approved facility. Of the three alternatives, Alternative 3a would provide the least protection within WAG 5 because the vitrified tank site would remain at ARA-I. Moreover, the soil cover over the vitrified waste form has less long-term effectiveness than the vitrified waste form itself. Therefore, direct exposure to radiation could be a risk in the future.

10.6.2 Compliance with ARARs and TBCs

The ARARs for Alternative 1, no action, would not be met for ARA-16. Alternatives 3a, in situ vitrification, and 4, removal, ex situ thermal treatment, and disposal, for the ARA-16 tank would meet ARARs.

10.6.3 Long-Term Effectiveness and Permanence

Of the three retained ARA-16 alternatives, Alternative 1, no action, would provide the least long-term effectiveness and permanence for the ARA-16 site. Alternative 4, excavation, ex situ thermal treatment, and disposal, would provide the highest degree of long-term effectiveness and permanence because the waste would be removed from WAG 5. Alternative 3a would provide less protection within WAG 5 because the vitrified tank site would remain at ARA-I. Moreover, the soil cover of the vitrified waste form has less long-term effectiveness than the vitrified waste form itself. Therefore, direct exposure to radiation could be a risk in the future.

10.6.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

For Alternatives 3a and 4, the waste would be treated to reduce toxicity, mobility, and volume. The two alternatives are considered equivalent relative to this criterion.

10.6.5 Short-Term Effectiveness

Of the retained ARA-16 alternatives, Alternative 1, no action, would be the most effective in the short term because no actions resulting in additional worker exposure would occur. No off-Site exposures

Table 29. Detailed analysis summary of remediation alternatives for the ARA-16 Radionuclide Tank site.

Criteria	Alternative1 No Action	Alternative 3a In Situ Vitrification at ARA-1	Alternative 4 Removal, Ex Situ Thermal Treatment, and Disposal
Overall protection of human health and the environment			
Human health protection	No reduction in risk	Would eliminate potential exposure to waste by eliminating exposure pathways.	Would eliminate potential exposure to waste by removing contamination from WAG 5.
Environmental protection	Would allow continued ecological exposures and risk of tank waste release.	Would eliminate potential exposure to waste by eliminating exposure pathways.	Would eliminate potential ecological exposure to waste by removing contamination from WAG 5.
Compliance with applicable, relevant, and appropriate requirements (ARARs)			
Action-specific			
Idaho Hazardous Waste Management Act–IDAPA 16.01.05.006, .008, and .011	Would not meet ARAR.	Would meet ARAR.	Would meet ARAR.
Resource Conservation and Recovery Act– 40 CFR 262, 264, and 268	Would not meet ARAR.	Would meet ARAR.	Would meet ARAR.
Toxic Substance Control Act–40 CFR 761	Would not meet ARAR.	Would meet ARAR.	Would meet ARAR.
Idaho Fugitive Dust Emissions–IDAPA 16.01.01.650 through .651	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Rules for Control of Air Pollution in Idaho–IDAPA 16.01.01.210, and IDAPA 16.01.01.585 through .586:	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
NESHAP–40 CFR 61.92 and .93	Would meet ARAR because waste is not a source of air emissions.	Would meet ARARs through use of engineering controls.	Would meet ARAR through use of engineering controls.
Chemical-specific			
Idaho Ground Quality Rule–IDAPA 16.01.11.200	Would not meet ARAR.	Would meet ARAR by immobilizing contamination and monitoring for releases	Not applicable
Location-specific			
Rules for Control of Air Pollution in Idaho–IDAPA 16.01..01.581	Not applicable	Would meet ARAR through use of engineering controls.	Would meet ARAR through use of engineering controls.
Native American Graves Protection and Repatriation Act–25 USC 32	Would meet ARAR.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.
National Archeological and Historic Preservation Act–36 CFR 800	Would meet ARAR.	Would meet ARAR through surveys and assessments and actions deemed necessary.	Would meet ARAR through surveys and assessments and actions deemed necessary.
To be considered (TBC)			
Radiation Protection of the Public and Environment–DOE Order 5400.5	Would not meet TBC because no controls would be implemented.	Would meet TBC through use of engineering and institutional controls and best management practices.	Would meet TBC through use of administrative controls.

Table 29. (continued).

Criteria	Alternative1 No Action	Alternative 3a In Situ Vitrification at ARA-1	Alternative 4 Removal, Ex Situ Thermal Treatment, and Disposal
Long-term effectiveness and permanence			
Magnitude of residual risk	No change from existing risk.	Would eliminate source-to-receptor pathways.	No residual risk would remain at WAG 5.
Adequacy and reliability of controls	No control and, therefore, no reliability.	The vitrified waste form is estimated to provide reliable control over contaminants in waste for hundreds of years.	Disposal facility for treated waste, contaminated soil, and debris is assumed to provide adequate and reliable control for the period of institution control.
Reduction of toxicity, mobility, or volume through treatment			
Treatment process used	Not applicable	In situ vitrification	Incineration
Amount destroyed or treated	Not applicable	Approximately 100%	Approximately 100%
Reduction of toxicity, mobility, or volume	Not applicable	40 to 50% volume reduction, 100% mobility reduction, and 50% toxicity reduction.	50 to 80% volume reduction, 70% mobility reduction, and 50% toxicity reduction.
Irreversible treatment	Not applicable	Not reversible, but would afford long-term stability.	Not reversible, but would afford long-term stability.
Type and quantity of residuals remaining after treatment	Not applicable	Vitrified waste form, decontamination fluids, used personal protective equipment.	No waste would be left at WAG 5. A vitrified mass, decontamination fluids, and used personal protective equipment would remain after treatment of the tank waste.
Statutory preference for treatment	Not applicable	Meets preference.	Meets preference
Short-term effectiveness			
Community protection	Would not increase potential risks to the public.	Would not increase potential risks to the public.	Would be slight increase in potential risks to the public during off-Site transportation.
Worker protection	Not applicable	Workers would be protected by extant engineering and administrative controls.	Workers would be protected by engineering and administrative controls.
Environmental impacts	No change from existing conditions.	Limited to site preparation required for in situ vitrification. Limited potential for airborne contamination.	Limited to disturbances from vehicle and material transport activities associated with excavation of the tank. If required, use of containment systems with high-efficiency particulate air filtrations and dust suppressants would significantly limit the potential for airborne contamination.
Time until action is complete	Not applicable	Approximately 18 to 24 months	Approximately 18 to 24 months

Table 29. (continued).

Criteria	Alternative1 No Action	Alternative 3a In Situ Vitrification at ARA-1	Alternative 4 Removal, Ex Situ Thermal Treatment, and Disposal
Implementability			
Ability to construct and operate	No construction or operation.	Moderately difficult; involves proprietary technology.	Moderate because of radiation protection requirements. Uses available construction technology.
Ease of implementing additional action if necessary	Could require repeat of feasibility study and record of decision process.	Moderately difficult. The relatively small volume of vitrified waste could be excavated, removed, and disposed of if required.	Easy. Residues from the tank waste could be stabilized.
Ability to monitor effectiveness	Monitoring of conditions would be readily implemented.	The effectiveness in vitrifying all contaminants would be easily monitored.	Sampling of waste residues to verify treatment performance would be easily performed.
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required.	Difficult because of the presence of RCRA- and TSCA-regulated components in the waste. ARAR waivers would be required.	Relatively easy.
Availability of services and capacity	None required.	Services for in situ vitrification at ARA-16 would be available through a subcontractor.	Services would be available at the INEEL.
Availability of equipment, specialists, and materials	None required.	Equipment and materials to perform in situ vitrification at ARA-16 would be available through a subcontractor.	Equipment and materials would be available either at the INEEL or through subcontractors, or will be purchased.
Availability of technology	None required.	Available commercially.	Available at the INEEL.
Cost (net present value, 5% discount rate)			
Capital Cost	$1.6 million	$3.6 million	$4.4 million
Operations and Maintenance Cost	$7.7 million	$5 million	NA
Total Cost	$ 9.3 million	$ 8.6 million	$ 4.4 million

a. Details of the cost estimates are provided in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999, Appendix K).

would occur because the site is not located near inhabited areas and no public roads are in the vicinity. No additional environmental impacts would result from this alternative other than those resulting from the extant conditions. Under Alternative 4, removal, ex situ thermal treatment, and disposal, the contaminated soil would be excavated and removed and the tank waste would be transferred into another container, which would result in the highest risk for exposure. Therefore, this alternative is considered the least effective for short-term protection for the ARA-16 tank site. Alternative 3a is considered the most effective for the tank site because direct exposure to ARA-16 tank contents would be avoided.

10.6.6 Implementability

Each of the three alternatives retained for detailed analysis is technically implementable for ARA-16. Alternative 1, no action, would be the most implementable for ARA-16 because it would require no change in extant site conditions.

Alternative 4, removal, ex situ thermal treatment, and disposal, is more implementable than Alternative 3 for the ARA-16 radionuclide tank. The existing facilities for storage of ARA-16 waste are adequate, and the necessary equipment and methods for treatment under Alternative 4 are currently under construction at the ATG, Inc. (ATG) facility in Richland, Washington, and construction of the AMWTF is planned.

Alternative 3a is considered less implementable because in situ vitrification of a buried mixed waste tank has not been demonstrated.

10.6.7 Cost

Alternative 4, removal, ex situ thermal treatment, and disposal, is the least costly alternative for the ARA-16 tank site. Alternative 3a is nearly twice as costly as Alternative 4 because of the large capital expense required to implement in situ vitrification, construct the soil cover, and install the monitoring system, and the significant operations and maintenance costs to maintain the site and perform monitoring for the period of institutional controls. Alternative 1, no action, is the most expensive of the three alternatives because of the monitoring that would be performed until the end of the period of institutional controls.

10.6.8 State Acceptance

The IDHW has been involved in the development and review of the OU 5-12 Comprehensive RI/FS report (Holdren et al. 1999), the Proposed Plan (DOE-ID 1999b), and this ROD. All comments received from IDHW on these documents have been resolved and the documents revised accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered. The IDHW concurs with the selected remedial alternative for the ARA-16 Radionuclide Tank contained in this ROD and is a signatory to the ROD with DOE and EPA.

10.6.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held May 17 through 19, 1999 (see Section 3). The 30-day public comment period was May 10, 1999, through June 9, 1999. The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDHW assisted in the development of the responses.

All comments received on the Proposed Plan were considered during the development of this ROD. Comments were raised on the validity of some sample data sets. However, the public was supportive of the preferred alternative for the ARA-16 Radionuclide Tank and generally was in agreement that removal of the radiologically contaminated waste system is required to protect human health and the environment.

10.7 Selected Remedy for the ARA-16 Radionuclide Tank, Alternative 4, Removal, Ex Situ Thermal Treatment, and Disposal

The selected remedy for the ARA-16 site is Alternative 4, removal of the ARA-16 Radionuclide Tank waste and shipment for ex situ thermal treatment and disposal. This remedy was selected based on the results of the comparative analysis of alternatives. Alternative 4 is the least costly alternative that meets threshold criteria (i.e., provides overall protection of human health and the environment and satisfies ARARs) and is easily implemented. The long-term effectiveness is high for Alternative 4 because contamination will be permanently removed from the site and treated to reduce toxicity, mobility, and volume. The estimated time required to complete remediation is 18 to 24 months. Specifically, Alternative 4 will consist of the following activities:

- Removal of waste from the tank, transfer to a high-integrity container, shipment to the RWMC for storage, treatment in a facility approved for RCRA or TSCA mixed waste, and disposal of residuals at the ICDF, if waste acceptance criteria are satisfied, another INEEL facility, or the Waste Isolation Pilot Plant, depending on post-treatment characterization results

- Excavation of the tank and vault

- Shipment of soil with Cs-137 concentrations exceeding the remediation goal (see Table 28) to the ICDF or another INEEL facility in conjunction with the soils from the contaminated soil sites (see Section 8)

- Decontamination of the tank and associated piping and disposal at the RWMC, ICDF, or another approved facility on the INEEL

- Treatment of decontamination fluids at WERF and disposal of the residuals and other secondary waste generated during remediation at an approved facility such as Envirocare

- Additional sampling of the decontamination fluids, the vault, tank, and associated piping for waste designation and to demonstrate that waste can meet waste acceptance criteria for treatment or disposal

- Dust control and environmental monitoring during active remediation

- Restoration of the site.

The ARA-16 tank contains approximately 17 L (4.5 gal) of sludge and 1,180 L (312 gal) of liquid waste (Coveleskie 1999). The waste contains high concentrations of radionuclides, toxic metals, and organics, including PCBs. Based on sampling results and process knowledge, the waste is considered low-level radioactive mixed waste and RCRA-listed waste. The associated RCRA waste codes are F001 because of concentrations of trichloroethylene, methylene chloride, and 1,1,1 trichloroethane, and F005 because of concentrations of toluene. In addition, the waste is classified as RCRA characteristic waste for trichloroethylene. Aroclor-1260 was detected at 98 ppm in the sludge; hence the waste also is regulated

under TSCA. If required by engineering studies conducted during the remedial design phase, a temporary structure equipped with shielding and a negative pressure ventilation system exhausted through high-efficiency particulate air filters will be erected over the site prior to removal of the tank waste and tank system.

The tank waste will be removed using technologies such as jetting and pumping or vacuum removal and packaged in high-integrity containers for storage at the RWMC until an acceptable treatment facility on or off the INEEL becomes operational. To be acceptable, the facility must be (1) approved for treatment of RCRA and TSCA mixed waste, (2) capable of treating all of the tank waste to satisfy RCRA land disposal restrictions, and (3) able to satisfy TSCA requirements for PCB disposal.

Two treatment facilities that will satisfy these requirements have been identified; the AMWTF at the INEEL, and the ATG mixed waste treatment facility at Richland. The AMWTF and the ATG facility are obtaining RCRA and TSCA permits. Both facilities will use high-temperature thermal processes to destroy organics, including PCBs, to meet the RCRA land disposal regulations for organics and the TSCA PCB disposal criteria. The AMWTF incinerator ash will be mixed with grout, resulting in a final waste form that meets RCRA criteria for heavy metals and immobilizes radionuclides. The final waste form from the ATG system is a nonleachable glass that also will satisfy RCRA criteria for heavy metals and immobilize radionuclides.

Excavation and removal of the structural components of the tank system will require use of conventional excavation equipment such as backhoes and front-end loaders and hand digging. During excavation, real-time gamma surveys will be used to delineate the extent of contamination and allow segregation of contaminated soil from uncontaminated soil. The contaminated soil will be disposed of in conjunction with the remediation of the contaminated soil sites as described in Section 8. Uncontaminated soil will be returned to the excavation site.

The ARA-16 tank and associated piping will be decontaminated in accordance with TSCA and RCRA decontaminating standards and procedures to the extent possible. Sampling will be performed to determine whether the RCRA clean debris standard is met. Because the tank and pipes are stainless steel, it is assumed that these materials can be cleaned to meet criteria for disposal as non-RCRA regulated low-level radioactive debris at the RWMC, the ICDF, or other disposal facility on the INEEL. Encapsulation of the tank and pipes will be performed only if required to meet the waste acceptance criteria of the disposal facility. The decontamination residue will be treated-at WERF, and the residuals will be disposed of at a permitted disposal facility off the INEEL such as Envirocare.

Previous sampling results indicate that the ARA-16 tank has not leaked (Holdren et al. 1999). Therefore, the remedy incorporates the assumption that the vault and the gravel within the vault can be disposed of at the INEEL as low-level waste. The most likely location for disposal of the vault and gravel is either the RWMC or the ICDF.

Current radiological and industrial hygiene control practices will be used to reduce worker exposure to radioactive and toxic materials. Radiological controls could consist of limiting the amount of time an operator can work in the area, requiring personnel to wear personal protective clothing, and imposing distance and shielding limits to reduce radiation exposure. Industrial hygiene controls could include use of personal protective clothing to prevent dermal exposure to contaminants and respirators to prevent inhalation of toxic substances. Air emissions will be controlled by the use of water sprays or soil fixatives to suppress dust during soil excavation and removal.

Following removal of the ARA-16 tank system, the excavated site will be backfilled with uncontaminated soil, compacted, and vegetated in accordance with INEEL guidelines (DOE-ID 1989).

10.7.1 Estimated Cost for the Selected Remedy

The estimated cost for implementing Alternative 4 is $4.4 million. Details of the cost estimate are provided in Table 30.

10.7.2 Estimated Outcomes of the Selected Remedy

Cleanup to meet the remedial action objectives and the remediation goal (see Table 28) for the ARA-16 site can be achieved by removal of contaminated soil; removal, treatment, and disposal of the tank waste; and decontamination and disposal of the tank system within 24 months after remediation is started. Cleanup to the remediation goal for soil and removal and treatment of the tank waste and removal and disposal of the tank system will provide protection of future workers and residents. Institutional controls will provide protection of current workers. Continued industrial use is projected for the ARA (DOE-ID 1996a). The complete removal of all soil contaminated at concentrations exceeding the remediation goal for Cs-137, the structural components of the ARA-16 tank system, and the tank waste will make the ARA-16 site suitable current and future industrial use, as well as residential use after the 100-year institutional control period assumed for the risk assessment.

10.8 Statutory Determinations for the ARA-16 Radionuclide Tank

10.8.1 Overall Protection of Human Health and the Environment

The selected remedy, Alternative 4, removal, ex situ thermal treatment, and disposal, will provide highly effective, long-term protection of human health and the environment. Removal of contaminated soil, the tank waste, and tank system will eliminate potential long-term risks from exposure or contaminant migration. Treatment of the ARA-16 tank waste in a treatment facility approved for RCRA or TSCA mixed waste will destroy toxic organics including PCBs and reduce the volume of waste. Envirocare, the ICDF, the RWMC, the Waste Isolation Pilot Plant, or another approved disposal facility would provide long-term isolation of the treated waste, vault, and decontaminated tank system components.

Alternative 4 is protective of the environment during implementation because mitigative measures to prevent contaminant migration during excavation activities would be implemented. Short-term protection of human health is only moderate because workers could receive exposure to the tank waste, contaminated structures of the tank system, and contaminated soil during remediation. However, risks during implementation will be managed through administrative and engineering controls. Additional waste generated during rernediation will consist only of small quantities of decontamination fluids and discarded personal protective clothing and equipment. Therefore, Alternative 4 meets specified remedial action objectives and provides overall protection of human health and the environment.

10.8.2 Compliance with ARARs and TBCs

The ARARs and TBCs for Alternative 4 are presented in Table 31. As shown in the table, the substantive requirements of RCRA and IDAPA ARARs specific to hazardous waste and the TSCA ARAR specific to PCB-contaminated waste in the ARA-16 tank waste will be met. Compliance with emissions ARARs would be ensured by using dust suppression techniques during construction and excavation. Controlling the off-gases generated during the thermal treatment process will be the responsibility of the treatment vendor and is not relevant to actions conducted within WAG 5. The sites will be surveyed for cultural and archeological resources and appropriate actions taken to satisfy ARARs protection of sensitive resources. The TBC DOE Order 5400.5 would be met through administrative and engineering controls to limit exposures to allowable levels.

Table 30. Cost estimate summary for the ARA-16 Radionuclide Tank site selected remedy.

Planned Activity		Cost (Fiscal Year 1998 dollars)
FFA/CO Management and oversight		
	WAG 5 management	375,000
Remedial design		
	Remedial design/remedial action scope of work	$54,000
	Remedial action work plan	63,000
	Packaging, shipping, transportation documentation	48,000
	Remedial action report	48,000
	Data collection and management for first 5-year review	141,000
	Safety analysis documentation	101,000
	Sampling and analysis plan	108,000
	Pre-final inspection report	8.000
	Legal review	32,000
	Total title design package	287,000
	Site characterization	20,000
Remedial action**n**construction subcontract		
	Construction subcontract	1,977,000
Project construction management		400,000
CAPITAL COST SUBTOTAL		3,662,000
	Contingency @ 30%	1,099,000
TOTAL CAPITAL COST IN FISCAL YEAR 1998 DOLLARS		4,761,000
TOTAL CAPITAL COST IN NET PRESENT VALUE		4,422,000
Operations		
	Program management	NA
	Data collection and management for 5-year reviews	NA
	Maintenance	NA
	Decontamination and dismantlement	NA
	Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL		NA
	Contingency @ 30%	NA
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1998 DOLLARS		NA
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		NA
TOTAL PROJECT COST IN NET PRESENT VALUE		4,422,000

Table 31. ARARs and TBCs for the selected alternative—removal, ex situ thermal treatment, and disposal—for the ARA-16 Radionuclide Tank site[a]

Category	Citation	Reason	Relevancy[b]
Action-specific applicable, relevant, and appropriate requirements (ARARs)			
Rules for the Control of Air Pollution in Idaho	Toxic Substances IDAPA 16.01.01.161	The release of carcinogenic and noncarcinogenic contaminants into the air must be estimated before construction begins, controlled, if necessary, and monitored during excavation of soil, removal of the waste and tank system, and decontamination of the tank and piping in accordance with state standards.	A
	Toxic Air Emissions IDAPA 16.01.01.585 and .586		
	Fugitive dust IDAPA 16.01.01.650 AND.651	Dust emission must be controlled at all times, especially during excavation and removal of the tank, vault, and piping in accordance with state standards.	
	Requirements for Portable Equipment IDAPA 16.01.01.500.02	Portable equipment for removal of the waste, tank, vault and piping, and any portable support equipment must be operated to meet state and federal air emissions rules.	A
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Radionuclide Emissions from DOE Facilities 40 CFR 61.92	Exposure of radioactive contamination release is limited to 10 mrem/year for the off-Site receptor, and emissions and emission monitoring must comply with NESHAP requirements.	A
	Emission Monitoring 40 CFR 61.93		
	Emission Compliance 40 CFR 61.94(a)		
Resource Conservation and Recovery Act—Standards Applicable to Generators of Hazardous Waste	Hazardous Waste Determination IDAPA 16.01.05.006 (40 CFR 262.11)	A RCRA hazardous waste determination is required for the waste, vault, tank, piping, and any secondary waste generated during remediation, which is to be treated or disposed of on the INEEL.	RA

Table 31. (continued).

Category	Citation	Reason	Relevancy[b]
Resource Conservation and Recovery Act—Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Units	General Waste Analysis IDAPA 16.01.05.008 (40 CFR 264.13(a)(1–3))	RCRA analysis requirements apply to the waste, tank, vault, and piping, and secondary waste generated during remediation.	A
	General Inspections IDAPA 16.01.05.008 (40 CFR 264.15)	In accordance with RCRA, regular inspections must be performed during remediation.	A
	Preparedness and Prevention IDAPA 16.01.05.008 (40 CFR 264 Subpart C)	Soil excavation, waste and tank system removal, and decontamination activities must comply with RCRA requirements.	A
	Contingency Plan and Emergency Procedures IDAPA 16.01.06.008 (40 CFR 264 Subpart D)	Soil excavation, waste and tank system removal, and decontamination activities must comply with RCRA requirements.	A
	Equipment Decontamination IDAPA 16.01.05.008 (40 CFR 264.114)	All equipment used during remediation must be decontaminated in accordance with RCRA requirements if hazardous waste is contacted.	A
	Use and Management of Containers IDAPA 16.01.05.008 (40 CFR 264.171 – 177	Waste, tank, vault, piping, and any secondary hazardous waste generated remediation must be managed in accordance with RCRA requirements.	A
	Tnak Closure and Post Closure Care IDAPA 16.01.05.008 (40 CFR 264.197(a))	Closure of waste, tank, vault, and piping must be conducted in accordance with RCRA requirements.	A

Table 31. (continued).

Category	Citation	Reason	Relevancy[b]
Resource Conservation and Recovery Act—Land Disposal Restrictions	Treatment Standards IDAPA 16.01.01.011 (40 CFR 268.40 (a)(b)(e))	The waste, tank, vault, and piping must be treated, if necessary, to meet RCRA land disposal restrictions criteria before disposal.	A
	Treatment Standards for Hazardous Debris IDAPA 16.01.05.011 (40 CFR 268.45 (a – d))		A
	Universal Treatment Standards IDAPA 16.01.05.011 (40 CFR 268.48 (a))		A
National Oil and Hazardous Substances Pollution Contingency Plan – Hazardous Substance Response	Procedures for Planning and Implementing Off Site Response Actions 40 CFR 300.440	Applies to all waste treated or disposed of off the INEEL.	A
Toxic Substance Control Act (SA)—Polychlorinated Biphenyls	PCB Remediation Waste: Performance-based disposal 40 CFR 761.61 (b)(1)	The tank waste must be treated or decontaminated to meet TSCA polychlorinated biphenyls (PCB) -disposal criteria.	A
	Decontamination Standards and Procedures : Self-implementing decontamination procedures 40 CFR 761.79 (c)(1) and (2)	The tank, piping, and equipment that come into contact with the tank waste must be decontaminated in accordance with TSCA requirements.	A
	Decontamination solvents 40 CFR 761.79 (d)	Solvents used for decontamination must be managed in accordance with the TSCA.	A
	Limitation of exposure and control of releases 40 CFR 761.79 (e)	TSCA exposure limits apply to all persons conducting decontamination activities of the ARA-16 tank and piping.	A
	Decontamination waste and residues 40 CFR 761.79 (g)	Waste and residuals must be decontaminated in accordance with the TSCA.	A

Table 31. (continued).

Category	Citation	Reason	Relevancy[b]
Location-specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
	Identifying Historic Properties 36 CFR 800.4		
	Assessing Effects 36 CFR 800.5		
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6)	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before the commencement of construction and appropriate actions must be taken to protect any sensitive resources.	A
	Repatriation		
	25 USC 3005 (43 CFR 10.10)		
To be considered guidance (TBC)			
Radiation Protection of the Public and the Environment	DOE Order 5400-5, Chapter II (1)(a,b)	The order specifies limits on the effective dose to the public from exposure to radiation sources and airborne releases.	

a. The selected remedy for ARA-16 focuses on the waste and tank system. Contaminated soil will be addressed in conjunction with the remediation of the contaminated soil Site ARA-23 discussed in Section 8.

b. A = Applicable; RA = Relevant and appropriate.

10.8.3 Cost Effectiveness

Alternative 4, removal, ex situ thermal treatment, and disposal, is the least costly remediation option for ARA-16 that satisfies threshold criteria. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

10.8.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy provides a permanent solution because the soil with contaminant concentrations exceeding the Cs-137 remediation goal, the tank waste, and tank system components will be permanently removed. The tank contents are principal threat wastes as defined by EPA guidance (EPA 1999a). The tank waste will be treated to reduce contaminant toxicity, mobility, and volume and disposed of in a facility outside of WAG 5 designed for long-term isolation and protection. In addition, the tank and associated piping will be decontaminated and disposed of in an equally protective facility outside of WAG 5. Because the tank vault is concrete and thus porous, decontamination of the surfaces is not practical. Therefore, the vault will be disposed of as low-level waste at the RWMC, the ICDF, or another INEEL facility.

Some soil may be left in place with residual Cs-137 contamination; therefore, minimal monitoring and maintenance may be required during the 100-year period of institutional control. After the 100-year period, the Cs-137 will have decayed to below risk-based levels for residential use of the site.

10.8.5 Preference for Treatment as a Principal Element

The selected remedy, Alternative 4, removal, ex situ thermal treatment, and disposal, prescribes treatment of the ARA-16 tank waste in a treatment facility approved for RCRA or TSCA mixed waste and decontamination of the tank and associated piping to a clean debris standard (40 CFR 268.45). Therefore, the selected alternative satisfies the preference for treatment as a principal element of the selected remedy.

10.8.6 Five-Year Reviews

Five-year reviews will be conducted for all sites with institutional controls. Land use will be restricted at ARA-16 until remediation is implemented as prescribed in this ROD. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.

11. LIMITED ACTION

Limited action comprising institutional controls will be implemented at nine sites within WAG 5 because residual contamination precludes unrestricted exposure. In addition, six of the seven sites addressed by the remedial actions discussed in Sections 8, 9, and 10 will be controlled until remediation is implemented, then evaluated for post-remediation controls. The 15 sites that will be managed initially through institutional controls and the future development of a WAG 5 institutional control plan are discussed below.

11.1 Institutional Controls in Waste Area Group 5

Institutional controls will be maintained by DOE at any CERCLA site at the INEEL where risk is greater than 1E-04 for a hypothetical current residential scenario. However, baseline risk assessments at the INEEL typically do not estimate risk for a current residential scenario (LMITCO 1995). For purposes of evaluating the need for institutional controls at WAG 5, the potential for current residential risk in excess of 1E-04 was inferred from the risk assessment for the 100-year future residential scenario. Any site with 100-year future residential scenario with an estimated risk of 1E-06 or greater was assumed to pose a current residential risk of 1E-04. Institutional controls will remain in place at each of these nine sites for at least 100 years or until the site is released for unrestricted use in a 5-year review.

Three of the nine sites, ARA-06, ARA-24, and PBF-13, are landfill sites. Risks estimates for the 100-year future residential scenario for residual soil contamination at the other six sites are less than 1E-04, but current risks for these sites may be greater than 1E-06 for a residential scenario.

Institutional controls will be maintained in the interim until the selected remedy has been implemented at six of the seven sites identified for remediation in this ROD. Interim controls are not required for PBF-16, a site identified for remediation based on ecological risk from exposure to mercury. For the other six sites (i.e., ARA-01, ARA-02, ARA-12, ARA-16, ARA-23, and ARA-25), existing controls such as access restrictions and signs will be maintained until remediation is complete. Long-term institutional control requirements for these sites will be determined based on the analysis of post-remediation confirmation samples.

In accordance with the INEEL Land Use Plan (DOE-ID 1996a), DOE will provide institutional controls for sites subject to land-use restrictions over the next 100 years unless a 5-year review concludes that unrestricted land use is allowable. After 100 years, DOE may no longer manage INEEL activities and controls will take the form of land-use restrictions. Though land use after 100 years is highly uncertain, it is likely that industrial applications will continue at the INEEL and WAG 5. The Hall Amendment of the National Defense Authorization Act of 1994 (Public Law 103-160) requires concurrence from EPA on the lease of any National Priorities List sites during the period of DOE control, and CERCLA [42 USC 9620 § 120(h)] requires notification to the state of a lease involving contamination. When DOE no longer manages INEEL activities and controls are needed, CERCLA [42 USC 9620 § 120(h)] requires that DOE indicate the presence of contamination and any restrictions in property transfer documentation.

Institutional controls will be applied initially to 15 of the 55 sites in WAG 5 and will not be required for the other 40 sites. A summary of the analysis conducted to identify no action and institutional control sites is presented in Table 32. A preliminary description of the controls that will be applied is provided in Table 33, and the estimated costs for maintaining institutional controls for 100 years are reported in Table 34. An institutional control plan for WAG 5 will be prepared in conjunction with the development of RD/RA documents to identify the specific measures that will be

Table 32. No action site and sites requiring institutional controls in Waste Area Group 5.

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
ARA-01	ARA-I Chemical Evaporation Pond	Institutional controls	Estimated baseline risks for this RI/FS site are (1) 2E-04 for the 100-year future residential scenario from exposure to arsenic and (2) ecological hazardous quotients greater than 10 from exposure to selenium and thallium (Holdren et al. 1999)	Restriction the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background value. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review
ARA-02	ARA-I Sanitary Waste System-	Institutional controls	The estimated baseline risks for this Track 2 site area 2E-03 for the 100-year future residential scenario and 1E-05 for current and future occupational scenarios from exposure to radionuclides in the seepage pit sludge (Holdren et al 1999). Exposure to Aroclor-1242 also poses toxicological hazardous to future resident	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contamination sludge is removed to basalt or if contaminant concentrations are comparable to local background values for soil. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review
ARA-03	ARA-I Lead Sheeting Pad near ARA-627	Institutional controls	The estimated baseline risk for this Track 2 site is 2E-05 for the 100-year future residential scenario form exposure to Cs-137 (Holdren et al 1999).	Restrict the site to industrial land use until discontinued based on the result of a 5-year review.
ARA-04	ARA-I Sewage Treatment Facility (ARA-737)	No action	This no action site contains no hazardous substances[e] or radiological contaminants (Hover 1999a)	None
ARA-05	ARA-I Evaporation Pond to the Northeast (ARA-744)	No action	This Track 1 site contains no hazardous substances or radiological contaminations (EG&G 1994b; DOE-ID 1999b).	None
ARA-06	ARA-II Stationary Low-Power Reactor No. 1 Burial Ground	Institutional controls	This RI/FS site (originally identified as a Track 2 site) is a low-level radioactive waste landfill with an estimated baseline risk of 1E-01 for the 100-year future residential scenario form exposure to radiologically contaminated soil and waste, diminishing to 1E-04 in approximately 400-years (Holdren, Filemyr, and Vetter 1995). Implemented remedial action includes an engineered barrier (DOE-ID 1996b).	Maintain land-use controls to inhibit intrusion into the buried waste. Surface contamination will be addressed by the remediation of ARA-23. Institutional controls will be maintained until discontinued based on the results of a 5-year review. Recommendations for appropriate land-use restrictions will accompany any land transfer.

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
ARA-07	ARA-II Seepage Pit to East (ARA-720A)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992b).	Unrelated surface contamination will be addressed by the remediation of ARA-23. The septic tank will be removed or filled with earthen materials and abandoned in place in accordance with State of Idaho standards (IDAPA 16.01.03.007.23).
ARA-08	ARA-II Seepage Pit to West (ARA-720B)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992c).	Unrelated surface contamination will be addressed by the remediation of ARA-23. The septic tank will be removed or filled with earthen material and abandoned in place in accordance with State of Idaho standards (IDAPA 16.01.03.007.23)
ARA-09	ARA-II Septic Tank (ARA-738)	No action	This no action site contains no hazardous substances or radiological contamination (Hover 1992d) The tank was removed	Unrelated surface contamination will be addressed by the remediation of ARA-23
ARA-10	ARA-II Septic Tank East (ARA-613)	No action	This no action site contains no hazardous substances or radiological contamination (Hover 1992e). The tank was removed	Unrelated surface contamination will be addressed by the remediation of ARA-23
ARA-11	ARA-II Septic Tank West (ARA-606)	No action	This no action site contains no hazardous substances or radiological contamination (Hover 1992f). The tank was removed.	Unrelated surface contamination will be addressed by the remediation of ARA-23
ARA-12	ARA-III Radioactive Waste Leach Pond	Institutional controls	Estimated baseline risks for this Track 2 site are (1) 1E-03 for the current occupational scenario form exposure to Ag-108m and Co-60 and (2) 2E-03 for the 100-year future residential scenario for exposure to Ag-108m. Ecological hazard quotients are greater than 10 from exposure to copper, mercury, and selenium (Holdren et al. 1999).	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentration are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.
ARA-13	ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740)	No action [d]	The estimated risk for this Track 1 site is less than 1E-06 (EG&G 1993b; DOE-ID 1996b).	The septic tank will be removed or filled with earthen materials and abandoned in place in accordance with State of Idaho standards (IDAPA 16.01.03.007.23)

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
ARA-14	ARA-III Septic Tank and Drainfield (ARA-739)	No action	This no action site contains no hazardous substances or radiological contamination (Hover 1992g). The tank was removed.	None. The contents removed from the septic tank are not classified as hazardous waste and are under the control of the federal Inspector General. The waste will eventually be addressed under RCRA and is not relevant to CERCLA decision for WAG-5.
ARA-15	ARA-III Radionuclide Tank (ARA-735)	No action	The tank was removed from this Track 1 site and no evidence of leakage was observed. Surveys confirmed that no radiological contamination is present (LMITCO 1994a)	None
ARA-16	ARA-I Radionuclide Tank	Institutional controls	Estimated baseline risk for this Track 1 site are (1) 4E-04 for the current occupational scenario for exposure to Cs-137 and (2) 1E-04 for the 100-year future residential scenario from exposure to Cs-137 in soil. In addition, the tank contains mixed wastes that has not been released to the environment (Holdren et al. 1999).	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminants concentration are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.
ARA-17	ARA-I Drain (ARA-626)	No action [d]	This Track 1 site contains no hazardous substances or radiological contamination (EG&G 1993d; DOE-ID 1996b).	None
ARA-18	ARA-III Radionuclide Tank (ARA-736)	No action	The tank was removed from this Track 1 site and no evidence of leakage was observed. Surveys confirmed that no radiological contamination is present (LMITCO 1994b).	None
ARA-19	ARA-II Detention Tank for Fuel Oil/Radionuclides (ARA-719)	No action	The tank was removed from this Track 1 site and no evidence of leakage was observed (EG&G 1993g)	Unrelated surface contamination will be addressed by the remediation of ARA-23.
ARA-20	ARA-IV Test Area Contaminated Leach Pit No.1	No action	This Track 2 site was decontaminated and dismantled in 1983. The pit structure, except for a ring at a depth of 18 ft, was removed. Post-removal samples showed no contamination (Pickett et al. 1994)	None
ARA-21	ARA-IV Test Area Septic Tank and Leach Pit No.2	No action [d]	No evidence of contamination was found in 1987 during decontamination and dismantlement at this no action site (Hover 1992h)	The tank will be removed or filled with earthen materials and abandoned in-place in accordance with State of Idaho standards (IDAPA 16.01.03.007.23)

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
ARA-22	ARA-IV Control Area Septic Tank and Leach Pit No.3 (ARA-617)	No action [d]	No evidence of contamination was found in 1987 during decontamination and dismantlement at this no action site (Hover 1992i)	The tank is still in use. Future assessment and closure will be managed by Central Facilities Area Operations.
ARA-23	ARA-III Radiologically Contaminated Surface Soils Around ARA-I and ARA-II	Institutional controls	Estimated baseline risk for this Track 1 site are (1) 2E-04 for the current occupational scenario for exposure to Cs-137 and (2) 5E-04 for the 100-year future residential scenario from external exposure to Cs-137 (Holdren et al 1999).	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentration are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.
ARA-24	ARA-III Windblown Soil	Institutional controls[d]	Estimated baseline risk for this Track 1 site are less than 1E-06 for all scenarios (Holdren et al 1999). However, a contaminated pipeline embedded in concrete 20 ft belowgrade remains.	Land use will be restricted to prohibit potential exposure to radiological contaminated material. Institutional controls will be maintained until discontinued based on the results of 5-year review. Recommendation for appropriate land-use restrictions will accompany any land transfer.
ARA-25	ARA-I Soils Beneath the ARA-626 Hot Cells	Institutional controls	Estimate baseline risks are (1) 5E-03 for the current occupational scenario from exposure to radionuclides and arsenic and (2) 8E-03 for the 100-year future residential scenario from exposure to radionuclides and arsenic. Ecological hazardous quotients are greater than 10 from exposure to copper and lead (Holdren et al. 1999). This site was identified during the development of the WAG 5 comprehensive RI/FS and was not assigned a site classification (e.g., as a Track 1 or Track 2 site).	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background values. Otherwise, institutional controls will be maintained until discontinued based on the results of a 5-year review.
PBF-01	PBF Control Area Septic Tank (PBF-724) and Seepage Pit (PBF-735)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992j).	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-02	PBF Control Area Septic Tank (PBF-728 and PBF-739) and Seepage Pit (PBF-736)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992k).	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-03	PBF Control Area Septic Tank (PBF-632 and Seepage Pits PBF-745 and (PBF-748)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992l).	The system is still in use. Future assessment and closure will be managed by PBF Operations.

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
PBF-04	PBF Control Area Oil Tank at PBF-608 (Substation) Outside PBF Fence	No action	The tank and some soil were removed, with some contaminated soil left in place (EG&G 1994a). The estimated baseline risk for this Track 1 site using data collected for PBF-31 and PBF-32 is less than 1E-06, and modeled groundwater concentration are less than risk-based concentration (Holdren et al. 1999)	None
PBF-05	PBF Reactor Area Warm Waste Injection Well (PBF-301)	No action [d]	Residual contamination in the vadose zone may be present at an approximate depth of 33.5 m (110 ft), but modeled groundwater concentration for this Track 2 site are below maximum contaminant levels (Rohe, Sondrup, and Whitaker 1996).	None. The well has been abandoned in place.
PBF-06	PBF Reactor Area Blowdown Pit for Reactor Boiler by PBF-621	No action [d]	This Track 1 site contains no hazardous substances or radiological contamination (EG&G 1993e; DOE-ID 1996b).	The pit is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-07	PBF Reactor Area Oil Drum Storage (PER-T13)	No action	This Track 1 site contains no hazardous substances or radiological contamination (EG&G 1993f; DOE-ID 1996b).	None
PBF-08	PBF Reactor Area Corrosive Waste Disposal Sump Brine Tank	No action [d]	Remedial action for this interim action site was selected (DOE-ID 1992b) and implemented successfully (Parsons 1995) to remove chromium and Cs-137 contamination.	The sump is still in use, and procedures are in place to minimize the likelihood of additional contamination. Future assessment and closure will be managed by PBF Operations
PBF-09	PBF Reactor Area Septic Tank and Drainfield (PBF-728)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992m).	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-10	PBF Reactor Area Evaporation Pond (PBF-750)	Institutional controls	Remedial action for this interim action site was selected (DOE-ID 1992b) and implemented successfully (Parsons 1995) to remove chromium and Cs-137 contamination. The post-remediation estimated baseline risk is 2E-05 for the 100-year future residential scenario from exposure to Cs-137 (Holdren et al. 1999).	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
PBF-11	PBF SPERT-1 Seepage Pit (PBF-750)	No action [d]	The hazard index is much less than 1 and this Track 2 site contains no carcinogenic contaminants (Hillman-Mason et al. 1994).	None

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
PBF-12	PBF SPERT-1 Leach Pond	Institutional controls	Risk evaluation for this Track 1 site identified no current occupational risk and a 100-year future residential risk of 2E-05 from exposure of Cs-137 (EG&G 1993h; Holdren et al. 1999)	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
PBF-13	PBF Reactor Area Rubble Pit	Institutional controls	Risk evaluation for this Track 1 site identified no current unacceptable risk (EG&G 1993k; DOE-ID 1996b), but the site contains construction waste, possible friable asbestos. The visible asbestos was removed, and the site was covered with a 3-m (10 ft) -thick layer of soil and riprap.	Control land use to prohibit potential exposure to friable asbestos. Augment the existing institutional controls with signs and maintenance of the existing cover. Periodic inspections also will be defined in the WAG 5 institutional control plan. Institutional controls will be maintained until discontinued based on the result of a 5-year review. Recommendations for appropriate land-use restrictions will accompany any land transfer.
PBF-14	PBF SPERT-II Inactive Fuel Oil Tank (Front of PBF-612)	No action [d]	The tank was abandoned in place. No evidence of leakage or contamination was observed, and this Track 1 site was assessed as free of significant hazardous or radiological contamination (EG&G 1993a)	None
PBF-15	PBF Reactor Area Corrosive Waste Injection Well (PBF-302)	No action [d]	Residual contamination in the vadose zone may be present at a depth of 35 m (116 ft), but modeled groundwater concentrations for this Track 2 site are below maximum contaminants levels (Rohe, Sondrup, and Whitaker 1996).	None. The well has been abandoned in place.
PBF-16	SPERT II Leach Pond	No action	Estimated human health risk estimates for this Track 2 site are below 1E-06, but ecological hazard quotients for mercury are greater than 10 (Holdren et al. 1999).	Institutional controls are not applicable to ecological concern sites. Because the site will be remediated to address ecological risk, the no action status will apply after remediation is complete.
PBF-17	PBF SPERT-II Septic Tank and Seepage Pit (PBF-725)	No action [d]	This no action site contains no hazardous substances or radiological contamination (Hover 1992n).	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-19	PBF SPERT-III Inactive Fuel Oil Tank (West Side of the Waste Experimental Reduction Facility)	No action	Estimated risks for this Track 1 site are below 1E-06. The tank was probably removed in 1986, but the subsequent use of the area for outside storage precluded confirmation. The area is covered by pavement and cargo containers (EG&G 1993c)	None
PBF-20	PBF SPERT-III Small Leach Pond	No action [d]	Estimated risk for this Track 2 site are below 1E-06. The site was used for disposal of sodium hydroxide and sulfuric acid (Hillman-Mason et al. 1994).	None

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
PBF-21	PBF SPERT-III Large Leach Pond	Institutional controls	Estimated risks for this Track 1 site are below 1E-06 for the current occupational scenario and are 1E-05 for the 100-year future residential scenario from exposure to radionuclides. The contamination is covered by an 8-ft-thick layer of soil (EG&G 1994c).	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
PBF-22	PBF SPERT-IV Leach Pond (PBF-758)	Institutional controls	Estimated risks for this Track 2 site are (1) 9E-06 for exposure to Cs-137 for the current occupational scenario and (2) 3E-06 for exposure to Cs-137 for the 100-year future residential scenario (Holdren et al. 1999)	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
PBF-24	PBF SPERT-IV Blowdown Pit (Adjacent to PBF-716)	No action	This Track 1 site contains no hazardous substance or radiological contamination (EG&G 1993i).	None
PBF-25	PBF SPERT-IV Septic Tank and Leach Pit (PBF-727 and PBF-757)	No action [d]	This no action site contains no hazardous substances or radiological contamination (EG&G 1993o)	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-26	SPERT- IV Lake	Institutional controls	Estimate baseline risk for this Track 1 site are (1) 7E-05 for the current occupational scenario from exposure to radionuclides and (2) 6E-05 for the 100-year future residential scenario from exposure to radionuclides (Holdren et al. 1999).	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
PBF-27	PBF SPERT-III Septic Tank (PBF-726) and Seepage Pit	No action [d]	No evidence indicates that contamination is present at this no action site (Hover 1992p)	The system is still in use. Future assessment and closure will be managed by PBF Operations.
PBF-28	PBF Reactor Area Cooling Tower Area and Drainage Ditch	No action [d]	Estimated risks are below 1E-06 for this Track 1 site (EG&G 1993j; DOE-ID 1996b)	None
PBF-29	PBF Reactor Area Abandoned Fuel Oil Tank	No action	The tank was removed from this action site. No evidence of contamination was observed (Holdren et al. 1999).	None
PBF-30	PBF Reactor Area Abandoned Septic system	No action [d]	The tank was abandoned in place at this Track 1 site. No evidence of contamination was observed (Pollitt 1998).	None

Table 32. (continued)

Site Code[a]	Site Name	No Action [b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Preliminary Recommendation
PBF-31	SPERT -II Fuel II tank (PBF-742)	No action	The tank and some contaminated soil were removed from this Track 1 site. Modeled groundwater concentration for residual contamination in vadose zone basalt are below risk-based concentration for groundwater (Pollitt 1998; Holdren et al 1999).	None
PBF-32	PBF Control Area Fuel Oil Tank (PBF-742)	No action	The tank and some contaminated soil were removed from this Track 1 site. Modeled groundwater concentrations for residual contamination in vadose zone basalt are below risk-based concentration for groundwater (Pollitt 1998; Holdren et al 1999).	None

a. The site codes PBF-18 and PBF-23 were not assigned

b. Unrestricted land use can be allowed for no action sites, and 5-year reviews are not required.

c. Unless specified otherwise, land use will be restricted at each institutional control site until discontinued based on results of a 5-year review. According to DOE land-use projections (DOE-ID 1996a), DOE control is anticipated for at least 100 years.

d. The identification of the site as a no action or a site requiring institutional controls was revised from the classification presented in the WAG Proposed plan (DOE-ID 1999b), Tables 16 and 17).

e. Hazardous substances and radiological contamination are both mentioned specifically because the Resource Conservation and Liability Act (42 USC 6901 et seq.), which identifies and classifies hazardous contaminants, does not address radioactivity. Both chemical and radiological contaminants can be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq.).

Table 33. Institutional control requirements for Waste Area Group 5.

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites ARA-06, ARA-II Stationary Low-Power Reactor No. 1 (SL-1) Burial Ground The site is low-level waste landfill containing radiologically contaminated debris and soil from the cleanup of the SL-1 accident. An engineered barrier was constructed over the site. Total risk for the residential scenario is projected to diminish to 1E-04 in approximately 400 years					
Current DOE operation	Land— no unauthorized intrusion into capped areal	Radionuclides— exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restriction (warning signs) 2. Control of activities (drilling or excavating) 3. Publication of surveyed boundaries and descriptions of controls in the INEEL Land use Plan (DOE-ID 1996a)	*Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievement principle (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)]
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Landfill— no unauthorized intrusion into capped area	Radionuclide— exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control land use consistent with the WAG 5 ROD 4. Notice of affected stakeholders (i.e., Bureau of Land Management, Sho-Ban Tribal Council, local county governments, IDHW, and the EPA) for any change in land-use designations, restriction, or land users	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act [c] (Public Law 103-160) Property release restrictions (DOE Order 5400.5)

Table 33. (continued).

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 5 ROD 2. Notice to affected stakeholders (e.g., Bureau of Land Management, Sho-Ban Tribal Council, Local county governments, IDHW, and the EPA) for any change in land-use designation, restriction, or land users	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[I] Criteria for Bureau of Land Management (BLM) acceptance of property 43 CFR 2374.2[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE) Order 5400.5)
Sites ARA-01, ARA-12, ARA-16, ARA-23, ARA-25 Current occupational scenario risk estimates are greater than 1E-04. Interim controls will be maintained to protect workers until the selected remedies have been implemented.					
Current DOE operations until remedial action is implemented	Industrial	Radionuclides—external radiation	Prevent exposure to contaminated soil, except for approved activities pursuant to the FFA/CO (DOE-ID 1991).	1. Visible access restriction (warning signs) 2. Control of activities (drill or excavating)	FFA/CO (DOE-ID 1991) Workers protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)]

Table 33. (continued).

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites ARA-01, ARA-02, ARA-12, ARA-16, ARA-23, and ARA-25 Future residential risk may be greater than 1E-06 after the selected remedies have been implemented because remediation goals are based on the 100-year future residential scenario. Land-use restrictions will be maintained until discontinued based on the results of a 5-year review. Land-use controls will not be required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background values.					
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Radionuclides (and arsenic for ARA-25)—minimal concern	Control and use as industrial until discontinued based on the results of a 5-year review.	Property lease requirements including control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103—106)[c] Property release restriction (DOE Order 5400.5)
Post DOE control	Industrial	Radionuclides—minimal concern	Control and use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2) Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table 33. (continued).

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites ARA-03, PBF-10, PBF12, PBF-21, PBF-22, and PBF-26 Risk estimates for the 100-year future residential scenario are between 1E-06 and 1E-04. Institutional controls will be maintained until discontinue based on the results of a 5-year review.					
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Various—minimal concern	Control land use as industrial until discontinued based on the results of a 5-year review.	Property lease requirements including control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 0620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103–106)[c] Property release restriction (DOE Order 5400.5)
Post DOE control	Residential	Various—minimal concern	Control and use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table 33. (continued).

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites ARA-24 and PBF-13 Buried contaminated media remain at these two sites. At ARA-24, a radiologically contaminated pipe is present at a depth of 20 ft below the surface. At PBF-13, friable asbestos may be present.					
Current DOE operations	Industrial	Potential friable asbestos	Control land use as industrial	1. Visible access restrictions (warnings signs) 2. Control of activities (drilling or excavating) 3. Publication of surveyed boundaries and descriptions of controls in the INEEL and Use Plan (DOE-ID 1996a)	FFA/CO (DOE-ID 1991) CERCLA [42 USC 0620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103—106)[c] Property release restriction (DOE Order 5400.5)
DOE control post operation (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Potential friable asbestos	Ensure that land use is appropriate	1.Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103—160)[c] Property release restrictions (DOE Order 5400.5)

Table 33. (continued).

Timeframe	Land Restriction [a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Residential	Potential friable asbestos	Ensure land use is appropriate	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 5 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)[d]] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h) (3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR2372.1)[I] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

a. Institutional controls are applicable only to sites where hazardous substances, pollutants, or contaminants are present that preclude unlimited land use. Surveillance will be conducted every 5 years to ensure that controls are in place.

b. Notification to state of leases involving contamination. Concurrence of U.S. Environmental Protection Agency is requested on leases of National Priorities List (54 FR 48184) sites.

d. A statement that remedial action is complete is required in the deed.

e. If response action for which the federal government is responsible is not complete, restrictions, the response guarantee, the schedule for investigation and completion of all necessary response action, and budget assurances must be included in the deed.

f. A clause allowing the U.S. government access to the property must be included in the deed.

g. A notice of information about hazardous substances present on the property must be included in the deed.

h. Uncontaminated parcels of land must be identified with concurrence of the EPA administrator before termination of operations.

i. A Notice of Intent with contamination information and protection needs is required relinquish the property to the U.S. Department of Interior.

j. Transfer to the U.S. Department of Interior must indicate continuation of DOE responsibility.

k. Report to the General Services Administration on contamination information and allowable land use of excess real property.

Table 34. Cost estimate summary for Waste Group 5 institutional controls.

Planned Activity	Cost (Fiscal Year 1998 dollars)
FFA/CO management and oversight	
WAG 5management	NA
Remdedial design	NA
Remedial action—construction subcontract	NA
Project construction management	NA
CAPITAL COST SUBTOTAL	NA
TOTAL CAPITAL COST IN FISCAL YEAR 1998 DOLLARS	NA
TOTAL CAPITAL COST IN NET PRESENT VALUE	NA
Operation	
Program management	NA
Data collection and management for WAG-wide 5-year reviews	3,243,00
(100 years)	
Caretaker/maintenance	755,000
Maintenance	NA
Decontamination and dismantlement	NA
Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL	3,998,000
Contingency @ 30%	1,199,000
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1998 DOLLARS	5,197,000
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE	2,310,000
TOTAL PROJECT COST IN NET PRESENT VALUE	2,310,000

implemented at each site. The list of sites requiring institutional controls will change overtime as remediation is completed and 5-year reviews are conducted.

11.2 Institutional Control Plan for Waste Area Group 5

A comprehensive approach for establishing, implementing, enforcing, and monitoring institutional controls will be developed in accordance with EPA Region 10 policy (EPA 1999b). The following elements for the WAG 5 institutional control plan will be developed in the RD/RA phase and will involved procedures for controlling activities as outlined in the policy:

- A comprehensive listing of all areas or locations in WAG 5 that have will have institutional controls for protection of human health or the environment. The list will include sites within WAG 5 covered by any and all decision documents. The information in this list will include, at a minimum, the location of the area, the objective of the restriction or controls, the timeframe for which the restrictions apply, and the tools and procedures that will be applied to implement the restrictions or controls and to evaluate the effectiveness of these restrictions or controls.

- Identification, made legally binding where appropriate, of all entities and persons, including but not limited to, employees, contractors, lessees, agents, licensees, and invites relevant to WAG 5 institutional controls.

- Identification of all activities, and reasonably anticipated future activities, including but not limited to future soil disturbance, routine and nonroutine utility work, well placement and drilling, grazing activities, groundwater withdrawals, paving, construction, renovation work on structures, or other activities that could occur on CERCLA sites with institutional controls.

- A tracking mechanism that identifies all land area under restriction or control.

- A process to prompt notify both the EPA and the State of Idaho before any anticipated change in land-use designation, restriction, land users, or activity for any institutional control required by a decision document.

In addition, the comprehensive WAG 5 approach will incorporate by reference the INEEL Land Use Plan (DOE-ID 1996a), installation maps, a comprehensive permitting system, and other installation policies and order.

Within 6 months of the signature of this ROD, report about monitoring the effectiveness of WAG 5 institutional controls will be submitted to the EPA and IDHW. An updated institutional control monitoring report based on the results of an on site inspection will be submitted to the EPA and IDHW at least annually thereafter until the first 5-year review. The deadline for the initial and subsequent monitoring reports may be modified, subject to approval by the EPA and IDHW, to accommodate the submittal of one monitoring reports for all operable units and all institutional controls at WAG 5, and possibly one or more monitoring report for all INEEL waste area groups, and thereby allow integration of different decision documents signature dates. In addition, after the INEEL comprehensive approach is well established and its effectiveness has be demonstrated, the frequency of future monitoring reports w\may be modified, subject approval by the EPA and IDHW. At a minimum, the institutional controls monitoring report will contain the following components:

- A description of the means employed to meet WAG 5 institutional controls requirements

- A description of the means employed to meet waste site-specific objectives, including the results of visual field inspections of all areas subject to waste site-specific restrictions

- An evaluation of the effectiveness of the approach at meeting all WAG-wide institutional control requirements and waste site-specific objectives

- A description of any deficiencies of the approach and the efforts or measures that have been or will be taken to correct problems.

The DOE will notify the EPA and IDHW immediately upon the discovery of any activities that is inconsistent with institutional controls objectives or any change in the land use or land-use designation of a site addressed in the WAG list areas or locations covered by institutional controls. The DOE will work together with the EPA and IDHW to determine a plan of action to rectify the situation, except when DOE believes that an activity creates an emergency situation. The DOE can respond to the emergency immediately upon notification to the EPA and IDHW and need not wait for the EPA or IDHW input to determine a plan of action. The DOE will identify the problems with the institutional control

process, determine the changes necessary to correct the process to avoid future problems, and implement these changes after consulting with the EPA and IDHW.

The DOE will identify a point of contact for implementing, maintaining, and monitoring institutional controls.

The DOE will notify EPA and IDHW at least 6 months before the transfer, sale, or lease of any property subject to institutional controls required by a decision document. Such notification will allow the involvement of the EPA and IDHW in discussion to ensure that appropriate provisions are included in the conveyance documents to maintained effective institutional controls. If itis not possible for DOE to notify the EPA and IDHW at least 6 months before the transfer, sale, or lease of any property subject to institutional controls, than DOE will notify the EPA and IDHW as soon as possible thereafter.

The DOE will not delete or terminate controls unless the EPA and IDHW have concurred in the deletion or termination.

12. ADDITIONAL COMPONENTS OF THE SELECTED REMEDY FOR WASTE AREA GROUP 5

In addition to the remediation that will be applied to specific sites, several activities will be implemented at WAG 5 to complete the selected remedy. These activities, including disposition of stored and investigation-derived waste and groundwater monitoring, are discussed below.

12.1 Disposition of Stored Waste and Investigation-Derived Waste

In 1996, the contents of the three ARA-02 septic tanks, a total of approximately 5,678 L (1,500 gal), were removed and placed in thirty-one 208-L (55-gal) drums. The decontamination waste (diesel) from the removal action, and investigation-derived waste from the ARA- 16 sampling filled an additional 24 drums. The 55 drums were placed in compliant storage at ARA-II near the septic system. The 55 waste drums will be addressed during the comprehensive RD/RA for WAG 5.

All but eight of the 55 drums contain waste that can be accepted by WERF and will be sent to that facility for incineration. The eight remaining drums contain PCB, concentrations at levels regulated by TSCA (40 CFR 761) and cannot be accepted by WERF. The eight drums of PCB-contaminated waste will remain in storage at ARA-II until they can be sent to the AMWTF or another compliant facility for treatment. If the waste cannot be sent to a treatment facility within 2 years of the issuance of this ROD, the waste will be relocated to the Mixed Waste Storage Facility or another compliant centralized INEEL location for continued storage until a treatment facility is available.

The WAG 5 Proposed Plan (DOE-ID 1999b) indicated that the 47 drums would be processed at WERF and the remaining eight drums would be sent to approved facilities for treatment and disposal, but the costs associated with the disposition of the waste were not presented. The estimated costs for disposing of the stored waste are given in Table 35.

Contaminated media such as soil, debris, liquids, sample residue, sampling equipment, and personal protective equipment, not identified by the INEEL FFA/CO or in this comprehensive investigation, may be generated as a result of RD/RA activities at WAG 5. Procedures to address the investigation-derived waste will be documented in the remedial action work plan. In addition, legacy waste that has been generated as a result of previous sampling activities at WAG 5 will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to achieve remediation goals consistent with remedies selected for the sites in this ROD.

12.2 Groundwater Monitoring

Groundwater monitoring will be conducted annually at WAG 5 at least until the first 5-year review. The risk estimates in the WAG 5 RI/FS for groundwater use did not exceed 1E-04 and the hazard indices were less than or equal to 0.5 (Holdren et-,al. 1999). Based on the analysis of the nature and extent of contamination and risk estimates, alternatives to address groundwater pathway risks were not analyzed. However, risk estimates, a risk-based concentration, and a maximum contaminant limit for lead in groundwater were not developed because toxicity data are not available. Lead concentrations attributable to INEEL operations may be occurring in groundwater at WAG 5 that exceed the EPA action level and Idaho groundwater quality standard for lead of 15 Fg/L (EPA 1996 and IDAPA 16.01.11.200). Groundwater monitoring will be conducted to reduce the uncertainties associated with the previous sampling and to provide trend data to assess the possibility that an unidentified source of lead contamination is affecting the aquifer.

Table 35. Cost estimate summary for final disposal of the CERCLA waste currently in compliant storage at ARA-II.

Planned Activity	Cost (Fiscal Year 1998 dollars)
FFA/CO management and oversight	
WAG 5management	250,000
Remdedial design	
Remedial design/remedial action scope of work	NA
Remedial action work plan	NA
Packaging, shipping, transportation documentation	48,000
Remedial action report	NA
Data collection and management for first 5-year review	NA
Safety analysis documentation	NA
Sampling and analysis plan	NA
Pre-final inspection report	NA
Legal review	NA
Total title design package	NA
Site characterization	NA
Remedial action—construction subcontract	NA
Treatment subcontract	86,000
Management action andoperations contractor support for the disposal contract	25,000
CAPITAL COST SUBTOTAL	409,000
Contingency @ 30%	123,000
TOTAL CAPITAL COST IN FY-99 DOLLARS	532,000
TOTAL CAPITAL COST IN NET PRESENT VALUE	532,000
Operation	
Program management	NA
Data collection and management for WAG-wide 5-year reviews	NA
Maintenance	NA
Decontamination and dismantlement	NA
Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL	NA
Contingency @ 30%	NA
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1998 DOLLARS	NA
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE	NA
TOTAL PROJECT COST IN NET PRESENT VALUE	532,000

The results from three WAG 5 groundwater sampling campaigns (i.e., April and July 1995 and August 1997) and output from GWSCREEN fate and transport modeling were interpreted in the WAG 5 Comprehensive RI/FS (Holdren et al. 1999). The detected and modeled concentrations of lead were compared to the 15-µg/L standard. Five wells in WAG 5 had at least one groundwater sample with detected lead concentrations exceeding 15 µg/L. The results of the GWSCREEN modeling indicate that the known concentrations of lead in WAG 5 soil are not causing elevated lead concentrations in groundwater.

The most likely cause of the apparently elevated lead concentrations is related to sampling and analysis. Naturally occurring lead and well construction materials are probably not sources of lead in the aquifer. Evidence of possible sampling error was observed in the April 1995 samples from Well ARA-001, for which duplicate sample values were 8.2 µg/L and 75.7 µg/L.

Sample preparation, such as filtering and sample digestion, also can influence analytical results. The potential exists for particulate matter from the well to be included in the water sample. The occasional incorporation of particles into the groundwater samples may generate the few relatively high lead results that occur amid a larger number of typically lower values. With a larger data set, the apparent outlier values could be discriminated from the bulk of the data. Furthermore, samples for lead analyses are digested, meaning the water sample is treated with a strong acid before analysis to ensure that all of the particulate matter is broken down. Sample digestion may be the cause of the occasional spikes of high lead concentrations in WAG 5 and INEEL data sets because particulates (either soil particles or flakes of well material) may occasionally be collected into the sample bottles. For that reason, future samples for lead analysis should be filtered.

Samples will be collected within a year of the date of the signing of this ROD and annually thereafter at least until the first 5-year review for this ROD, when the need for continued groundwater monitoring will be assessed. The analytes will be determined during the development of the groundwater sampling and analysis plan. Costs for monitoring the full suite of groundwater analytes are included in the estimate for 5 years of groundwater monitoring provided in Table 36.

Table 36. Estimated costs for groundwater monitoring at Waste Area Group 5.

	Planned Activity	Cost (Fiscal Year 1999 dollars)
Operations	Field sampling plan	44,000
	Health and safety plan	29,000
	Annual sample collection for 5 years	47,000
	Annual sample analysis for 5 years	30,000
	Sample management for 5 years	33,000
OPERATIONS AND MAINTENANCE COST SUBTOTAL		182,000
	Contingency @ 30%	55,000
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 1999 DOLLARS		238,000
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		212,000
TOTAL PROJECT COST IN NET PRESENT VALUE		212,000

13. DOCUMENTATION OF SIGNIFICANT CHANGES

Several issues relative to the components of the selected remedy for WAG 5 were either not presented in the WAG 5 Proposed Plan (DOE-ID 1999b) or were modified after the Proposed Plan was published. These differences from the Proposed Plan are discussed below.

13.1 Modification to the Preferred Alternative for Contaminated Soil Sites

Alternative 4, removal and disposal, and Alternative 5, removal, ex situ sorting, and disposal, for the contaminated soil sites were developed separately but combined for presentation in the Proposed Plan (DOE-ID 1999b). The preferred alternative for the contaminated soil sites presented in the Proposed Plan was labeled Alternative 5a and described as excavation, ex situ sorting, and disposal at the INEEL. Alternative 4a was identified as a subset of Alternative 5a. However, subsequent to finalization of the Proposed Plan, a treatability study was performed using the segmented gate system (see Section 8.10.5) to determine whether ex situ sorting of the contaminated soil at WAG 5 would achieve a substantial reduction in the volume of soil requiring disposal.

The results of the treatability study indicate that the soil at WAG 5 cannot be successfully sorted to satisfy the 23-pCi/g final remediation goal for Cs-137 (see Table 16) with any volume reduction. Therefore, the analysis of alternatives in this ROD for the contaminated soil sites reflects a return to the presentation of alternatives developed in the RI/FS. The selected alternative in this ROD is Alternative 4a. As summarized in Section 8 and documented in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999), Alternative 4a consists of excavation and disposal without sorting at the ICDF or another facility on the INEEL.

13.2 Operable Unit 5-05, ARA-06 Stationary Low Power Reactor No. 1 Burial Ground

Operable Unit 5-05 comprises the SL-1 Burial Ground, Site ARA-06, and the surrounding area. An RI/FS (Holdren, Filemyr, and Vetter 1995) was conducted for this operable unit. In accordance with the OU 5-05 ROD (DOE-ID 1996b), an engineered barrier was placed over the landfill. Two elements relative to the OU 5-05 ROD have been modified. First, contaminated soil detected during the GPRS survey of the windblown contamination area around ARA-I and ARA-II will be remediated in conjunction with the cleanup of Site ARA-23. Some of this soil is within the area once defined as OU 5-05. Second, post-remedial requirements for OU 5-05 will be consolidated with the post-remedial requirements for OU 5-12.

13.2.1 Surface Soil Contamination In Operable Unit 5-05

The original boundary for OU 5-05, Site ARA-06, was defined as the fence surrounding the SL-1 Burial Ground. However, the OU 5-05 ROD redefined the operable unit boundary to include the northeast 40% of the windblown contamination area around ARA-I and ARA-II. Dose equivalent rate measurements outside the burial ground fence indicated radiological field levels at or below the average INEEL level of 20 µrem/hour (Jorgensen 1995). Therefore, no unacceptable external exposure risks were identified for this area, and DOE-ID, EPA, and IDHW reached consensus that no further action would be required for the surface soil outside the burial ground fence. However, this area was surveyed during the 1997 GPRS survey of ARA-I and ARA-II, and Cs-137 was detected at concentrations in excess of the preliminary remediation goal of 23 pCi/g identified for WAG 5 (Holdren et al. 1999). Therefore, the surface soil in OU 5-05 exceeding the Cs-137 remediation goal of 23 pCi/g will be remediated as part of

Site ARA-23 during the comprehensive RD/RA. In addition, the original definition of the boundary for OU 5-05, the fence surrounding the SL-1 Burial Ground, was reestablished to simplify the implementation and management of long-term institutional controls for ARA-23 (the windblown contamination area) and ARA-06 (the SL-1 Burial Ground).

13.2.2 Post-Remedial Requirements

Based on the results of the OU 5-05 baseline risk assessment, human health risk will diminish to less than 1E-04 in approximately 400 years (Holdren, Filemyr, and Vetter 1995). Therefore, institutional controls must be maintained at OU 5-05 for that time period. During this period, 5-year reviews and site maintenance (e.g., fences, signs, vegetation, and subsidence) must be conducted to ensure the continued protectiveness of the remedy implemented at SL-1. These activities will be consolidated with the post-remedial activities for OU 5-12 at the earliest opportunity, The first 5-year review will be implemented for OU 5-05 in 2001, and the next review is scheduled for 2006. However, consolidation of the OU 5-05 review with the OU 5-12 review is anticipated before 2005. Therefore, the OU 5-05 review may be conducted before the second 5 years have passed.

13.3 Arsenic in the ARA-01 Chemical Evaporation Pond

Arsenic was detected at ARA-01 in concentrations above the INEEL background value, and risk was evaluated for human health. However, the maximum detected arsenic concentration at ARA-01, 25.8 mg/kg (Holdren et al. 1999), is within the range of WAG 5 background values of nondetection to 38.6 mg/kg (Martin et al. 1990; Stanisich et al. 1992). Therefore, arsenic was not identified as a human health COC. In the process of developing remediation goals for ARA-01, WAG 5 background values were closely examined. Though the PBF background concentrations for arsenic are high in comparison to INEEL background values, ARA background concentrations are comparable to the INEEL value of 5.8 mg/kg (Rood, Harris, and White 1996). Therefore, arsenic is now identified as a human health COC for ARA-01. The site will be remediated to address human health risks from arsenic in addition to remediation to address ecological risks from thallium, and selenium. Because ARA-01 was already identified for remediation, adding arsenic to the COC list does not affect the validity of the analysis of alternatives or the selected remedy for ARA-01. The remedial action objectives for the contaminated soil sites (see Section 8.2) do not require revision because dermal absorption, the exposure pathway of concern for arsenic at ARA-01, is addressed. A remediation goal for arsenic at ARA-01 has been established, as presented in Table 16.

13.4 Lead in ARA-25 Contaminated Soil and the ARA-02 Sanitary Waste System Seepage Pit

Lead was identified in the WAG 5 RI/FS risk assessment as a contaminant of potential concern for the contaminated soil at ARA-25 and the ARA-02 Sanitary Waste System seepage pit and (Holdren et al. 1999). The human health risk associated with lead could not be quantified because reference doses for lead have not been developed. As a result, lead was not presented as a contaminant of potential concern in the risk summary in the RI/FS (Holdren et al. 1999, Section 8) or in the WAG 5 Proposed Plan (DOE-ID 1999b), and a preliminary remediation goal was not developed. However, because the maximum detected lead concentrations of 1,430 mg/kg in ARA-25 soil and 1,290 mg/kg in the ARA-02 seepage pit sludge exceed the EPA lead screening level of 400 mg/kg (EPA 1994b), a lead remediation goal has been identified for both sites in this ROD (see Tables 16 and 22). The lead will be mitigated by implementation of the selected remedies for ARA-25 and ARA-02.

13.5 Risks from Ag-lo8m and Cs-137 at ARA-12

The risk estimates in the WAG 5 RI/FS for Site ARA- 12, the Radioactive Waste Leach Pond at ARA-III, were developed based on limited analytical data and information from the 1997 GPRS survey of the ARA-III facility (see Section 8.2). Unacceptable risks from external exposure to Ag- 108m and Cs-137 were identified (Holdren et al. 1999).

To estimate risk, the GPRS data were interpreted using the assumption that the elevated gamma readings were generated by Cs-137 contamination in the soil. Though soil samples were collected to verify the GPRS readings, the analytical results (Giles 1999b) were not available until after publication of the WAG 5 Proposed Plan (DOE-ID 1999b). The analytical results show that most of the gamma radiation detected at ARA-12 is attributable to Ag-108m and that Cs-137 concentrations are much lower than anticipated. The risk estimates for Cs-137 are, therefore, overestimated because the GPRS data converted to Cs-137 concentrations were used to evaluate external exposure to Cs-137. The maximum detected Cs-137 concentration is only 4.42 pCi/g, significantly less than the 23 pCi/g risk-based remediation goal. Therefore, Cs-137 is eliminated as a COC for ARA-12.

The risk estimates in the RI/FS for Ag-108m were based on the analysis of soil samples collected in 1993 (Pickett et al. 1994). Because the concentrations of Ag-108m detected in 1993 are higher than those detected in 1999, the risk estimates developed with the 1993 data are upper-bound estimates.

The risk estimate for Ag-108m also was based on a half-life of 130 years. Recently, the half-life for this isotope was revised to 418 years (Firestone and Shirley 1999). Because the longer half-life would increase the risk estimate and the site has already been identified for remediation, the risk estimate for ARA-12 was not revised. However, the remediation goal was revised as appropriate (see Table 16).

The impact of this information on the analysis and selection of a remedy for ARA-12 is negligible. The Proposed Plan identified Ag-108m as a contaminant of concern it this site and a preliminary remediation goal was presented. The remediation goal is a risk-based soil concentration and is not dependent on the detected concentrations at the site. Therefore, revised risk estimates were not developed. Though the risk estimates for ARA-12 reported in the Proposed Plan were not revised, the conclusions based on the estimates (i.e., the decision to remediate and remedy selection) are protective of human health and the environment.

13.6 Institutional Control Sites

As discussed in Section 11.1 and reflected in Tables 32 and 33, 15 sites in WAG 5 have been identified in this ROD for institutional controls. In the WAG 5 Proposed Plan (DOE-ID 1999b, Tables 16 and 17), 29 sites were identified for institutional controls and 19 sites were identified as not requiring institutional controls. Subsequent review of WAG 5 sites using the recently released EPA Region 10 policy for institutional controls (EPA 1999b) resulted in several modifications to the lists in the Proposed Plan. Most of the changes involved sites with structures (e.g., septic tanks and seepage pits). In the Proposed Plan, the sites with remaining structures were identified for institutional controls. However, such sites were not identified in this ROD for institutional controls unless residual contamination precludes unlimited exposure (see Section 12). Those sites that were changed from one classification to the other are indicated in Table 32.

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Part 3: Responsiveness Summary

STAKEHOLDER COMMENTS AND DEPARTMENT OF ENERGY RESPONSES

The public comment period for the WAG 5 Proposed Plan (DOE-ID 1999b) began May 10 and ended June 9 for the receipt of written and oral comments. Public meetings on the WAG 5 Proposed Plan were conducted in Idaho Falls on May 17, Boise on May 18, and Lewiston on May 19,1999. Oral comments were submitted by those attending the meetings. The written comments and the meeting transcripts are available in three INEEL information repositories in the Administrative Record for the WAG 5 Comprehensive RI/FS. The information repositories are located in the INEEL Technical Library in Idaho Falls, the Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow.

Typically, comments received from stakeholders pertaining to a proposed plan are compiled and comments that are similar in meaning are summarized and consolidated. However, because only 25 comments were submitted, each comment is presented below in its entirety. The oral comments are reproduced with minimal editing for clarity. The written comments, with the exception of corrected spelling and punctuation and extremely rare instances of editing for clarity, are presented verbatim. In addition, letters within brackets have been added to some comments to indicate multiple parts. A complete response to each comment is provided. An index to the comments on the WAG 5 Proposed Plan is provided in Table 37 below.

Table 37. Oral and written comments on the WAG 5 Proposed Plan.

Name	Affiliation	Comment No.
Oral		
Beatrice Brailsford	Snake River Alliance Idaho Falls, Idaho	1, 2, and 3
Beverly Carlyle	Concerned citizen Idaho Falls, Idaho	4
Ted Carpenter	Shoshone-Bannock Tribes Fort Hall, Idaho	5
Pam Allister	Snake River Alliance Boise, Idaho	6
Chuck Broscious	Environmental Defense Institute Troy, Idaho	7, 8, 9, and 10
Written		
Chuck Broscious	Environmental Defense Institute Troy, Idaho	11, 12, and 13
Chuck Rice	Citizens Advisory Board Idaho Falls, Idaho	14, 15, 16, 17, and 18
Steve Hopkins	Snake River Alliance Boise, Idaho	19, 20, 21, 22, 23, 24, and 25

Oral Comments Presented at the Public Meetings and DOE Responses

Idaho Falls Public Meeting

Comment 1 **[a]** The Snake River Alliance's fundamental concern remains, how does this fit together with the other cleanup actions? The notion that some caps won't last as long as other caps is something that we need to keep examining. **[b]** I would like to note that this might be the first cleanup plan where we've seen the INEEL say that it's cheaper to clean it up than continue to monitor it until the end of time. That's probably a real good stride forward.

Response: **[a]** Cleanup actions from the other WAGs were used where possible to develop cost estimates, basic assumptions, implementability, current worker exposures, different contaminant transport properties, and so forth. Each site has different contaminants with different design requirements, so a one-size-fits-all solution is not possible. Before the actual design development, the design requirements specific to the problem are identified. For instance, in some cases with short-lived radionuclides, a native soil cover may be the preferred alternative. A site requiring a 400-year design life such as SL-1 required a layered gravel and rock cap to be effective against erosion and intrusion. **[b]** For the site in question, PBF- 16, site characterization is the cost issue, not monitoring. Monitoring may be a reasonable alternative for other sites even if long-term costs are high. Site-specific characteristics and applicable alternatives must be considered, and cost is only one of several criteria used to develop the comparative analysis of alternatives. For this particular site, it is more cost-effective to remediate to protect ecological receptors than it is to conduct additional studies or characterization.

Comment 2 In this plan, we have to remove the tanks so that we can clean up the soil. And in WAG 3, I asked specifically, don't you have to remove the tanks to clean up the soil? And the answer was no.

Response: Commenting on tanks in WAG 3 is outside the scope of this project, except to note that the situations in the two WAGs differ significantly. Waste Area Group 5 has one small buried tank at a shallow depth with a very small amount of soil contaminated with one constituent, and a small volume of mixed waste in the tank. Waste Area Group 3 must address several large tanks at greater depths with multiple contaminants in the soil and comparatively large waste volumes in the tanks. An interim action (DOE-ID 1999a) has been selected to seal the surface to reduce infiltration while further analysis of alternatives for the tanks is conducted. It is not surprising that different remedies would be appropriate. For WAG 5, removing the tank to remediate the soil is the most efficient and effective approach.

Comment 3 There's got to be a fair amount of public involvement when we're developing the waste acceptance criteria for the soil dump. People are edgy about that to begin with and they are not going to get more relaxed if they don't know how we're going to decide what to put in it.

Response: The comment is noted and was forwarded to the WAG 3 project team.

Comment 4 We always go 100 years down the road. It would be real nice to know what is going on today because INEEL will take care of this and that, and everything will be great in 100 years. Today is the day. Are you going to be here in 100 years?

Response: For the purposes of risk assessment and cost development, it is assumed that the INEEL will be under the active stewardship of the Department of Energy or another federal agency to ensure that risks are controlled for the next 100 years. The INEEL Land Use Plan (DOE-ID 1996a)

indicates that a minimum of 100 years of institutional controls for the INEEL will be enforced. The DOE Radioactive Waste Management Manual also specifies 100 years of institutional controls (DOE M 435.1-1). Because management controls limit the potential effects of contaminants on workers and residential land use is precluded by institutional controls, the baseline risk assessment evaluates a residential scenario 100 years in the future.

Comment 5 **[a]** To the Shoshone-Bannocks, the animals and plants out there, the native species, are part of the tribal heritage. As you know, I really don't see that need for that 48-58 acres to have all of the native ecosystem be removed. **[b]** Also, of course, I want to remind you that you're really not disposing of anything. You're storing it. **[c]** And I do hope that if the land ever reverts from DOE possession, that it is returned to the Shoshone-Bannock Tribes to be preserved as an ecological preserve, an environmental preserve.

Response: **[a]** The large surface soil area cited in the comment, Site ARA-23, is contaminated with Cs-137. Unfortunately, removing the vegetation and scraping the soil is the only way to remove the contamination. Phytoremediation, a technology that uses plants to collect radioactive contamination, is not a viable option for ARA-23 because of the particulate nature of the contamination. The no action alternative consisting of leaving the contaminated soil in place does not to meet the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.) threshold criteria for protection of human health and the environment and compliance with regulations. All other possible alternatives for remediating ARA-23, including capping, require removing the plants and soil. However, the site will be restored following remediation by vegetating the excavated areas with a mixture of plant species. **[b]** Radioactivity cannot be destroyed. Natural radioactive decay over time is the only mechanism for reducing radiotoxicity. Therefore, storing the contaminated media in a managed disposal facility was selected to protect human health and the environment. **[c]** Land-use .projections (DOE-ID 1996a) indicate that industrial land use will continue far into the future at the INEEL. However, as evidenced by the recent establishment of the 74,000-acre INEEL Sagebrush Steppe Ecosystem Reserve, DOE can transfer portions of the Site to other entities. Anticipating that it will maintain its cooperative relationship with the Shoshone-Bannock Tribes, DOE will continue to consult with tribal representatives about cultural resources and land use.

Boise Public Meeting

Comment 6 The Snake River Alliance requests full participation in the developing of the waste acceptance criteria for the soil repository, any soil repository in Idaho.

Response: The comment is noted and was forwarded to the WAG 3 project team.

Lewiston Public Meeting

Comment 7 The comments that I have on this proposed plan revolve around questions of what the waste category for the radioactive waste tank actually is. There seem to be some different data sets--one data set says it's a mixed transuranic waste, the other data set says that it's not.

Response: The data sets are in disagreement. According to the 1997 analytical results (see Table 27 of this ROD), which are the most accurate representation of the tank contents, the tank contents are not classifiable as transuranic (TRU) waste. Significant questions were raised concerning the data quality for the analysis of the samples collected in 1994 (DOE-ID 1997). Though analytical results indicated TRU waste, the 1994 data were never validated. Because of the uncertainties associated with these data, the waste characteristics were identified as a data gap in the WAG 5 RI/FS Work Plan (DOE-ID 1997), and samples of the tank waste were collected and analyzed for all possible contaminants.

However, regardless of the ultimate classification of the waste as TRU or not TRU, the waste will be collected from the tank, treated, and characterized to satisfy the disposal facility waste acceptance criteria.

Comment 8 I submitted for the record copies of the Final Work Plan for Waste Area Group 5, Operable Unit 5-12, Comprehensive Remedial Investigation/Feasibility Study [showing] that the concentration levels easily make the criteria of a hundred nanocuries per gram of transuranic waste. So as far as this document is concerned, it should be listed as transuranic waste. If that is the case, then the alternatives for the particular waste site, this is ARA-16, a number of the alternatives listed as utilizing in situ vitrification would not be legal, because there is no place on the INEEL site that would qualify as a transuranic—permanent transuranic waste disposal facility. Matter of fact, there is only one in the country and that's in New Mexico. I have gained commitments from various officials here that they will send copies of other sampling data that they claim say that it's mixed low-level waste. So I'm anxiously awaiting that.

Response: Different analytical data indicate different classification (see response to Comment 7). The contents of the ARA- 16 tank may or may not be classifiable as TRU, depending on the data set that is used. Regardless, disposal of TRU at the INEEL is not precluded by statute. The requirements are embedded in DOE Order 435.1, "Radioactive Waste Management," (DOE O 45.1) and are to be considered, but are not what are termed applicable or relevant and appropriate requirements (ARARs); therefore, DOE has the discretion to approve treatment that would leave the tank waste in place. In situ vitrification has the potential to satisfy legal requirements, though an ARAR waiver based on demonstration that the treatment is effective could be required to meet the substantive requirements of the Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.). Therefore, in situ vitrification was a viable alternative for the ARA-16 tank.

Comment 9 There was a lot of discussion earlier in the meeting unofficially about where the preliminary remedial goals that are listed in the plan come from. There is some acknowledgment here on page 12 that they are EPA-approved screening levels. But as far as I could tell, in downloading the EPA preliminary remediation goals, they don't match. There doesn't seem to be any documentation on how those preliminary remediation goals are derived and what basis they're arrived at. I think if you're going to use those numbers, then you have to indicate where they came from and what justification there is for them.

Response: The EPA screening level on page 12 of the Proposed Plan is relevant only to lead. The preliminary remediation goals for other contaminants are based on risk or background concentrations. Tables 16, 22, and 28 in the Decision Summary (Part 2 of this ROD) show the basis for the remediation goals established for WAG 5 cleanup activities.

Comment 10 There is a lot of reliance on the eventual construction of the ICDF—INEEL CERCLA Disposal Facility. The siting of that particular disposal facility needs to be a very public process where the public can have an opportunity to be involved with that decision-making process. It should not be done in any other closed door manner where our concerns about the flood zone areas—as far as we're concerned—should be excluded, or exclusionary parts of the site where new disposal facilities will not be allowed to be constructed.

Response: The comment is noted and was forwarded to the WAG 3 project team.

Comment 11 At first glance the proposed Power Burst Facility/Auxiliary Reactor Area (PBF/ARA) cleanup plan appears to offer the type of information needed by the public in order to make an informed decision on whether the plan's preferred alternatives are the appropriate actions to take. Tables showing maximum concentration levels of the contaminants and "preliminary remediation goals" can offer just this kind of essential information. Unfortunately, the preliminary remediation goals listed in the plan bear no resemblance to the published Environmental Protection Agency's reference guide of risk values and preliminary remediation goals for radionuclide's concentration in soil that generates a one in a million (1E-6) lifetime cancer risk. The preliminary remediation goals that DOE is using are a thousand times higher than the EPA's preliminary remediation goals, yet the plan states that "the lead preliminary remediation goal is the EPA approved screening level" (page 12). If DOE has developed its own preliminary remediation goals independent of EPA or other regulatory agencies, then this fact must be noted and an explanation of how these preliminary remediation goals are derived and what specific assumptions were employed in the development.

Response: All remedial actions at CERCLA sites must be protective of human health and the environment and comply with ARARs. The EPA screening levels for carcinogens are typically set at a risk of 1E-07, but EPA supports use of a 10^{-4} order of magnitude risk in making risk management decisions for the INEEL. Remediation goals based on risk of 1E-04 would be approximately 1,000 times higher than the screening levels. However, site-specific remediation levels based on risk assessment vary depending on site-specific conditions. Site-specific risk assessment can be used to establish cleanup levels for response actions under CERCLA. For WAG 5, the preliminary remediation goals presented in the feasibility study and Proposed Plan were developed using risk-based or background concentrations, except for lead. Risk could not be estimated for lead because the necessary toxicity data were not available. Therefore, a risk-based remediation goal could not be developed. The 400 mg/kg lead remediation goal given on page 12 of the Proposed Plan was taken from EPA guidance (EPA 1994). Tables 16, 22, and 28 in the Decision Summary (Part 2 of this ROD) present the derivation of the remediation goals.

Comment 12 **[a]** The PBF/ARA Proposed Plan offers maximum contaminant levels on some less contaminated sites yet on the more serious contaminated sites the DOE refuses to offer maximum contaminant levels. For instance, for the 1,000 gal. hot waste tank at the Auxiliary Reactor Area I Operable Unit ARA-16, DOE fails to list the maximum contaminant levels. The table lists only contaminants of concern without concentration levels. DOE also fails to acknowledge that the waste is mixed transuranic (MTRU) in an apparent attempt to sidestep regulatory requirements for this class of radioactive waste. **[b]** DOE's own 1997 Track II Remedial Investigation Feasibility Study (RI/FS) acknowledged this waste is "F-listed transuranic (TRU) waste." The legal criterion for transuranic waste is it must contain greater than 100 nanocuries per gram of transuranic radionuclides. This RI/FS lists the following TRU contaminant levels in (ARA-16):

Americium-241	0.45 micro curies/gram = (450 nanocuries/gram)
Plutonium-238	0.33 micro curies/gram = (330 nanocuries/gram)
Plutonium-239	0.29 micro curies/gram (290 nanocuries/gram)
1,1,1-Trichloromethane	10,300 µg/L
Trichloroethene	4,800 µg/L (DOE/ID-10555, pages A-8 & D-17]

At a hearing on May 19, DOE officials noted that another sample of the ARA-16 hot tank contents indicated that the waste was "mixed, low-level." When there are only two data sets, DOE cannot arbitrarily choose one over the other without some credible justification that so far is absent. In other words, if DOE had a dozen samples of the tank waste, and eleven indicated mixed low-level and one

indicated mixed TRU, then one may conclude that the preponderance of evidence points to mixed low-level. Another discrepancy between the plan and the RI/FS is the volume of tank contents, which according to the RI/FS the contents are greater than three times the volume noted in the plan.

[c] The plan considers the ARA-16 tank itself as low-level waste without offering any sampling data to substantiate this waste classification. Since the tank held mixed transuranic waste for nearly fifty years, the only reasonable assumption is to consider the tank itself as MTRU until sampling data demonstrate otherwise. Therefore, the plan's preferred alternative to bury the tank onsite would not meet regulatory requirements because DOE has no EPA-permitted disposal sites at INEEL for MTRU.

[d] The Proposed Plan offered an ARA-16 hot tank contents remedial Alternative-3 (in-situ vitrification) of onsite disposal of the tank and its contents, which again would be in violation of the statutes because the agency cannot legally dispose of TRU on the INEEL Site. Although Alternative 3 is not the preferred alternative, DOE has an obligation to offer cleanup alternatives that meet regulatory requirements, which is clearly not occurring. Misinformation of this type undermines the credibility of the process and reduces the public's confidence in the state and federal regulatory agencies.

Response: **[a]** The Proposed Plan (DOE-ID 1999b) lists concentrations only for contaminants of concern. Because a release has not occurred from the tank, the contents are not identified as contaminants of concern. The list of constituents detected in the waste given in Table 13 of the Proposed Plan was included to support a decision to remediate the tank contents, the only principle threat waste in WAG 5, even though a release has not occurred. The soil at the ARA-16 site is not contaminated at the levels detected in the tank waste. Analytical results for samples collected from the tank waste in 1997 are provided in Table 27 of the Decision Summary (Part 2 of this ROD).

[b] It is assumed that the comment that cites a Track 2 RI/FS actually refers to the WAG 5 Work Plan (DOE-ID 1997) that was developed to guide the sampling, analysis, and development of the RI/FS for the WAG 5 comprehensive investigation. The concentrations of the radionuclides and chemicals cited in the comment are found in Appendix D, the Field Sampling Plan, of the Work Plan. The concentrations reported in the Work Plan were not confirmed by the samples collected in 1997 (see Table 27 of the Decision Summary). Differences between the 1994 and the 1997 sample concentrations were probably caused by the amount of sludge available for sampling and the total volume of the waste. The highest concentrations would be present in the sludge phase, with lesser concentrations in the liquid phase of the tank contents. During both the 1994 and the 1997 sampling, the liquid level could be measured with conventional methods (i.e., by inserting a stick), but the thickness of the sludge could be estimated only. Sludge samples were successfully collected in 1994. However, during the 1997 sampling, all of the planned sludge samples could not be collected, even by scraping the bottom of the tank, because sufficient volume was not available. Another factor could be the locations in the tank from which the samples were taken. The sludge is probably not homogeneous. Either the waste will be treated to satisfy classification requirements as TRU for disposal at the Waste Isolation Pilot Plant or non-TRU for disposal at a mixed waste disposal facility (e.g., the INEEL CERCLA Disposal Facility [ICDF]). The development of the alternative anticipates that the residual will be disposed of as TRU waste. The selected alternative specifies treatment at the Advanced Mixed Waste Treatment Facility or the ATG, Inc. Richland facility (ATG) in Richland, Washington. All treatment residuals from the AMWTF will be disposed of at the Waste Isolation Pilot Plant. Treatment residuals from ATG, Inc. can be either TRU, which would be sent to the Waste Isolation Pilot Plant, or non TRU. The classification of the residuals as TRU or non TRU is dependent on the process controls applied during treatment. Additional analysis of the waste will be conducted when the site is remediated to provide the waste characterization data and certification required by most disposal facilities. The results of this additional sampling will resolve any doubt about the appropriate classification for the waste.

Evidence indicates that the volume of waste in the tank has fluctuated, probably because of a manhole seat that leaked. Ile seal was repaired in 1997. Recent measurements indicate that the tank contains a very small amount of sludge, approximately 4.5 gal, and about 312 gal of liquid waste (Coveleskie 1999).

[c] The preferred alternative presented in the Proposed Plan (DOE-ID 1999b) was excavation not onsite burial of the tank. The tank is constructed of stainless steel. Successful decontamination of stainless steel has been achieved many times. However, if the stainless steel tank cannot be sufficiently decontaminated to comply with waste acceptance criteria for burial, disposal will be implemented in accordance with the requirements appropriate for its waste classification.

[d] Disposal of TRU waste at the INEEL is not precluded by statute. The requirements are contained in DOE Order 435.1 and are to be considered but are not ARARs. The U.S. Department of Energy has the discretion to approve treatment that would leave this waste in place. In situ vitrification has the potential to satisfy legal requirements, though an ARAR waiver based on demonstration that the treatment is effective could be required to meet the substantive requirements of RCRA. Therefore, in situ vitrification is a viable alternative for the ARA-16 tank.

Comment 13 The proposed plan offers the public access to INEEL Administrative Record through DOE's Internet website. Having personally attempted numerous times to utilize this site, I can categorically say it is ventrally unusable, presumably, because the documents are scanned in as a graphic rather than in text mode. Unless a person has a super fast computer and modem, it would take years to browse through a single RI/FS.

Response: This comment has been conveyed to the manager of the Administrative Record. Hard copies of Administrative Record documents can be requested from the Community Relations Plan Office at (208) 526-4700.

Comment 14 We were pleased to see that the document was visibly improved from a prior version, which was reviewed by the INEEL CAB's Environmental Restoration Committee. The comments submitted by that Committee were obviously taken to heart and incorporated to a great extent. In addition, it is evident that the document preparers were largely successful in their attempts to prepare a document that will support public review. It is well organized and formatted, easing review and enhancing comprehension. The rationale for selection of the preferred alternatives is well presented. We conclude that the preferred alternatives are indeed appropriate. We await the issuance of the Record of Decision.

Response: Thank you. Many of the improvements were a result of comments from the INEEL CAB's Environmental Restoration Committee and input from a citizens' focus group generated during reviews of two earlier proposed plans for other waste area groups.

Comment 15 The INEEL CAB recommends that the three agencies proceed expeditiously so that cleanup activities at WAG 5 can begin shortly.

Response: As required by CERCLA, remedial action must begin no later than 15 months following the signing of this Record of Decision.

Comment 16 Review of the Proposed Plan generated questions about the likely schedules that would apply under each of the remedial alternatives. While such information is not typically presented in Proposed Plans, we think that the public may be interested in learning about expected implementation schedules for each remedial alternative to support informed comparisons among alternatives. We

acknowledge that detailed schedules may only become available as a result of negotiations with the regulators that culminate with the issuance of a Record of Decision. **The INEEL CAB recommends that DOE include a detailed implementation schedule in the Record of Decision for WAG 5. In addition, we recommend that DOE include rough implementation schedules for each remedial alternative in future Proposed Plans.**

Response: As mentioned in the comment, remedial design/remedial action schedules depend on the date of issuance of a record of decision. Therefore, detailed implementation schedules cannot be developed and included in records of decision. Though proposed plans can present estimates of the duration of actions, even rough implementation schedules cannot be included. The Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) requires that a scope of work for remedial design/remedial action activities be delivered to the agencies 21 days after a record of decision is signed. The scope of work will provide the schedule for developing the remedial design and remedial action work plans. Implementation schedules will be included in these work plans. The FFA/CO also requires the commencement of substantial continuous physical remedial action onsite within 15 months of the issuance of a record of decision.

Comment 17 Use of the term "Future Residential Scenario Cancer Risk" in Tables 3, 5, 6, 10, and 12 creates confusion for the reader. Explanations to the committee and subsequently to the Board by knowledgeable staff allowed an understanding of what was meant by the term. **The INEEL CAB recommends changing the term or adding appropriate explanations in future Proposed Plans and in the Record of Decision for WAG 5.**

Response: The term "Future Residential Scenario Cancer Risk" refers to the additional risk of developing cancer above the baseline risk of developing cancer over a 70-year life span as a result of a 30-year exposure of a contaminant left at a site. This risk would be to a human who became a resident at that site at the end of the simulated 100-year institutional control period. Sidebars were included to define many terms in the WAG 5 Proposed Plan to enhance the readers' understanding. "Future Residential Scenario Cancer Risk" was discussed in several locations, including in an "Info" sidebar, but not presented as a definition. The Community Relations Program has been made aware of this comment so that future proposed plans will provide a clearer definition.

Comment 18 The explanation of the numbering of the alternatives evaluated for the contaminated soil sites (page 14) was inadequate. It did not allow the reader to develop a full understanding of why only Alternatives 1, 3b, 5a and 5b are presented. We recognize the need for consistency between a proposed plan and the related remedial investigation/feasibility study documentation. We nonetheless suggest that this Proposed Plan could have provided a better numbering mechanism that would generate less confusion for the reader. **The INEEL CAB recommends that future Proposed Plans use clearer numbering schemes.**

Response: The CERCLA guidance outlines the recommended format for developing Superfund remedial investigation/feasibility studies, proposed plans, and other documents (EPA 1999, 1988). The need for continuity with the feasibility study is one reason for preserving the numbering scheme. However, the numbering in the feasibility study was used because variations of the same alternative, such as Alternatives 3a and 3b for the contaminated soil sites, cannot be assigned individual numbers and analyzed in the feasibility study or proposed plan as independent alternatives. The WAG 5 Proposed Plan is a communication tool, and it is our desire to communicate clearly and concisely. Only the alternatives that satisfy the threshold criteria are presented in the Proposed Plan, other than the "No Action" alternative, which always is included for baseline comparison purposes. The Community Relations Program has been made aware of this comment so that future proposed plans will provide a clearer explanation of the numbering.

Comment 19 Page 8. In the contaminated soil sites summary it would be more helpful to have the contaminants of concern ordered by concern rather than in alphabetical order.

Response: There are several reasons why lists of contaminants are presented alphabetically:

Consistency in presentation is desirable. Though lists of contaminants in order of descending risk would be readable for WAG 5 because there are few contaminants of concern, other WAGs, such as WAG 3 (the Idaho Nuclear Technology and Engineering Center) and WAG 7 (the Radioactive Waste Management Complex), have much lengthier lists. These lists would be more difficult to use and extremely awkward to maintain during document development if contaminants were ordered by risk.

More than one risk number is associated with each contaminant, and the order may vary depending on which risk number the contaminant is being sorted on. Consider the following: there are three risk scenarios (current and future occupational, and future residential), numerous exposure pathways (e.g., external exposure and inhalation of dust), and three different risk indicators (i.e., carcinogenic risk and noncarcinogenic hazard indices for human health, and hazard quotients for ecological receptors).

Quantified risk estimates typically have a level of uncertainty that may or may not have been quantified. For risk estimates that are similar in magnitude, ranking contaminants of concern could be problematic.

In most (perhaps all) of the supporting information for the Proposed Plan, including Track 1 and Track 2 documents, analytical results, risk assessment tables in the RI/FS, and other references, contaminants are presented in alphabetic sequence.

Comment 20 Page 11. Regarding the description of the ARA-23 site you refer to past sampling showing contamination limited to the top 4 inches of soil. Several of these sampling efforts and instances of "particle picking" were discussed in the SL-1 and BORAX burial grounds ROD (January 1996). These efforts revealed contamination below 3 inches with some particles that were not "picked" emitting radiation up to 250 mR/hour. Are we now to believe that the remaining contamination is isolated between the top 3 and 4 inches of soil?

Response: Two different risk estimates were developed for the future residential scenario for the ARA-23 site. First, analytical results from soil samples were used to develop risk estimates using standard risk assessment techniques. The contaminated soil was assumed to be 2 ft thick. Data from the surface survey were used to develop the second estimate. Both estimates justify remedial action. Section 3.1.23 of the WAG 5 Comprehensive Remedial Investigation/Feasibility Study report (Holdren et al. 1999) provides a summary of the ARA-23 data. Though evidence indicates that most of the contamination is limited to the top 1 in., the issue is not significant to the design of the remedial action. The site consists of undulating terrain characterized by basalt outcrops and isolated pockets of thin surface soil. Limiting the removal to the top 1 in. of soil cannot be accomplished with heavy equipment, especially over many acres. The remediation goal likely will be achieved with the first pass of the equipment. If not, removal will continue until the remediation goal is achieved or basalt is encountered.

Comment 21 Page 13. In the discussion of the SPERT-II Leach Pond it is stated discharges are still occur-ring to the pond. Even if the discharge is "clean water," any discharge would seem to push the contaminants deeper into the sediment. This concern on our behalf was compounded at the Idaho Falls meeting when an official responded that "mercury does not move."

Response: Unfortunately, the allusion to water being discharged to the pond has been cited in every document since the Track 2 assessment was written in 1994. However, recent inquiry found that

the compressor was removed in 1994 and no water has been discharged to the SPERT-II Leach Pond (PBF-16) for several years (Gerber 1999). The potential movement of mercury through the vadose zone and to the underlying aquifer was examined in the Track 2 evaluation of this site (Hillman-Mason et al. 1994). The maximum projected groundwater concentration 100 years in the future was only 8.6E-08 Mg/m^3. This information supports the conclusion that migration of mercury associated with the PBF-16 site is not significant.

Comment 22 Page 18. Concerning the table of alternatives for soil contamination sites, of the three possibilities under Alternative 5 for the contaminated soil, 0% volume reduction or no sorting clearly seems the best. On page 16, in the discussion of the various Alternative 5 outcomes it is stated: "If sorting does not substantially reduce disposal costs, ex situ sorting techniques will not be implemented." Well, under the Alternative 5 analysis of costs on the page 18 table, this question has already been answered–0% volume reduction or no sorting is the least expensive. Even under a best case scenario of 90% reduction, it would still be more expensive than no reduction; and if only 50% reduction is achieved it would cost nearly $6 million more. Furthermore, more processing of the waste would result in more worker exposure.

Frankly, there are no demonstrated benefits of soil sorting. It appears like another instance of a technology in search of a mission. You expect the public to accept an alternative that is more costly with no demonstrated benefit, which could in fact impose an additional health risk. In fact, when examining your table the reader can conclude one of two things from your analysis of threshold and balancing criteria under Alternative 5a: a. There is no difference between the three outcomes: 0%, 50%, 90%; or b. you have chosen not to analyze them. Please don't dink with the waste any more than is necessary.

Response Soil sorting would be cost-effective for onsite disposal only with the achievement of a volume reduction of greater than 90%. If onsite disposal were not available, offsite disposal would be required and would be much more expensive. In this case, the likelihood is higher that soil sorting would reduce disposal costs and would be cost-effective at a volume reduction of 50% or greater. However, the soil sorting treatability study has been completed and the segmented gate system was not able to achieve the sorting efficiency required to justify sorting. Therefore, the selected remedy for the soil sites is Alternative 4a, excavation and disposal at the ICDF.

Comment 23 Page 22. Concerning Alternative 4, in situ stabilization and encapsulation, the statement that "contaminant mobility would be reduced by more than 90%" was a little alarming considering this was what was essentially done to the old waste calciner–the most contaminated structure on the Site. How did you arrive at the 90% estimate? And what is your confidence interval for this estimate? This also calls into question your previous statement that "contamination would be contained" under this alternative.

Response The grout would be specifically formulated to chemically bind with the contaminants in the sludge so that they would not leach when exposed to water. A significant amount of research has been performed by INEEL scientists as well as other independent scientists on the development and testing of grout formulas to prevent contaminants from leaching into the environment. The 90% reduction in mobility is a very conservative estimate of the reduction in mobility that can be achieved. Testing performed recently at the INEEL on the grouting of a portion of the RWMC Acid Pit indicated that contaminant mobility was reduced by more than 99%. Samples of the sludge would be used to test grout formulas before use in the field for remediation, and remediation objectives would specify that the mixture of grout and waste would have to achieve a performance standard of greater than 90% reduction in mobility by conducting leach tests. Grouting to stabilize the waste would proceed only after testing proved that the performance standard could be met. Hence, confidence would be very high (nearly 100%) that this degree of reduction in mobility would be achieved. Because the sludge occupies

only a small volume of the seepage pit, there would be some void space after stabilization. This void space would be filled with grout. The grout material would be durable and highly resistant to weathering, and so would provide extra protection to the stabilized sludge. This extra layer of grout around the stabilized sludge would encapsulate most or all of the sludge.

Comment 24 Page 26. We are pleased that Alternative 3b1 was not selected. Digging up the tank, moving it to Test Area North, burying it and then vitrifying it calls into question why you would move the tank to a different location to treat it the same way it could be treated in place. This would involve a great deal of extra work, and result in more worker exposure and additional cost for no added benefit. This obviously calls into question your statement on page 27 that "long-term effectiveness would be high, because the waste would be removed from the site." A benefit perhaps for that particular piece of earth, but not so beneficial for the new burial site.

Response In situ vitrification will not be implemented at Test Area North. The selected remedy is Alternative 4, which offers high long-term effectiveness. Alternatives 3b1 and 3b2 were developed during a time when in situ vitrification of the V-tanks at Test Area North was considered the most viable option for treating the V-tank waste, which has characteristics similar to the ARA-16 tank waste. The V-tanks contain more than 10,000 gal collectively. The advantage of transferring the ARA-16 tank to the V-tank site for treatment would be to save costs for treatment because the in situ vitrification equipment would have to be mobilized to, and operated at, only one site. The long-term costs also would be reduced because one waste site would have be capped, monitored, and maintained instead of two. Because the ARA-16 tank is small and the waste volume also is small, the impact at the V-tank site of adding the ARA-16 tank prior to in situ vitrification would be minimal.

Comment 25 Page 30. Concerning Table 16, "Sites requiring institutional controls and 5-year reviews, " readers are referred to the updated fact sheet for more information, and there are contradictions. In the updated fact sheet, 22 of 29 of the sites identified in Table 16 are listed in the no action or no further action categories. Specifically, the fact sheet under no further action states these sites do not require site controls, which contradicts the title of Table 16. Furthermore, institutional controls have traditionally been a limited action alterative–somewhere between remediation and no action. From examining the information provided on this page, it is not clear that the term "institutional controls" is being used in a way consistent with past CERCLA decisions. If it is true that the use of the tern here does not mean institutional controls as they are implemented under the limited action alternative, what type of "institutional controls" are planned for these sites?

In addition, we support the decision to better contain the contamination at the ARA-I, ARA-III ARA-626, and PBF-16 sites over long-term monitoring especially since it is considered to be less expensive and achieves a more significant reduction in threat to human health and the environment. It does make us wonder, however, how many other sites in other waste area groups could have been handled similarly. The Snake River Alliance has always been and will continue to be Idaho's most consistent voice in calling for cleanup at the INEEL.

Response: The EPA Region 10 recently issued a new policy (EPA 1999) that specifies requirements for institutional controls that was not available for the development of the Update Fact Sheet (LMITCO 1999) or for the Proposed Plan (DOE-ID 1999b). This ROD was developed in compliance with the new policy. The institutional control plan for WAG 5 will be developed as a component of the remedial design. The Decision Summary (Part 2 of this ROD) contains revised information about institutional controls and indicates which sites are classified differently from the tables presented in the Proposed Plan. Generally, institutional controls are not required for no action sites while controls may be implemented for no further action and limited action sites. The types of institutional control are presented in Tables 32 and 33.

TECHNICAL AND LEGAL ISSUES

All currently identified technical and legal issues associated with the WAG 5 selected remedies have been addressed as described in the Decision Summary (Part 2 of this ROD). If other issues are identified at a later time, such as during the development of the remedial design or the implementation of the remedial actions, resolution will be achieved through the process defined in the Federal Facility Agreement and Consent Order (DOE-ID 1991).

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IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD) - Explanation of Significant Differences (ESD):

ROD Date: 06/23/2000
Operable Unit: 06
ROD ID: EPA/541/R-00/037

Text: Full-text ROD document follows on next page.

EPA 541-R00-037
2000

EPA Superfund
Explanation of Significant Differences:

Idaho National Engineering Laboratory (USDOE)
Operable Unit 6
Idaho Falls, ID
06/23/2000

IDAHO DEPARTMENT OF HEALTH AND WELFARE

DIVISION OF ENVIRONMENTAL QUALITY

Explanation of Significant Differences

RECEIVED
JUN 23 2000
Environmental Cleanup Office

Explanation of Significant Differences to the Record of Decision for Test Reactor Area Operable Unit 2-13

Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Explanation of Significant Differences to the Record of Decision for Test Reactor Area Operable Unit 2-13

Idaho National Engineering and Environmental Laboratory

Introduction

This Explanation of Significant Differences (ESD) applies to the comprehensive Record of Decision (ROD) for the Test Reactor Area (TRA) at the Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho Falls, Idaho. The ROD was signed in December 1997 by the United States Department of Energy Idaho Operations Office (DOE-ID), the United States Environmental Protection Agency (EPA) Region 10, and the Idaho Department of Health and Welfare.

This ESD, prepared in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Code of Federal Regulations (CFR) 40 CFR 300.435(c)(2)(I), documents significant differences to the selected remedies in the ROD. In summary,. this ESD clarifies the institutional control requirements for individual sites within this ROD and establishes the general requirements the DOE will apply to ensure effective institutional controls for these individual sites. The Idaho Department of Health and Welfare supports the need for this ESD.

This ESD will become part of the INEEL administrative record. The INEEL administrative record is available to the public at the following locations:

INEEL Technical Library
DOE Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83415
(208) 526-1185

Albertsons Library
Boise State University
1910 University Drive
Boise, ID 83725
(208) 385-1621

University of Idaho Library
University of Idaho Campus
434 2nd Street
Moscow, ID 83843
(208) 885-6344

Summary of Site History, Contamination Problems, and Selected Remedy

The INEEL, managed by the DOE, is a government facility located 32 mi (51 km) west of Idaho Falls, Idaho, and occupies 890 mi^2 (2,305 km^2) of the northeastern portion of the Eastern Snake River Plain. The TRA is in the west-central portion of the INEEL.

Facilities at the INEEL are primarily dedicated to nuclear research. development, and waste management. Surrounding areas are managed by the Bureau of Land Management for multipurpose use. The developed area within the INEEL is surrounded by a 5-mi^2 (13-km^2) buffer zone used for cattle and sheep grazing. Communities nearest to the TRA are Atomic City (south), Arco (west), Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). The county land surrounding the INEEL is approximately 45% agricultural, 45% open land, and 10% urban. Sheep, cattle, hogs, and poultry are produced; and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. Most land surrounding the INEEL is owned by private individuals or the United States government.

The TRA was established in the early 1950s for studying radiation effects on materials, fuels, and equipment. Three major reactors have been built at the TRA, including the Materials Test Reactor, the Engineering Test Reactor, and the Advanced Test Reactor. The Advanced Test Reactor is currently the only major operating reactor at the TRA. Approximately 420 people are employed at the TRA.

Public access to the INEEL is strictly controlled by fences and security personnel. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL approximately 20 mi (32 km) away, and U.S. Highways 20 and 26 cross the southern portion approximately 5 mi (8 km) away. Ninety miles (145 km) of paved highways pass through the INEEL and are used by the general public.

The Snake River Plain Aquifer, the largest potable aquifer in Idaho, underlies the Eastern Snake River Plain and the INEEL. The aquifer is approximately 200 mi (322 km) long, 20 to 60 mi (32 to 97 km) wide, and covers an area of approximately 9,600 mi^2 (25,000 km^2). The depth to the aquifer varies from approximately 200 ft (61 m) in the northeastern comer of the INEEL to approximately 900 ft (274 m) in the southeastern corner, a distance of 42 mi (68 km). Depth to groundwater is approximately 480 ft (146 m) below TRA. Drinking water for employees at TRA is obtained from production wells in the northeastern part of the facility.

To better manage environmental investigations, the INEEL is divided into ten waste area groups (WAGs). Within the TRA WAG (WAG 2), 55 known or suspected contaminant release sites were identified, 47 of which were recommended for no action. All remedial action is completed on the action sites and cleanup standards have been met per the ROD.

The remedial action objectives are summarized in Appendix A. The major components of the remedies selected in the ROD are summarized in Appendix B, particularly as they relate to institutional controls. The ROD has a full description of the selected remedies.

Description of the Significant Differences and the Basis for Those Differences

The TRA ROD, December 1997, includes institutional controls and the underlying land assumptions that were part of the ROD decision. It lacks details on the site-specific institutional controls including the geographic locations where institutional controls are required, the objectives of the control or restriction and a description of the types of restrictions. The ROD does not discuss how these institutional controls will be implemented, maintained, and monitored, both while the DOE has control of the property as well as if and when the property is transferred to other federal ownership or private ownership. This ESD preserves the underlying land assumption, clarifies the site-specific institutional control requirements, and establishes the requirement for how the DOE will implement, maintain, and monitor these site-specific institutional controls. The proposed changes to the TRA ROD do not alter the scope and performance of the remedies and do not noticeably change the cost.

The INEEL decided that an ESD to the TRA ROD is necessary to clearly identify any land or groundwater currently unavailable for free and unlimited use, and to commit to preserving the underlying assumptions of the remedial investigation/feasibility study (RI/FS) that support this ROD. These assumptions are that (1) the INEEL would be used only for industrial purposes for at least the next 100 years, (2) after 100 years, a resident would not dig any deeper than 10 feet, and (3) drinking-water wells would not be drilled while the land is used for industrial purposes for the next 100 years.

Site-Specific Institutional Control Requirements

Appendix B contains the revised site-specific institutional control requirements for every site and remedy listed in Appendix A that includes any form of institutional controls. These revised requirements clarify the geographic location of each institutional control, the objective of the control or restriction. and, as appropriate, a description of the types of necessary restrictions. Appendix C includes some additional risk calculations that were done in addition to the RI/FS. The results of these calculations are referred to in Appendix B.

Facilitywide Institutional Control Requirements

Facility-wide institutional control requirements (Appendix D) establish the procedures or processes that the INEEL will use to develop, implement, and monitor the site-specific institutional controls.

The remedial requirements described in Appendices B and C should result in remedial actions that improve the short-term and long-term protectiveness of human health and the environment.

The applicable or relevant and appropriate requirements established in the RODs are not modified by this ESD. This ESD is in furtherance of a new requirement, the EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities, May 3, 1999.

State Agency Comments

The Idaho Department of Health and Welfare has reviewed this ESD and supports these changes to the selected remedy.

Public Participation

The INEEL will publish a notice of availability and a brief description of this ESD in the local newspaper (the Idaho Falls Post Register) and six other Idaho newspapers. The INEEL community relations office may be contacted at 208-526-4700 or 1-800-708-2680.

Affirmation of the Statutory Determinations

After reviewing the proposed changes to the selected remedies, the DOE, EPA, and the Idaho Department of Health and Welfare believe that the remedies remain protective of human health and the environment, comply with federal and state requirements identified in the ROD as applicable or relevant and appropriate to these remedial actions at the time of the original ROD, and are cost-effective. In ,addition, permanent solutions and alternative treatment technologies are included in the revised remedies to the maximum practicable extent.

References

DOE-ID, 1996, *Idaho National Engineering Laboratory Comprehensive Facility and Land Use Plan,* U.S. Department of Energy Idaho Operations Office, DOE/ID-10514, March.

DOE-ID, 1997a, *Final Record of Decision for Test Reactor Area Operable Unit 2-13,* U.S. Department of Energy Idaho Operations Office, DOE/1D-10586, December.

DOE-ID, 1997b, *Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory,* U.S. Department of Energy Idaho Operations Office, DOE/ID- 10531, February.

DOE-ID, 1998a, *Groundwater Monitoring Plan for the Test Reactor Area Operable Unit 2-13,* U.S. Department of Energy Idaho Operations Office, DOE/ID-10626, June.

DOE-ID, 1998b, *Final Comprehensive Remedial Design/Remedial Action Work, Plan for the Test Reactor Area,* U.S. Department of Energy Idaho Operations Office, DOE/ID-10643, September.

EPA, 1999, *Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities,* Memorandum from Director, Office of Environmental Cleanup, Director, Office of Waste and Chemicals Management, Director, Office of Regional Counsel to Office Environmental Cleanup, Office of Waste and Chemicals Management, Office of Regional Counsel, May.

INEEL, 1995, *Work Plan for Waste Area Group 2 Operable Unit 2-13 Comprehensive Remedial Investigation/Feasibility Study,* U.S. Department of Energy Idaho Operations Office, INEL-94/0026, April.

Appendix A

A Summary of the Remedial Action Objectives

Appendix A

A Summary of the Remedial Action Objectives

Remedial action objectives (RAOs) for Test Reactor Area (TRA) Operable Unit (OU), 2-13 were developed in accordance with the National Contingency Plan (NCP) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedial investigation/feasibility study (RI/FS) guidance. The RAOs were defined through discussions among agencies Idaho Department of Health and Welfare (IDHW), Environmental Protection Agency (EPA), and the United States Department of Energy (DOE). The RAOs are based on the results of the human health risk assessment and are specific to the contaminants of concern (COCs) and exposure pathways developed for OU 2-13. They are as follows:

For protection of human health-

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) to current and future workers and future residents.

- Inhibit ingestion of radionuclide and nonradionuclide COCs by all affected exposure routes (including soil and groundwater ingestion, and ingestion of homegrown produce) that would result in a total excess cancer risk of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) or a hazard index greater than 1 to current and future workers and future residents.

- Inhibit degradation of any low-level radioactive soil (e.g., Warm Waste Pond 1952 and 1957 cell covers) that would result in exposure to buried waste or migration of contaminants to the surface that would pose-a total excess cancer risk (for all contaminants) of greater than 1 in 10,000 to 1,000,000 (1E-04 to 1E-06) or a hazard index greater than 1 to current and future workers and future residents.

For protection of the environment-

- Inhibit adverse effects to resident populations of flora and fauna, as determined by thp ecological risk evaluation, from soil, surface water, or air containing COCs.

- Inhibit adverse effects to sites where COCs remain in-place below ground surface that could result in exposure to COCs or migration of COCs to the surface.

The ROD selected remedies are included in Table B-1.

Appendix B

Revised Site-Specific Institutional Control Requirements

Appendix B

Site-Specific Institutional Control Requirements

Table B-1. Sites with remedies requiring institutional controls at Waste Area Group (WAG) 2.[a]

Site Code	Site Name	Record of Decision (ROD) Selected Remedy	Basis for Institutional Controls[b]	Institutional Controls[c]
TRA-03	TRA Warm Waste Pond (sediments)	Containment with an engineered soil cover and institutional controls	Containment barrier is in place. Current occupational risk is 2E-02. 100-yr futureresidential risk is >1E-04.	Restrict site to occupational access for more than 30 years and restrict to industrial land use only until residential risk is <1E-04 based on the results of a 5-year review.
TRA-06	TRA Chemical Waste Pond (TRA-701)	Containment with a native soil cover and institutional controls	Native soil cover in place. Hazard quotient greater than 1 for mercury via homegrown produce ingestion and soil ingestion at a depth of 14 feet.	Industrial land use is unrestricted land use to depths less than 14 feet.
TRA-08	TRA Cold Waste Disposal Pond (TRA-701)	Excavation and disposal	Soil excavated and disposed of to 1E-04 future residential risk cleanup levels. Institutional controls needed to preserve 100-year industrial land use assumption.	Restrict site to industrial land use for less than 100 years until residential risk is <1E-04 based on the results of a 5-year review.
TRA-13	TRA Sewage Leach Ponds (2) by TRA-732	Containment with a native soil cover and institutional controls	Containment barrier is in place. Current occupational risk is 1E-03 for Cs-137 and Ag-108. 100-year residential risk is 5E-04 at a depth of 14 feet. The hazard quotient is greater than 1 for mercury and zinc via homegrown produce ingestion.	Restrict site to occupational access for more than 30 years and restrict to industrial land use only until residential risk is <1E-04 based on the results of a 5-year review.

Table B-1. (continued).

Site Code	Site Name	Record of Decision (ROD) Selected Remedy	Basis for Institutional Controls[b]	Institutional Controls[c]
TRA- 15	TRA Hot Waste Tanks 2, 3, 4 at TRA-613 (TRA 713-B, 713-C, and 713-D)	Limited action	Tanks still in use. Current occupational risk 3E-04; 100-year future residential risk is 1E-04. Additional contaminated soil is greater than 13 feet. Risk assessment not done at this depth. Additional institutional controls needed to preserve assumption that deeper soil would never be assessed.	Restrict occupational and residential access for less than 100 years until risk is <1E-04 based on a 5-year review. After the above restriction land use at depths greater than 10 feet until otherwise evaluated.
TRA-19	TRA Rad Tanks 1 and 4 at TRA-630, replaced by Tanks 1, 2, 3, and 4 (TRA 730-1, 730-2, 730-3, 730-4)	Limited action with implementation of a contingent excavation and disposal option	New tanks still in use. Current occupational risks is 2E-01 for Cs-137. 100-year residential risk is 8E-02.	Restrict occupational access and prohibit residential development until soil is removed or status is changed based on results of a 5-year review.
None	Sewage Leach Pond Soil Contamination Area	Limited action	2E-04 current occupational risk; 30-year occupation risk and 100-year residential risk is <1E-04.	Restrict occupational and residential access until risk is <1E-04 based on results of a 5- year review.
None	Brass Cap Area	Limited action with implementation of a contingent excavation and disposal option	3E-01 current occupational risk and 8E-02 30-year future occupational risk. 8E-02 100-year future residential risk.	Restrict occupational access and prohibit residential development until contamination is removed or status is changed based on a 5-year review.

a. Information source is DOE-ID 1997b.

b. With the exception of TRA-08, all risks are preremediation risks developed in the baseline risk assessment (DOE-ID 1997b).

c. Timeframes are approximate. Duration of controls will be based on acceptable levels or risk.

Table B-2. No-action sites requiring institutional controls at WAG 2.

Site Code	Site Name	ROD Selected Remedy	Basis for Institutional Controls[a]	Institutional Controls
None	TRA PCB spill at TRA-619	No action	22 ppm polychlorinated biphenyl (PCBs) in soil under pad, which is below the 25 ppm for restricted industrial areas and greater than the 10 ppm for general nonrestricted use (40 Code of Federal Regulations (CFR) 761.125(c)(4). Institutional controls needed to preserve industrial land use assumption.	Permanently restrict this site to industrial land use only, unless otherwise indicated in a 5-year review.
None	TRA PCB spill at TRA-626	No action	24 ppm PCBs in soil >4 feet deep, which is below the 25 ppm for restricted industrial areas and greater than the 10 ppm for general nonrestricted use (40 CFR 761.125 (c)(4)). Institutional controls needed to preserve industrial land use assumption.	Permanently restrict this site to industrial land use only, unless otherwise indicated in a 5-year review.
None	TRA PCB spill at TRA-653	No action	PCBs #25ppm in soil, which is below the 25 ppm for restricted industrial areas and greater than the 10 ppm for general nonrestricted use (40 CFR 761.125(c)(4)). Institutional land use controls needed to preserve industrial land use assumption.	Permanently restrict this site to industrial land use only, unless otherwise indicated in a 5-year review.

Table B-2. (continued).

Site Code	Site Name	ROD Selected Remedy	Basis for Institutional Controls[a]	Institutional Controls
TRA-04	TRA Warm Waste Retention Basin, surficial sediments (TRA-712)	No action	5E-04 current residential risk for 10 feet and less. Risk evaluation not done for contamination at 40 feet deep. Institutional controls needed to preserve 100-year industrial land use assumption and assumption that deeper soil would never be accessed.	Restrict site to industrial use only for less than 10 feet deep. Restrict land use for deeper contamination until evaluated otherwise.
TRA-34	TRA North Storage Area	No action	3.5E-05 100-year residential risk. 1.2E-04 current residential risk for silver-108m, cesium-137, and europium-152. Institutional controls needed to preserve 100-year industrial land use assumption.	Restrict land use to industrial until residential risk is less than E-04 based on a 5-year review.
None	Hot Tree Site	No Action	2E-04 current residential risk from cesium-137. 2E- 05 risk after 100 years.	Restrict site to industrial land use only for approximately 30 years until residential risk is less than E-04 based on the results of a 5-year review.
None	Perched and Snake River Aquifer groundwater	No action, with monitoring	Chromium concentrations are greater than maximum contaminant levels (MCLs) and are predicted to decrease below MCLs within 20 years. H-3 concentrations are below MCLs. Institutional controls needed to preserve the assumption that drinking-water wells would not be drilled.	Restrict drilling of wells for drinking water use until contaminants are below MCLs based on the results of a 5-year review.

a. Information source is DOE-ID 1997a, DOE-ID 1997b, and Appendix C of this document.

Table B-3. Institutional control requirements for WAG 2.

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
TRA-03 Warm Waste Pond. The site is a low-level waste landfill containing radiologically contaminated soil. An engineered barrier was constructed over the site. Total risk for the residential scenario is projected to diminish to 1E-04 in approximately 1,000 years.					
Current DOE operations	Landfill—no unauthorized intrusion into capped area	Radionnuclides —exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Publication of surveyed boundaries and descriptions of controls in the INEEL Land Use Plan (DOE-ID 1996)	Federal Facility Agreement and Consent Order (DOE-ID 1991) Worker protection (10 CFR 839) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(H)]
DOE control post-operations (i.e., after operations cease)	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD 4. Notice to affected stakeholders (e.g., Bureau of Land Management, Sho-Ban Tribal Council, local county governments, IDHW, and the EPA) for any change in land-use designation , restriction, or land users	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act[c] (Public Law 103-160) Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post-DOE control	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)] [c] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g]
				2. Notice to affected stakeholders (e.g., Bureau of Land Management Sho-Ban Tribal Council, local county governments, IDHW, and the EPA) for any change in land-use designation, restriction, or land users	CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[l] Criteria for Bureau of Land Management acceptance of property 43 CFR 2374.2[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7) Property release restrictions (DOE Order 5400.5)

Table B-3. (Continued).

Timeframe	Land Restriction	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
TRA -13 Sewage Leach Pond. The site is a low-level waste landfill containing radiologically contaminated soil. A native soil cover was placed over the site. Total risk for the residential scenario is projected to diminish to 1E-04 in approximately 500 years.					
Current DOE operations	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Controls of activities (drilling or excavating) 3. Publication of surveyed boundaries and descriptions of controls in the INEEL Land Use Plan.	Federal Facility Agreement and Consent Order (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120 (h)]
DOE control post operations (i.e., after operations cease)	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Controls of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD 4. Notice to affected stakeholders (e.g., Bureau of Land Management, Sho-Ban Tribal Council, local county governments, IDHW, and the EPA) for any change in land-use designation, restriction, or land users	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)

Table B-3. (Continued)

Timeframe	Land Restriction	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post-DOE control	Landfill—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD 2. Notice to affected stakeholders (e.g., Bureau of Land Management, Sho-Ban Tribal Council, local county governments, IDHW, and the EPA) for any change in land-use designation, restriction, or land users	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120 (h)(3)][d] CERCLA [42 USC 9620 § 120 (h)(3) (C)(ii)][e] CERCLA [42 USC 9620 § 120 (h)(3) (A) (iii)][f] CERCLA [42 USC 9620 § 120 (h)(1)-(3)][g] CERCLA [42 USC 9620 § 120 (h)(4)][h] Property relinquishment notification (43CFR 23.72.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements 941 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sewage Leach Pond Soil Contamination Area. Current occupational scenario risk estimates are greater than 1E-04. Controls will be maintained to protect workers and prevent residential development until residential risk estimate is less than 1E-04 in approximately 100 years.					
Current DOE orerations	Industrial	Radionuclides—external raidiation	Limit exposure to contaminated soil.	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	Federal Facility Agreement and Consent Order (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardoous Substanced Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)]

Table B-3. (continued)

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
TRA-15 Soil Around tanks and TRA-04 Warm Waste retention Basin, Surficial Sediments. These sites have low-level radiologically contaminated soil. Total risk for the residential scenario is projected to diminis to 1E-04 in approximately 100 years for top 10 ft of TRA-15 and undetermined for deeper soils of TRA-15 and TRA-04.					
Current DOE operations	Industrial	Radionuclides—external radiation	Limit exposure to contaminated soil	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	Federal Facility Agreement and Consent Order (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (40 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 usc 9620 § 120(h)]
DOE control post-operations (i.e., after operations cease	Industrial	Radionuclides—external radiation	Limit exposure to contaminated soil.	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavation) 3. Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 §120(h)(5)][b] Hall Almendmint of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post-DOE control	Industrial	Radionuclides—external radiation	Limit exposure to contaminated soil	Property transfer requirements including issuance of finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD.	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)[d]] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h) (3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
TRA-19 Soil Around Tanks and Brass Cap Area. These sites have low-level radiologically contaminated soil. Controls will be maintained to protect workers until the soil is removed or status is changed.					
Current DOE operations	Industrial	Radionuclides—external radiation	Limit exposure to contaminated soil	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	Federal Facility Agreement and Consent Order (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan 940 CFR Part 300) CERCLA [42 USC 9620 § 120(h)]
DOE control post operations (i.e., after operations cease)	Industrial	Radionuclides—external radiation	Limit exposure to contaminated soil	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavation) 3. Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120 (h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-106)[c] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post-DOE control	Industrial	Radionuclides **C** external radiation	Limit exposure to contaminated soil	Property transfer requirements including issuance of finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD.	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)[d]] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h) (3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Groundwater. Contaminants in groundwater exceed maximum contaminant levels (MCLs). Controls will be maintained to prevent consumption and use of groundwater until contaminants are below MCLs in approximately 30 years.					
Current DOE operations	Groundwater use	Tritium, Chromium	Prevent consumption of groundwater that is greater than MCLs	1. Control of activities 2. Publish estimated conservative boundaries in INEEL Land Use Plan	Federal Facility Agreement and Consent Order (DOE-ID 1991 Worker protection (10 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)] Federal Facility Agreement and Consent Order (DOE-ID 1991)
DOE control post-operations (i.e., after operations cease)	Groundwater use	Tritium, Chromium	Prevent consumption of groundwater that is greater than MCLs	1. Control of activities 2. Property lease requirement including control of land use consistent with the WAG 2 ROD and this ESD	CERCLA [42 USC 9620 § 120 (h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-106)[c] Property release restrictions (DOE Order 5400.5)
TRA-06 Chemical Waste Pond. The site has mercury 14 feet below grade. A native soil cover was placed over the site. The hazard index is greater than for the residential scenario at 14 feet below grade and is not expected to diminish.					
DOE control post-operations (i.e., after operations cease)	Limited residential	Mercury ! residential exposure	Limit residential land use	1. Visible access restrictions (warning signs) 2. Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620§ 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)

Table B-3 (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post-DOE control	Limited residential	Mercury—residential exposure	Limit residential land use	Property transfer requirements including issuance of finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD.	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)[d]] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h) (3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[1] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)
TRA-08 Cold Waste Disposal Pond, TRA-34 North Storage Area, and Hot Tree Site. Risk estimates for current residential scenario are greater than 1E-04. Institutional controls will be maintained for approximately 30 years for TRA-34 and Hot Tree Site, and approximately 100 years fo TRA-08 or sooner if the site is released in a 5-year review					
DOE control post-operations (i.e., after operations cease)	Industrial	Radionuclides—minimal concern	Control land use as industrial until residential risk is less than 1E-04 in 30 years or sooner if released in a 5-year review.	Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD	Federal Facility Agreement and Consent order (DOE-ID 1991) CERLCA [42 USC 9620 § 120 (h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)

Table B-3. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Spill at TRA-619, TA-626, and TRA-653. Buried contaminated soil remains at these three sites.					
DOE control post-operations (i.e., after operation cese)	Industrial	Polychlorinated biphenyls (PCBs)	Control land use as industrial	Property lease requirements including control of land use consistent with the WAG 2 ROD and this ESD	Federal Facility Agreement and Consent Order (DOE-ID 1991) Hall Amendment of the National Defense Authorization Act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5) CERCLA [42 USC 9620 § 120(h))]
Post-DOE control	Industrial	PCBs	Ensure land use is appropriate	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the WAG 2 ROD and this ESD.	Federal Facility Agreement and Consent Oder (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)

a. Institutional controls apply only to sites where hazardous substances, pollutants, or contaminants preclude unlimited land use. Surveillance will be conducted every 5 years to ensure that controls are in place.

b. Notification to states of leases involving contamination. Concurrence of U.S. EPA is requested on leases of National Priorities List (NPL) (54 FR 48184) sites.

c. Consult with EPA and request the agency's concurrence for leases of sites that are on the NPL.

d. A statement that remedial action is complete is required in the deed.

e. If response action for which the federal government is responsible is not complete, restrictions, the response guarantee, the schedule for investigation and completion of all necessary response actions, and budget assurances must be included in the deed.

f. A clause allowing the U.S. government access to the property must be included in the deed.

g. A notice of information about hazardous substances on the property must be included in the deed.

h. Uncontaminated parcels of land must be identified and concurred with by the EPA administrator before termination of operations.

i. A Notice of Intent with contamination information and protection needs is required before the property is relinquished to the U.S. Department of Interior.

j. Transfer to the U.S. Department of Interior must indicate continuation of DOE responsibility.

k. k. Report to the General Services Administration on contamination information and allowable land use for excess real property.

Appendix C

Current Residential Risk

APPENDIX C

Current Residential Risk

Table C-1. Residential risk summary.[a, b]

		TRA-04 Human Cancer Risk	TRA-34 Human Cancer Risk	Hot Tree Site Human Cancer Risk
Acrylonitrile				
	100-yr Future	5.E-05 (5 in 100,000)	1.E-06 (1 in 1,000,000)	1.E-06 (1 in 1,000,000)
	30-yr Future	5.E-05 (5 in 100,000)	1.E-06 (1 in 1,000,000)	1.E-06 (1 in 1,000,000)
	Current	5.E-05 (5 in 100,000)	1.E-06 (1 in 1,000,000)	1.E-06 (in 1,000,000)
Arsenic				
	100-yr Future	3.E-05 (3 in 100,000)		
	30-yr Future	3.E-05 (3 in 100,000)		
	Current	3.E-05 (3 in 100,000)		
Beryllium				
	100-yr Future	1E-05 (1 in 100,000)	---	---
	30-yr Future	1.E-05 (1 in 100,000)		
	Current	1.E-05 (1 in 100,000)	---	---
Silver-108m				
	100-yr Future		3.E-05 (3 in 100,000)	
	30-yr Future		4.E-05 (4 in 100,000)	
	Current		5.E-05 (5 in 100,000)	
Cobalt-60				
	100-yr Future			
	30-yr Future	5.E-06 (5 in 1,000,000)		
	Current	3.E-04 (3 in 10,000)	2.E-05 (2 in 100,000)	2.E-05 (2 in 100,000)
Cesium-137				
	100-yr Future	1.E-05 (1 in 100,000)	5.E-06 (5 in 1,000,000)	2.E-05 (2 in 100,000)
	30-yr Future	5.E-05 (5 in 100,000)	1.E-05 (1 in 100,000)	1.E-05 (1 in 10,000)
	Current	1.E-04 (1 in 10,000)	5.E-05 (5 in 100,000)	2.E-04 (2 in 10,000)
Europium-152				
	100-yr Future	---		---
	30-yr Future	---	2E-05 (2 in 100,000)	---
	Current	---	9E-05 (9 in 100,000)	—

Table C-1. (continued).

		TRA-04 Human Cancer Risk	TRA-34 Human Cancer Risk	Hot Tree Site Human Cancer Risk
Uranium-238				
	100-yr Future	2.E-06 (2 in 1,000,000)	---	---
	30-yr Future	2.E-06 (2 in 1,000,000)	---	---
	Current	2.E-06 (2 in 1,000,000)	---	---
Total Risks				
	100-yr Future	1.E-04 (1 in 10,000)	4E-05 (4 in 100,000)	2E-05 (2 in 100,000)
	30-yr Future	2E-06 (2 in 10,000)	7E-05 (7 in 100,000)	1E-04 (1 in 10,000)
	Current	5E-06 (5 in 10,000)	2E-04 (2 in 10,000)	2E-04 (2 in 10,000)

a. Source of 30-year and 100-year risk information is DOE-ID 1997b.

b. Only risks greater than 1 in 1,000,000 are included.

Appendix D

Facilitywide Institutional Control Requirements

Appendix D

Facilitywide Institutional Control Requirements

A comprehensive approach for establishing, implementing, enforcing, and monitoring institutional controls will be developed in accordance with Environmental Protection Agency (EPA) "Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities" (May 1999). The following elements for waste area group (WAG) 2 institutional controls will be developed in the operation and maintenance (O&M) plan and will involve a facilitywide land use plan and procedures for controlling activities as outlined in the policy:

- A comprehensive facilitywide list of all WAG2 areas or locations covered by any and all decision documents at the facility that have or should have institutional controls for protection of human health or the environment. The information on this list will include, at a minimum, the location of the area, the objectives of the restriction or control, the timeframe that the restrictions apply, and the tools and procedures that the facility will use to implement the restrictions or controls and to evaluate the effectiveness of the restrictions or controls.

- Cover, and legally bind where appropriate, all entities and persons, including, but not limited to, employees, contractors, lessees, agents, licensees, and invitees. In areas where the facility is aware of routine trespassing, trespassers must also be covered.

- Cover all activities and reasonably anticipated future activities, including, but not limited to, any future soil disturbance, routine and nonroutine utility work, well placement and drilling, recreational activities, groundwater withdrawals, paving, training activities, construction, renovation work on structures or other activities.

- A tracking mechanism that identifies all land areas under restriction or control.

- A process to promptly notify both EPA and the State prior to any anticipated change in land use designation, restriction, land users, or activity for any institutional control required by a decision document.

Within six months of signature of this ESD, a monitoring report on the status of institutional controls at WAG 2 will be submitted to the EPA and Idaho Department of Health and Welfare. An updated institutional control monitoring report will be submitted to the EPA and Idaho Department of Health and Welfare at least annually thereafter. After the facility's comprehensive facilitywide approach is well established and the facility has demonstrated its effectiveness, the frequency of future monitoring reports may be modified subject to approval by EPA and the State. The institutional control monitoring report will contain at a minimum:

- A description of how DOE is meeting the facilitywide institutional control requirements

- A description of how DOE is meeting the WAG 2 specific objectives, including results of visual field inspections of all areas subject to WAG 2 specific restrictions

- An evaluation of whether or not all the WAG specific and facilitywide institutional control requirements are being met

- A description of any deficiencies and the efforts or measures that have been or will be taken to correct problems.

EPA and State review of the institutional control monitoring report will follow existing procedures for agency review of documents.

The DOE will notify EPA and the State immediately upon discovery of any activity that is inconsistent with the WAG specific institutional control objectives, or of any change in the land use or land use designation of a site addressed in the WAG 2 list of areas or locations covered by institutional controls. DOE will work together with EPA and the State to determine a plan of action to rectify the situation except in the case where DOE believes the activity creates an emergency situation, the DOE can respond to the emergency immediately upon notification to EPA and the State and need not wait for EPA or State input to determine a plan of action. DOE will also identify what went wrong with the institutional control process, evaluate how to correct the process to avoid future problems, and implement these changes after consulting with EPA and the State.

DOE will identify a point of contact for implementing, maintaining, and monitoring institutional controls.

DOE will notify EPA and the State at least six (6) months prior to any transfer, sale or lease of any property subject to institutional controls required by an EPA decision document so that EPA and the State can be involved in discussions to ensure that appropriate provisions are included in the conveyance documents to maintain effective institutional controls. If it is not possible for DOE to notify EPA and the State at least six months prior to any transfer, sale or lease, then DOE will notify EPA and the State as soon as possible but no later than 60 days prior to the transfer, sale, or lease of any property subject to institutional controls.

DOE will not delete or terminate any institutional control unless EPA and the State have concurred in the deletion or termination.

IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)

Site Information:

Site Name: IDAHO NATIONAL ENGINEERING LABORATORY (USDOE)
Address: IDAHO FALLS, ID

EPA ID: ID4890008952
EPA Region: 10

Record of Decision (ROD):

ROD Date: 07/14/2000
Operable Unit: 10
ROD ID: EPA/541/R-00/036

Text: Full-text ROD document follows on next page.

EPA 541-R00-036
2000

EPA Superfund
Record of Decision:

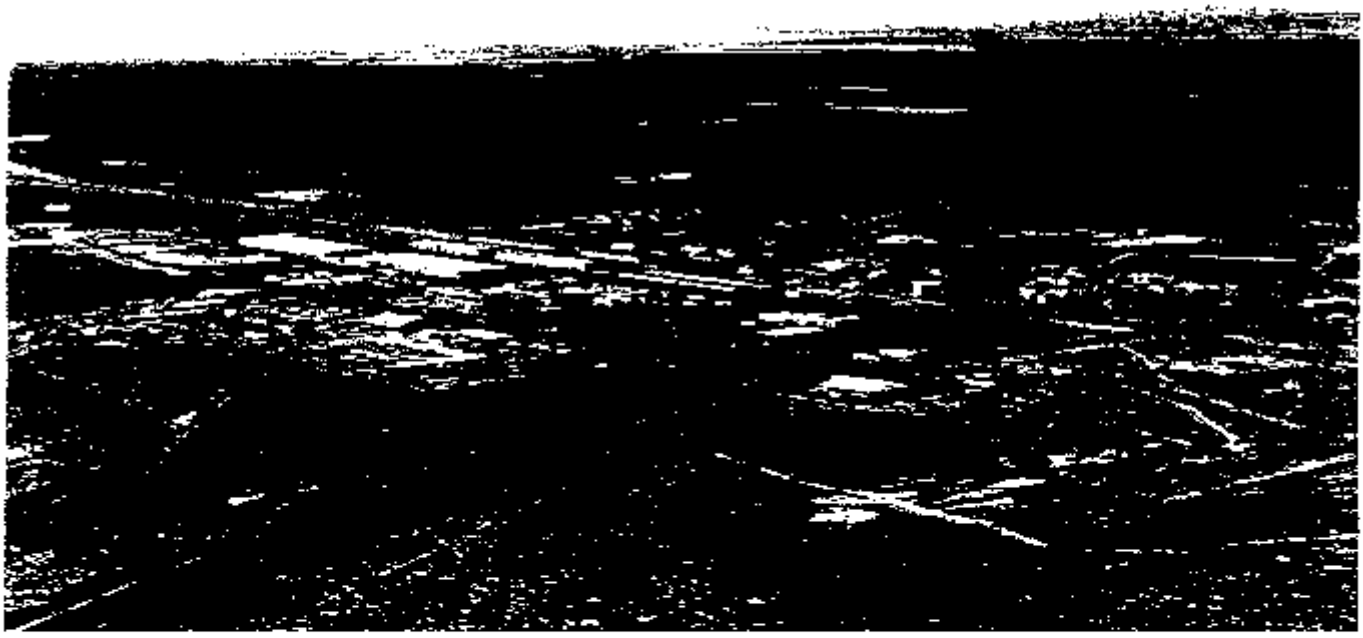
Idaho National Engineering Laboratory (USDOE)
Operable Unit 10
Idaho Falls, ID
07/14/2000

DOE/ID-10719 Revision 2 July 2000

IDAHO DEPARTMENT OF HEALTH AND WELFARE

DIVISION OF ENVIRONMENTAL QUALITY

Final Comprehensive Record of Decision for Central Facilities Area Operable Unit 4-13



Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DOE/ID-10719
Revision 2

Final Comprehensive Record of Decision Central Facilities Area Operable Unit 4-13

Published July 2000

Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

U.S. DEPARTMENT OF ENERGY IDAHO OPERATIONS OFFICE SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, the Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Beverly A Cook 7/31/00

Beverly A. Cook, Manager Date
U.S. Department of Energy Idaho Operations Office

U.S. ENVIRONMENTAL PROTECTION AGENCY
SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Findley 7-14-00

for Chuck Clarke, Regional Administrator — Date
Region 10
U.S. Environmental Protection Agency

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY
SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, the Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Environmental Quality.

7-18-2000

C. Stephen Alfred, Director
Department of Environmental Quality

Date

U.S. DEPARTMENT OF ENERGY IDAHO OPERATIONS OFFICE SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, the Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

_____

Beverly A. Cook, Manager Date
U.S. Department of Energy Idaho Operations Office

U.S. ENVIRONMENTAL PROTECTION AGENCY
SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

_____

Chuck Clarke, Regional Administrator Date
Region 10
U.S. Environmental Protection Agency

IDAHO DEPARTMENT OF HEALTH AND WELFARE
SIGNATURE SHEET

Signature sheet for the Record of Decision for OU 4-13, located in Waste Area Group 4, the Central Facilities Area, of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

_____

C. Stephen Allred, Administrator Date
Division of Environmental Quality
Idaho Department of Health and Welfare

PART I—DECLARATION OF THE RECORD OF DECISION

Site Names and Location

Central Facilities Area
Waste Area Group 4 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit 4-13
Incorporating 52 individual sites in Operable Units 4-1 through 4-13
Idaho National Engineering and Environmental Laboratory
CERCLIS ID No. 4890008952; CERCLA Site ID No. 1000305
Idaho Falls, Idaho

Statement of Basis and Purpose

This Record of Decision (ROD) presents the selected remedy for Waste Area Group (WAG) 4 at the Idaho National Engineering and Environmental Laboratory (INEEL). The selected remedy comprises remedial action at three individual sites and outlines limited action institutional controls that will be implemented at one of the remediated sites and one other site. Components of the selected remedy were selected in accordance with the requirements of the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) (42 USC 9601, et seq.) of 1980 as amended by the *Superfund Amendments and Reauthorization Act of 1986.* All documentation to support the decisions finalized in this ROD is contained in the Administrative Record for WAG 4. The selected remedy is intended to be the final action at WAG 4, the Central Facilities Area (CFA).

The U.S. Department of Energy Idaho Operations Office (DOE-ID) is lead agency for the decision. The U.S. Environmental Protection Agency (EPA), Region 10 and Idaho Department of Health and Welfare (IDHW) Division of Environmental Quality participated in the evaluation and selection of the remedial actions. The EPA approves and IDHW concurs with the selected remedy for WAG 4.

Although no unacceptable risks via groundwater were identified in the *Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13* (RI/FS) (DOE-ID 1999a), a subsequent report for the Operable Unit (OU) 4-12 Post-ROD monitoring program identified that nitrate in two wells at WAG 4 was above a federal drinking water maximum contaminant level (MCL) of 10 mg/L. On this basis, the Agencies initially decided to separate OU 4-13 into two actions: OU 4-13A, which was designated an Interim Action ROD, and OU 4-13B, which was designated as the groundwater RI/FS. Therefore, the proposed plan for OU 4-13 was retitled the *OU 4-13A Interim Action Proposed Plan* when it was issued in August 1999.

Subsequent to this decision, information was gathered regarding the likely source and extent of nitrate in the wells. The most likely source has been identified as the CFA-08 Sewage Plant Drainfield. Additionally, because the nitrate levels are expected to drop below the MCL during the time period that DOE operates the facility, a higher allowable level under 40 CFR 141.11 for nitrate (20 mg/L) is protective during the DOE operational period. The average nitrate concentration in one of the subject wells is equal to the MCL; nitrate concentrations in the other well is less than the 20 mg/L allowable level and shows a downward trend. On that basis, the agencies decided to eliminate the OU 4-13B RI/FS and maintain the original name, the OU 4-13 Comprehensive ROD. Groundwater will continue to be evaluated under the Post-ROD monitoring program.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedies

The Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) was developed to provide a framework and schedule for implementing CERCLA activities at the INEEL. The FFA/CO was signed by DOE-ID, EPA Region 10, and the IDHW. To facilitate the implementation of CERCLA at INEEL, the INEEL was divided into 10 WAGs. This ROD documents remedies selected for contaminated sites at WAG 4.

WAG 4 consists of 52 surface sites grouped into 13 operable unit (OUs). As designated in the FFA/CO, OU 4-13 is the *Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13* (DOE-ID 1999a). An estimate of cumulative risk associated with all 52 surface sites and an evaluation of appropriate actions for those sites posing unacceptable risk was included in the OU 4-13 RI/FS. Forty-seven of these sites were determined to be no action or no further action sites (this includes a no action portion of one site, CFA-08). The selected remedies for WAG 4 comprise three remedial actions to mitigate the risk associated with three sites (one of which will require continuing institutional controls). Also limited action is required at the no further action site, CFA-07, and three previously covered sites, CFA-01, -02, and -03, to implement and continue institutional controls. Monitoring of groundwater is required to assess the downward trend of nitrate. The sites that require remedial action are the CFA-04 Pond, the CFA-08 Sewage Plant Drainfield, and CFA-10 Transformer Yard (formerly known as the Transformer Yard Oil Spills Site).

CFA-04 Pond

The CFA-04 Pond was determined to pose a threat to human health and the environment from mercury contamination. The hazard indices are 80 for human (future resident with subsistence farming) and up to 30,000 for ecological receptors (screening level). The volume of mercury-contaminated soil is estimated to be 6,338 m^3 (8,290 yd^3). This estimate is based on the depth to basalt in the pond bottom (max=2.4 m [8 ft]), the windblown area, and the pipeline. The remedial action selected to mitigate the threat to human health and the environment for the CFA-04 Pond is excavation and on-INEEL disposal at the proposed INEEL CERCLA Disposal Facility (ICDF). Given the volume of contaminated soil, the cost of retrieval and associated cost of disposal is more cost effective than a more intensive analysis. This remedy will consist of the following actions:

1. Characterizing the site and excavating soil from CFA-04 that exceeds the mercury final remediation goal (FRG) of 0.50 mg/kg. Soil contaminated at concentrations above the FRG will be excavated to basalt or 3m (10ft) below ground surface (bgs). No basalt will be excavated.

2. Transporting and disposing soil that exceeds the mercury FRG to the ICDF.

3. Stabilizing soil as necessary to meet ICDF Waste Acceptance Criteria.

4. Performing verification sampling to ensure that soil exceeding the FRG of 0.50 mg/kg mercury has been removed.

5. Backfilling the pond, and adjacent areas that have been excavated with uncontaminated soil to grade. All excavations will be contoured to match the surrounding terrain and revegetated.

The preamble of the NCP states that when noncontiguous facilities are reasonably close to one another, and wastes at the sites are compatible for a selected treatment or disposal approach, CERCLA section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes; and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. CFA and Idaho Nuclear Technology and Engineering Center (INTEC) will be treated as one site for response purposes because of the reasonably close proximity of the facilities and because of the compatibility of the disposal approach. Both facilities are part of INEEL. INTEC is located just two miles north of CFA and the facilities are connected by a road limited only to badged personnel. The ICDF is being designed to safely consolidate INTEC CERCLA waste and will accept CERCLA waste from other areas within INEEL. The ICDF complex will include an engineered facility meeting Resource Conservation and Recovery Act Subtitle C, Idaho Hazardous Waste Management Act and polychlorinated biphenyl landfill design and construction requirements.

CFA-08 Sewage Plant Drainfield

The CFA-08 Sewage Plant Drainfield was determined to pose a threat to humans from cesium-137 contamination. The risk to the future residential receptor from cesium-137 is 4E-04. No environmental risks were identified. The volume of cesium-137 contaminated soil is estimated to be 56,634 m^3 (74,074 yd^3). Radioactive decay will reduce the cesium-137 concentration to below the 1E-04 (future resident) risk-based level of 2.3 pCi/g in 189 years. The remedial action selected to mitigate the threat to human health for the CFA-08 Sewage Plant Drainfield is containment of the contaminated soil area using an engineered cover. The cover will be designed to isolate low-level radioactive contaminants from human and biotic intrusion and to provide radiation shielding for a period of 189 years. Short-term remedial actions to be performed at the site include:

1. Constructing an engineered Evapotransperation (ET) cover, using clean native soil for fill material as needed

2. Contouring and grading the surrounding terrain to direct the surface water runoff away from the cover.

The continued effectiveness of the remedy will be evaluated by monitoring soil cover integrity and performing above ground radiological surveys. Because contamination is to be left in place, institutional controls are necessary for CFA-08 to restrict access until the land can be released for unrestricted use. Institutional controls (Section 12) to be implemented at CFA-08 include:

1. Restricting access using signs and permanent markers

2. Establishing and publishing surveyed boundaries

3. Controlling activities

4. Land use controls in land leasing and property transfers.

CFA-10 Transformer Yard

Due to lead contamination, CFA-10 Transformer Yard was determined to pose a threat to human health and the environment. Lead was detected in soil at a maximum concentration of 5,560 mg/kg, which exceeds the EPA residential screening criterion of 400 mg/kg and the ecological risk level of 10 times backgound (170 mg/kg). The relatively small volume of lead-contaminated soil is estimated at 122 m^3 (160 yd^3). The remedial action selected to mitigate the threat to human health and the environment for the CFA-10 Transformer Yard site is excavation and off-INEEL disposal at a permitted Treatment, Storage, and Disposal Facility (TSDF). This remedy will consist of the following actions:

1. Characterizing the site and excavating soil from CFA-10 (OU4-09) that exceeds the lead FRG of 400 mg/kg.

2. Performing verification sampling in the excavated area to verify that soil exceeding the FRG of 400 mg/kg for lead, has been removed.

3. Stabilizing in cement, soil as necessary to ensure LDRs are met.

4. Transporting and disposing of excavated and stabilized soil to a permitted off-INEEL TSDF.

5. Backfilling areas that have been excavated with uncontaminated soil to grade. All excavations will be contoured to match the surrounding terrain and revegetated.

Statutory Determination

Statutory Requirements

The selected remedies for the CFA-04 Pond, CFA-08 Sewage Drainfield, CFA-10 Transformer Yard, No Action and No Further Action sites have been determined to protect human health and the environment, comply with federal and state requirements that are legally applicable or relevant and appropriate, and are cost-effective. These remedies use permanent solutions and alternative treatment technologies to the maximum extent practicable.

Statutory Preference for Treatment

The statutory preference for a remedy to reduce the toxicity, mobility, or volume of materials through treatment is met by the selected remedies for CFA-04 and CFA-10. Treatment will be performed by stabilizing excavated, contaminated soil as appropriate to meet the ICDF Waste Acceptance Criteria for CFA 04 and the LDRs for CFA 10.

The Agencies have decided to implement engineering controls in cases where treatment is impractical or where sites pose relatively low long-term risk. Treating contaminated soils at CFA-08 is not practical due to the large volume of soil contaminated with relatively low levels of cesium-137. The selected remedial action at CFA-08 does not meet the preference for treatment as a principal element. However, the selected remedies fulfill the Agencies preference for engineered controls in lieu of treatment.

Institutional Controls

Institutional controls (IC) or land use/access restriction will be maintained by DOE at any INEEL CERCLA site where residual contamination levels are not protective for unrestricted exposure and unlimited land use according to EPA Region 10 Policy (EPA 1999a). ICs may be discontinued if

contaminant conditions or potential risk levels are determined to be protective which will be documented during CERCLA five-year reviews.

Five-Year Review Requirements

Statutory comprehensive five-year reviews are required at sites where contamination left in place precludes unrestricted exposure and unlimited land use. Reviews will evaluate factors such as contaminant migration from sites, effective use of institutional controls, and the overall effectiveness of remedial actions. Also, reviews will assess the need for future long-term environmental monitoring and administrative/institutional controls.

RECORD OF DECISION DATA CERTIFICATION CHECKLIST

Based on Section 6.2.6 of *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 1999b), the following information is included in the Decision Summary (Part II) of this ROD:

- Contaminants of concern (COCs) and their respective concentrations
- Baseline risk assessment of the COCs
- Cleanup levels established for the COCs and the basis for the levels
- Information about principal threat wastes is not included because source materials constituting principal threats were not encountered
- Current and future land- and groundwater-use assumptions used in the baseline risk assessment and ROD
- Land and groundwater use that will be available at the Site as a result of the selected remedies
- Estimated costs for capital, operation and maintenance, and total net present value; discount rate; and the number of years over which the remedy estimates are projected
- Decisive factors that led to selecting the remedies (i.e., how the selected remedies provide the best balance of tradeoffs relative to the balancing and modifying criteria).

Supporting information on the decision process can be found in the Administrative Record for WAG 4.

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ACRONYMS

ALARA	as low as reasonably achievable
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirements
ASA	Auditable Safety Analysis
bgs	below ground surface
BLM	U.S. Bureau of Land Management
BRA	baseline risk assessment
CAB	Citizen's Advisory Board
CEL	Chemical Engineering Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
CFA	Central Facilities Area
CFLUP	Comprehensive Facility Land Use Plan
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
FFA/CO	Federal Facility Agreement and Consent Order
FRG	final remediation goals
GFE	government furnished equipment
HI	hazard index

HQ	hazard quotient
HSP	Health and Safety Plan
IC	Institutional control
ICDF	INEEL CERCLA Disposal Facility
ICP	Institutional Control Plan
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho National Technical and Engineering Center
IRIS	Integrated Risk Information System
LOAEL	lowest observed adverse effects level
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	no observed adverse effects level
NPL	National Priorities List
NPV	net present value
NRTS	National Reactor Testing Station
UCL	upper confidence limits
O&M	operation and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
RAO	remedial action objective
RBC	risk based concentration

RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SF	slope factor
SGS	segmented gate separation
SP	sewage plant
SRPA	Snake River Plain Aquifer
TBC	to-be-considered
TCLP	Toxicity Characteristic Leaching Procedure
TRV	toxicity reference value
TSDF	Treatment, Storage, and Disposal Facility
UCL	upper confidence limit
UST	underground storage tank
VOC	volatile organic compound
WAG	Waste Area Group

PART II—DECISION SUMMARY

1. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

Waste Area Group (WAG) 4 is designated as one of 10 WAGs located at the Idaho National Engineering and Environmental Laboratory (INEEL). The INEEL has conducted nuclear reactor research and testing for the U.S. Government since 1949. It is managed by the U.S. Department of Energy Idaho Operations Office (DOE-ID) and occupies an area of approximately 2,305 km^2 (890 mi^2) in southeastern Idaho. WAG 4 comprises the Central Facilities Area (CFA), located in the south-central portion of the INEEL (see Figure 1-1).

A Federal Facility Agreement/Consent Order (FFA/CO) (DOE-ID 1991) between the U.S. Environmental Protection Agency (EPA) Region 10, the State of Idaho Department of Health and Welfare (IDHW), and the DOE-ID is the procedural framework for administering the INEEL's 10-WAGs for environmental restoration activities. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42USC 9601, et seq.) site identification number for the INEEL is 1000305.

The CFA has been used since 1949 to house many of the support services for all of the operations at the INEEL, including laboratories, security, fire protection, medical, communication systems, warehouses, a cafeteria, vehicle and equipment pools, bus system, and laundry facilities. The FFA/CO identified 52 potential release sites at WAG 4 (see Figure 1-2). The types of CERCLA sites at WAG 4 include landfills, underground storage tanks, above ground storage tanks, drywells, disposal ponds, soil contamination sites, and a sewage plant. Each of these sites was placed into one of 13 operable units (OUs) within the WAG based on similarity of contaminants, environmental release pathways, and/or investigations.

DOE-ID is the lead agency for the decisions presented in this Record of Decision (ROD). The EPA Region 10 and the IDHW participated in the evaluation and selection of remedies at WAG 4. The EPA approves decisions and IDHW concurs with the selected remedies. Both EPA and IDHW participated in the evaluation and selection of remedies for WAG 4.

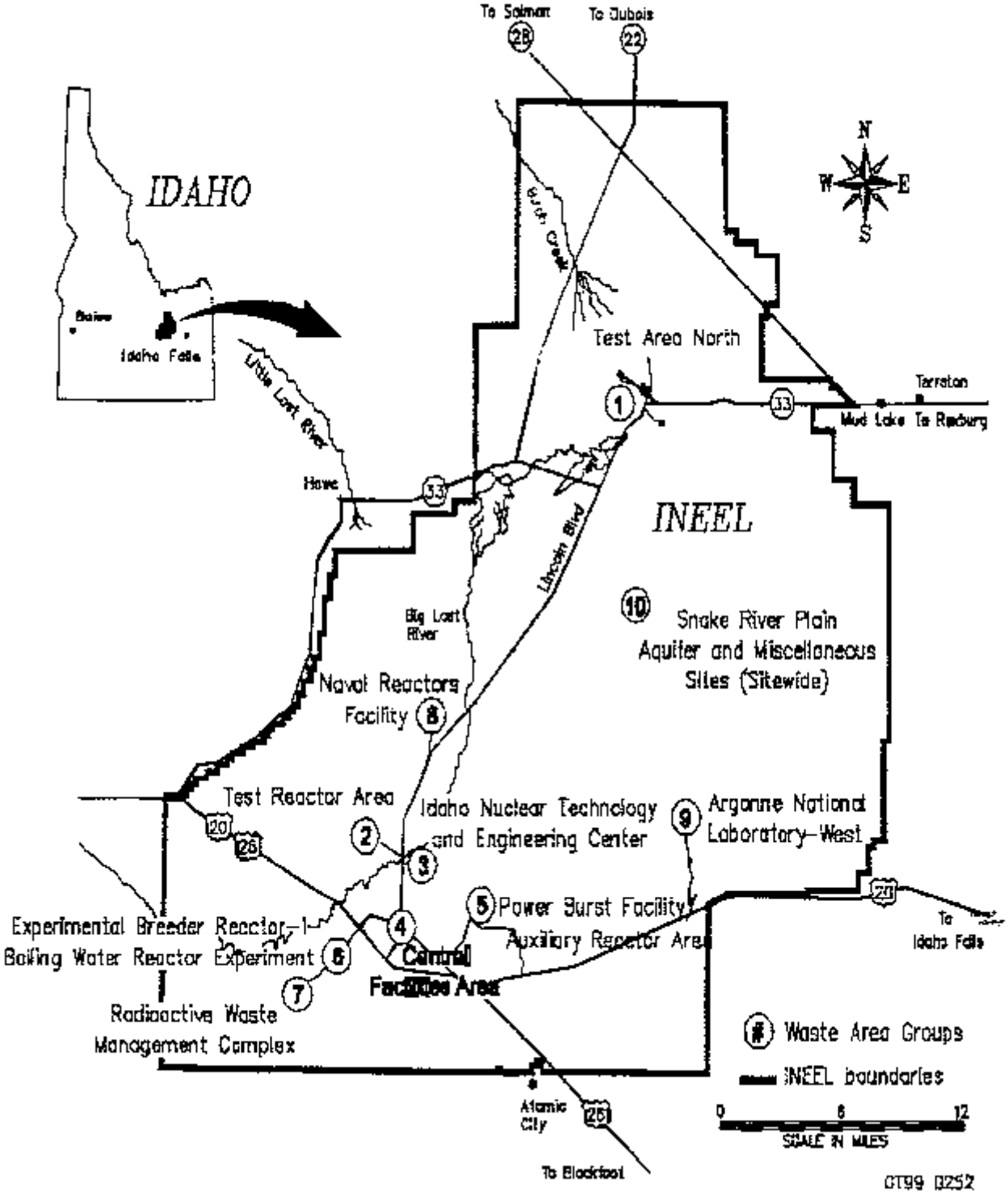

Figure 1-1. Location of WAG 4 at the INEEL.

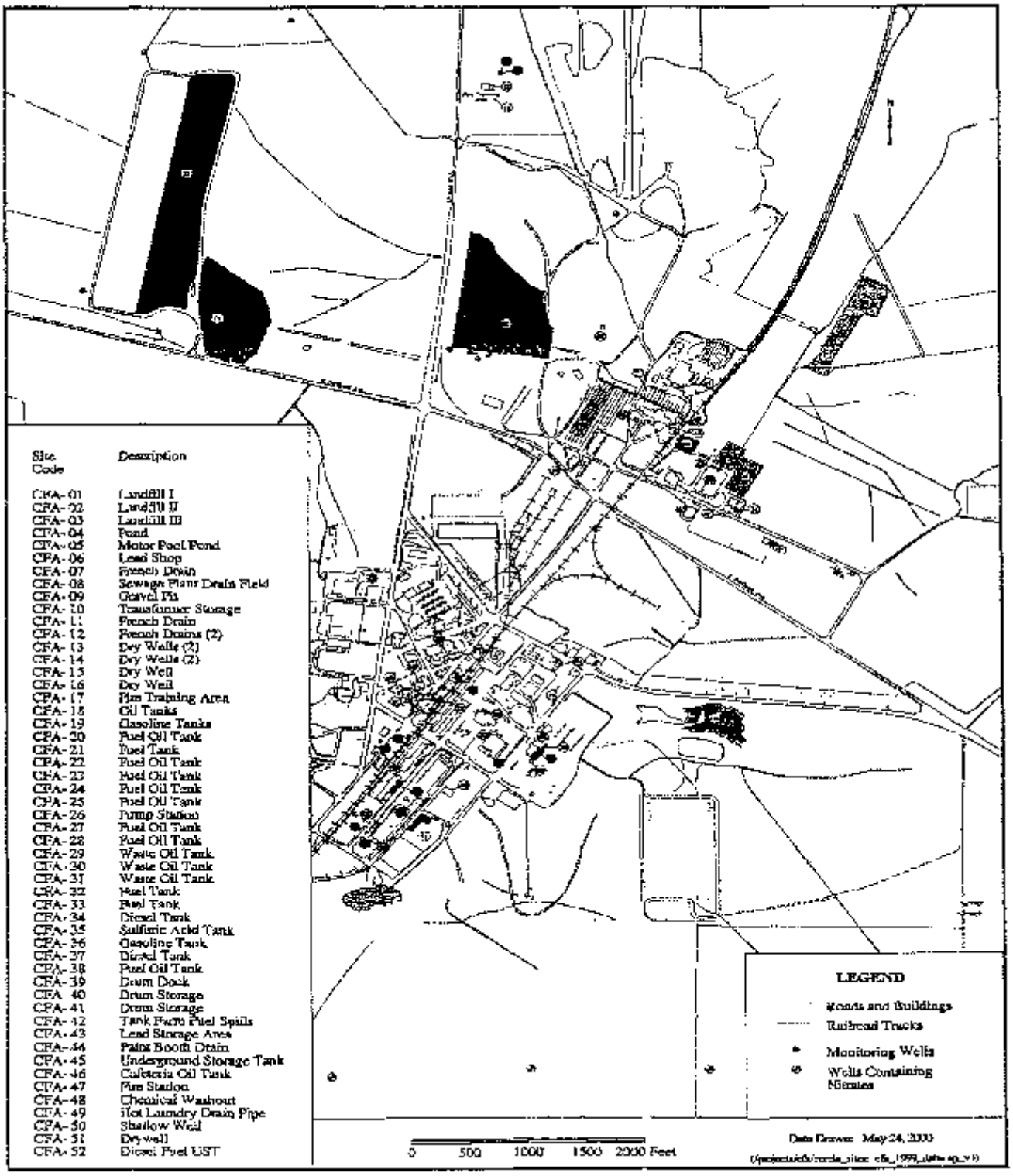

Figure 1-2. CERCLA sites and groundwater monitoring wells at WAG 4.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 INEEL History

Parts of the current INEEL site were first used as gunnery and bombing ranges during World War II by the U.S. Navy and U.S. Army Air Corps. The site was established in 1949 as the National Reactor Testing Station by the U.S. Atomic Energy Commission and was historically devoted to energy research and related activities. The National Reactor Testing Station was renamed in 1974 to the Idaho National Engineering Laboratory (INEL) to reflect a broader scope of engineering activities. In 1997, the name was changed to INEEL to reflect a growing emphasis on environmental remediation and research. Historically, facilities at INEEL were dedicated to the development and testing of peaceful applications of nuclear power. Waste disposal practices from these operations resulted in contamination of some facilities and the surrounding environment.

Throughout the 50 years of INEEL operations, disposal practices have been implemented in compliance with state and federal regulations and policies established by DOE and its predecessors. Some of these practices are not acceptable by contemporary standards and have been discontinued. Contaminated structures and environmental media, such as soil and water, are the legacy of some historical disposals. Occasional accidental releases have also occurred over time. In keeping with the contemporary emphasis on environmental issues, INEEL research is now focused an environmental restoration to address these contaminated media and waste management issues to minimize additional contamination from current and future operations. Spent nuclear fuel management, hazardous and mixed waste management and minimization, cultural resources preservation, and environmental engineering, protection, and remediation are challenges addressed by current INEEL activities (DOE-ID 1996).

2.2 CFA History

The original buildings at CFA, built in the 1940s and 1950s, housed Navy gunnery range personnel, administration, shops, and warehouse space. The facilities have been modified over the years to fit changing needs and now provide four major types of functional space: (1) craft (2) office, (3) service, and (4) laboratory. Approximately 1,028 people work at CFA. Public access to INEEL is strictly controlled through the use of security personnel and security measures such as fences around sensitive facilities.

2.3 WAG 4 Enforcement Activities

In January 1984, hazardous waste disposal sites within the INEEL that could pose an unacceptable risk to human health and safety or the environment were identified (EG&G 1984). The sites were ranked using either the EPA hazard ranking system for sites with chemical contamination or the DOE modified hazard ranking system for sites with radiological contamination. Based on the results of the hazard ranking, DOE-ID) entered into a *Consent Order and Compliance Agreement with Region 10* (COCA 1987), which regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. A hazard ranking score of 28.5 or higher qualifies a site for the *National Priorities List* (54 FR 48184) as amended by CERCLA (42 USC 9601 et seq.). Because the Test Reactor Area (WAG 2) received a score in excess of 28.5, the entire reservation became a candidate for the National Priorities List.

On November 15, 1989, the EPA added INEEL to the National Priorities List under CERCLA (42 USC 9601 et seq.). An FFA/CO and Action Plan (DOE-ID 1991) were negotiated and signed by DOE-ID, EPA, and the IDHW in December 1991, to implement the rededication of the INEEL under

CERCLA. Effective December 9, 1991, the FFA/CO superseded the corrective action elements of the *Consent Order and Compliance Agreement* (COCA 1987).

The goals of the FFA/CO are two-fold: (1) ensure that potential or actual INEEL releases of contaminants to the environment are thoroughly investigated in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300), and (2) appropriate response actions are taken to protect human health and the environment. The FFA/CO established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA and RCRA legislation and the *Idaho Hazardous Waste Management Act* (Institutional control [IC] § 39-4401). The FFA/CO is consistent with a general approach approved by the EPA and DOE in which agreements with states as full partners would allow site investigation and cleanup to proceed using a single road map to minimize conflicting requirements and maximize limited rededication resources. For management purposes, the FFA/CO divided INEEL into 10 WAGs.

The Secretary of Energy's Policy Statement (DOE 1994) on the National Environmental Policy Act (42 USC 4321 et seq.) stipulates that DOE will rely on the CERCLA process for review of actions to be taken under CERCLA. The policy statement also requires that DOE address National Environmental Policy Act values and public involvement procedures by incorporating such values, to the extent practicable, in documents and public involvement activities generated under CERCLA.

The OU 4-13 comprehensive remedial investigation /feasibility study (RI/FS) is the final investigation for WAG 4 identified in the FFA/CO. Actions conducted under the authority of CERCLA are summarized below.

2.3.1 CERCLA Actions

Two RODs, three time-critical removal actions, and four nontime-critical removal actions have been performed at WAG 4. The first ROD for WAG 4 was for the OU 4-11 Motor Pool Pond and was signed on December 31, 1992 (DOE-ID 1992a). ROD 4-11 resulted in no action with further evaluation of potential risk via the groundwater pathway in the OU 4-13 Comprehensive RI/FS (DOE-ID) 1999a).

A second ROD was issued on October 10, 1995, for the OU 4-03 Underground Storage Tank sites and OU 4-12 Landfills I, II and III (DOE-ID 1995). This ROD resulted in 19 No Further Action determinations for the underground storage tanks and installation of compacted native soil covers over the three landfills as a presumptive remedy. The ROD also called for cover and groundwater monitoring along with institutional controls. Groundwater monitoring wells were installed in 1995 and 1996. The landfill covers and monitoring systems were emplaced in 1997. Groundwater monitoring at WAG 4 was carried out under the *OU 4-12 Post-ROD Monitoring Work Plan* (DOE-ID 1997a). The monitoring commenced in 1996 and will continue until 2026, unless a five-year review alters that decision. A monitoring report has been published that summarizes data from the first two years of monitoring (DOE-ID 2000a, draft).

Three time-critical removal actions were performed at WAG 4 for the CFA-04 Pond, CFA-06 and -43 Lead Sites, and CFA-42 Tank Farm Spills. Approximately 218 m^3 (285 yd^3) of mercury-contaminated soil and calcine material were removed from the pond periphery and treated in an on-INEEL retort unit. Analytical data collected after the removal action indicated that mercury-contaminated soil remained in the pond bottom, a windblown area and along a pipeline that discharged to the pond. As a result the site was investigated further in the OU 4-13 RI/FS (DOE-ID 1999a).

A time-critical removal action was conducted in 1996 at CFA-06 Lead Shop and CFA-43 Lead Storage Area, which resulted in the excavation of approximately 457 m^3 (600 yd^3) of lead- and arsenic-

contaminated soil. Soil was shipped to an off-INEEL disposal facility. No further action was required per confirmation sampling.(DOE-ID 1999a).

During time-critical removal actions in 1996 and 1997, approximately 6,718 m^3 (8,787 yd^3) of petroleum-contaminated soil was removed from the CFA-42 Tank Farm Spills site. The tanks and associated pumping and piping systems were removed and soil was excavated to basalt. Potential risk remaining from the site was evaluated in the OU 4-13 RI/FS (DOE-ID 1999a).

Three nontime-critical removal actions were performed in 1997 at CFA-13, -15, -17 and -47. CFA-13 was a sewer clean out that received waste from Building CFA-640. The cleanout was excavated and disposed at the CFA Bulk Waste Landfarm. Potential risk from the soil surrounding the cleanout was evaluated in the OU 4-13 RI/FS (DOE-ID 1999a). The CFA-15 dry well was a concrete pipe 0.61 m (2 ft) in diameter by 2.44 m (8 ft) deep that received waste from Building CFA-674, i.e., discharged to the CFA-04 Pond. Potential risk from the soil surrounding the dry well was evaluated in the OU 4-13 RI/FS (DOE-ID 1999a).

One nontime-critical removal action was performed for sites CFA-17 and CFA-47, bermed fire pits and associated asphalt pad and an adjacent fire station chemical disposal area. A total of 4,051 m^3 (5,298 yd^3) were removed from the two areas. Soil was excavated to basalt. Potential risk from the sites was evaluated in the OU 4-13 RI/FS (DOE-ID 1999a).

It should be noted that the FFA/CO identified sites CFA-09 and CFA-11 as sites for which Interim Actions were planned as part of the OU 10-05 Ordnance Sites Interim Action ROD. However, geophysical investigations revealed no evidence of ordnance material at CFA-09 or CFA-11 and they were designated as no action sites in the OU 10-05 Ordnance Sites Interim Action ROD (DOE-ID 1992b).

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with CERCLA §113(k)(2)(b)(i-v) and §17, a series of opportunities for public information and participation in the WAG 4 Comprehensive OU 4-13 RI/FS and decision-making process was provided to the public between June 1997 and October 1999. The opportunities to obtain information and provide input included a "kick-off" fact sheet, *INEEL Reporter* newsletter articles (a publication of the INEEL's Environmental Restoration Program), three Citizen's Guide supplemental updates, one "update" fact sheet, a proposed plan, briefings and presentations to interested groups, and public meetings.

In June 1997, a "kick-off"fact sheet concerning the WAG 4 Comprehensive OU 4-13 RI/FS was sent to about 600 individuals from the general public and INEEL employees on the *Community Relations Plan* mailing list. Included with the fact sheet was a postage-paid return mailer comment form. No comments were received. This fact sheet also offered technical briefings to those interested in the WAG 4 comprehensive remedial investigation. This was the initial opportunity for public input in the RI process. Initially, no technical briefings were requested, but briefings were provided later in the RI process.

Bimonthly issues of the INEEL Reporter, which provided status of the investigation, were regularly sent out to individuals on the mailing lists, Reports also appeared in three issues of a *Citizen's Guide to Environmental Restoration at the INEEL* (a supplement to the *INEEL Reporter*) in early 1997, 1998, and late June 1999.

In May 1999, an "update" fact sheet was distributed to approximately 600 citizens on the INEEL Community Relations Plan mailing list. The purpose of the document was to keep citizens apprised of developments that occurred during the OU 4-13 RI/FS and to announce the approximate dates of future public meetings. The fact sheet offered technical briefings to those interested in the WAG 4 RI/FS.

The final WAG 4 Proposed Plan for remedial action at WAG 4 was mailed to about 600 members of the public on the *INEEL Community Relations Plan* mailing list during the week of July 26, 1999. The public comment period for the WAG 4 Proposed Plan began August 5 and was planned to end on September 4, 1999. However, at the request of the public, the comment period was extended 30 days to October 4, 1999.

During the week of August 2, 1999, personal calls were made to Idaho stakeholders in various Idaho communities. The purpose of the telephone calls was to inform individuals of upcoming public meetings and assess if a technical briefing was desired. As a result, technical briefings were held August 13, 1999, with Coalition 21. Coalition 21 is an organization of retired INEEL employees. The following week of August 16, 1999, another technical briefing was held with a member of an environmental group.

Also during the week of August 2, 1999, DOE-ID issued a news release to more than 100 media contacts concerning the beginning of a 30-day public comment period pertaining to the WAG 4 Proposed Plan. Many of the news releases resulted in short notes in community calendar sections of newspapers and in public service announcements on radio stations. The news release gave notice to the public that supportive WAG 4 investigation documentation was available in the Administrative Record (AR) section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls, Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow, Idaho. During the week of August 2, 1999, display advertisements announcing the availability of the Proposed Plan and the locations of public meetings appeared in regional newspapers in Idaho Falls, Boise,

Moscow, Arco, Fort Hall, Pocatello, and Twin Falls, Idaho. Large display advertisements appeared in the following newspapers: (1) the *Post Register* (Idaho Falls); (2) the *Arco Advertiser* (Arco); (3) *The Sho-Ban News* (Fort Hall), (4) *The Idaho State Journal* (Pocatello); (5) *The Times-News* (Twin Falls); (6) the *Idaho Statesman* (Boise); and (7) the *Moscow-Pullman Daily News* (Moscow). A follow-up advertisement ran in newspapers approximately four days before the public meetings in Idaho Falls, Boise, and Moscow. Post cards were mailed to approximately 5,400 citizens an the INEEL mailing list informing them of the availability of the WAG 4 Proposed Plan, the duration of the comment period, and the times and locations of upcoming public meetings. An electronic note was sent to all INEEL employees providing this information.

DOE-ID gave two briefings on the WAG 4 Proposed Plan to the INEEL Citizen's Advisory Board (CAB) and its Environmental Restoration Program Subcommittee. The advisory board is a group of 15 individuals, representing the citizens of Idaho, who make recommendations to DOE, EPA, and the State of Idaho regarding environmental restoration activities at the INEEL. On September 21, 1999, members of the CAB toured the three CFA contaminated-soil sites proposed for remediation. On September 22, 1999, the INEEL CAB met to finalize and submit their formal recommendations on the proposed plan to DOE.

For the general public, participation in the decision-making process included receiving the Proposed Plan, attending availability sessions before public meetings to informally discuss issues, attending public meetings, and submitting verbal and written comments to the Agencies during the 30-day public comment period. Citizens were urged to comment on the proposed plan and to attend public meetings. Public meetings were held in Idaho Falls on August 17, Boise on August 18, and Moscow on August 19, 1999. Prior to public meetings in each location, an availability session took place from 6 to 7 p.m. Public meetings began at 7 p.m.

Approximately 30 people not associated with the WAG 4 project attended the public meetings. Written comment forms (including a postage-paid, business-reply form) were made available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. The reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to record transcripts of discussions and public comments. The meeting transcripts were placed in the AR section for the WAG 4, CFA, and OU 4-13 in three INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the WAG 4 Proposed Plan.

Overall, 13 groups or members of the public provided formal comments; five citizens provided verbal comments at the public meetings and eight provided written comments. All comments received on the WAG 4 Proposed Plan were considered during the development of this ROD. The decision, finalized in this ROD, is based on the information in the AR for OU 4-13.

Part III of this ROD, the Responsiveness Summary, includes responses to all formal verbal comments presented at the public meetings and all written comments received on the WAG 4 Proposed Plan. Transcripts of oral comments and scanned versions of written comments are provided in Appendix A in their entirety. The oral and written comments are also included in the AR for WAG 4.

4. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

OU 4-13 Comprehensive RI/FS is the culmination of all of the CERCLA evaluations performed for WAG 4 at CFA. Table 4-1 presents a summary of all the affected WAG 4 sites, their OU, and the decisions made per this OU 4-13 ROD. According to the FFA/CO, the boundary of WAG 4 encompasses the facility locations and all surface and subsurface areas presently or historically used within the CFA area, as well as adjacent areas where waste activities may have taken place. The issuance of the ROD for OU 4-13, marks the beginning of final remedial activities. As specified in the action plan attached to the FFA/CO (DOE-ID 1991), post-ROD activities will include remedial design/remedial action (RD/RA) phases. The RD/RA will commence with the development of a scope of work to identify and establish deadlines for submitting other documents and outline the overall strategy for managing the RD/RA. A draft scope of work will be submitted to EPA and IDHW for review within 21 days of the issuance of the ROD. Substantial continuous physical remedial action within WAG 4 will commence within 15 months of the issuance of the ROD.

No principal threats have been identified at WAG 4. A principal threat is defined by EPA as source material considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur (EPA 1999b).

4.1 Remedial Action Sites

Remedial actions at WAG 4 protect human health and the environment. Three actions will be implemented to mitigate the unacceptable risks to human or ecological receptors associated with the three specific sites identified in the WAG 4 Comprehensive RI/FS (DOE-ID 1999a) and Proposed Plan (DOE-ID 1999b).

The first remedial action addresses the risk associated with mercury at the CFA-04 Pond. Mercury-contaminated soil in the pond bottom, the adjacent windblown area, and the pipeline will be excavated, treated as required, and disposed to the INEEL CERCLA Disposal Facility (ICDF). Treatment will include stabilization with cement of that portion of the soil with mercury concentrations in excess of the RCRA characteristic hazardous waste level.

The second action will be implemented to mitigate the risk posed by soil in the CFA-08 Sewage Plant Drainfield. Cesium-137 contaminated soil in the drainfield will be contained with an engineered barrier. Long-term monitoring and institutional controls will be implemented as part of the remedy.

The third action mitigates risk associated with lead-contaminated soil at the CFA-10 Transformer Yard site. Soil will be excavated, treated as required, and disposed of to an off-INEEL disposal facility. The decision to use an off-site facility is based on a comparative cost analysis of managing this relatively small volume of waste in the ICDF. Treatment will include stabilizing that portion of the soil with lead concentrations in excess of the RCRA characteristic hazardous waste levels using cement.

4.2 No Action and No Further Action Sites

Per this ROD, a no action site is a site that has no contaminant source or has a minor contaminant source with an acceptable risk level under a current residential exposure scenario, i.e., the risk is less than 1×10^4 or the hazard quotient is less than 1. A no further action site is a site that is not available for unrestricted exposure and unlimited use. For WAG 4, there is one reason for a site to be a no further action site:

Table 4-1. Summary of WAG 4 Sites.

Operable Unit	Site Code	Site Name	No Further Action-Institutional Controls
4-01	CFA-09	Central Gravel Pit	No Action
	CFA-11	French Drain (containing a 5-in. shell north of CFA-663)	No Action
4-02	CFA-13	Dry Well (south of CFA-640)	No Action
	CFA-14	Two Dry Wells (CFA-665)	No Action
	CFA-15	Dry Well (CFA-674)	No Action
	CFA-16	Dry Well (south of CFA-682 pumphouse)	No Action
4-03	CFA-18	Fire Department Training Area, Oil Storage Tanks	No Action
	CFA-19	Gasoline Tanks (2) East of CFA-606	No Action
	CFA-20	Fuel Oil Tank at CFA-609 (CFA-732)	No Action
	CFA-21	Fuel Tank at Nevada Circle 1 (South by CFA-629)	No Action
	CFA-22	Fuel Oil at CFA-640	No Action
	CFA-23	Fuel Oil Tank at CFA-641	No Action
	CFA-24	Fuel Tank at Nevada Circle 2 (South by CFA-629)	No Action
	CFA-25	Fuel Oil Tank at CFA-656 (North Side)	No Action
	CFA-27	Fuel Oil Tank at CFA-669 (CFA-740)	No Action
	CFA-28	Fuel Oil Tank at CFA-674 (West)	No Action
	CFA-29	Waste Oil Tank at CFA-664	No Action
	CFA-30	Waste Oil Tank at CFA-665, active	No Action
	CFA-31	Waste Oil Tank at CFA-754, active	No Action
	CFA-32	Fuel Tank at CFA-667 (North Side)	No Action
	CFA-33	Fuel Tank at CFA-667 (South Side)	No Action
	CFA-34	Diesel Tank at CFA-674 (South)	No Action
	CFA-35	Sulfuric Acid Tank at CFA-674 (West Side)	No Action

Table 4-1. (continued).

Operable Unit	Site Code	Site Name	No Further Action-Institutional Controls
	CFA-36	Gasoline Tank at CFA-680	No Action
	CFA-37	Diesel Tank at CFA-681 (South Side)	No Action
	CFA-38	Fuel Oil Tank, CFA-683	No Action
	CFA-45	Underground Storage Tank	No Action
4-04	CFA-39	Drum Dock (CFA-771)	No Action
	CFA-40	Returnable Drum Storage-South of CFA-601	No Action
	CFA-41	Excess Drum Storage-south of CFA-674	No Action
4-05	CFA-04	Pond	Remedial Action
	CFA-17	Fire Department Training Area, bermed	No Action
	CFA-47	Fire Station Chemical Disposal	No Action
	CFA-50	Shallow Well East of CFA-654	No Action
4-06	CFA-06	Lead Shop (outside areas)	No Action
	CFA-43	Lead Storage Area	No Action
	CFA-44	Spray Paint Booth Drain	No Action
	CFA-07	French Drains E/S (CFA-663)	No Further Action-Institutional Controls
	CFA-12	French Drains (2) (CFA-690)	No Action
4-08	CFA-48	Chemical Washout South of CFA-663 Sewage Plant Pipeline	No Action No Action No Action
	CFA-08	Sewage Plant Drainfield	Remedial Action
	CFA-49	Hot Laundry Drain Pipe	No Action
4-09	CFA-10	Transformer Yard	Remedial Action
	CFA-26	CFA-760 Pump Station Fuel Spill	No Action
	CFA-42	Tank Farm Pump Station Fuel Spills	No Action
	CFA-46	Cafeteria Oil Tank Spill (CFA-721)	No Action

Table 4-1. (continued).

Operable Unit	Site Code	Site Name	No Further Action-Institutional Controls
4-11	CFA-05	Motor Pool Pond	No Action
4-12	CFA-01	Landfill I	Addressed under the OU 4-12 ROD-continued operation, maintenance, and monitoring
	CFA-02	Landfill II	
	CFA-03	Landfill III	
4-13[a]	CFA-51	Drywell at North End of CFA-640	No Action
	CFA-52	Diesel Fuel UST (CFA-730) at Bldg CFA-613 Bunkhouse	No Action

a) OU 4-13 was amended April 1996 to include these two sites.

- It has a contaminant source at depths greater than 3 m (10 ft) below grade that might pose a risk to human health if it was ever brought to the surface. Contaminants do not have an exposure route (current residential exposure scenario) available under current site conditions.

The Agencies have determined that no action or no further action be taken under CERCLA at 46 sites in WAG 4 (one additional site, CFA-08, has two no action portions, and a remedial action portion). A summary of these determinations is included in Table 4-1. Fifteen of these sites plus on portion of the CFA-08 site were determined to be no action during the RI/baseline risk assessment (BRA) analysis for this ROD. One additional site, CFA-07 (OU 4-07), French Drain, was determined to be a no further action site and will have institutional controls until it is otherwise evaluated and documented in a CERCLA five-year review. Additional details on these sites can be found in the AR.

The other 30 no action sites were determined to be no action for one of the following reasons:

- The site was a declared a no action site by the signing of a previous WAG 4 ROD.
- A source did mot exist at the site.
- Contamination at the site was determined to pose a risk less than 1E-06 or have a hazard quotient less than 1 through a Track 1 or Track 2 evaluation.

4.3 Groundwater

No unacceptable risk were predicted via the groundwater pathway from sites at WAG 4 during the OU 4-13 Comprehensive RI/FS (DOE-ID 1999a). Additionally, groundwater monitoring for all wells at WAG 4 will be carried out under the Post-ROD Monitoring Work Plan. Please see Figure 1–2 for the monitoring well locations. The OU 4-12 Post-ROD Monitoring Work Plan included a cost estimate for 30 years of groundwater monitoring at WAG 4; the wells have monitored for four years to date. Monitoring will continue until such time as the five-year reviews show, and the Agencies agree, that it is no longer necessary. A monitoring report was prepared for this two year of quarterly monitoring

from 1996 to 1998 that also shows no constituents in the groundwater at WAG 4 are above risk-based concentrations (DOE-ID 2000a).

During the preparation of the OU 4-12 monitoring report, two constituents — lead and nitrate—were identified at elevated concentrations. Although there is no federal MCL for lead, the EPA lead action level and the State of Idaho groundwater quality standard is 15 ug/L, unless site-specific situations are taken into account (IDAPA 16.01.11). Lead concentrations in one well, CFA-MON-A-003, have exceeded this standard. Lead concentrations were below the quality standard during the first two sampling rounds in 1996, began increasing to a peak concentration of 44.8 ug/L in mid-1997, and have been decreasing since that time. The most recent sampling event reported a lead concentration of 19 ug/L in April 1999. Zinc and iron concentrations followed a similar trend in CFA-MON-A-003, although no groundwater standards were exceeded. Because this is an isolated occurrence and no lead sources were identified at CFA that could pose a risk to groundwater, lead levels in CFA-MON-A-003 are thought to be a localized phenomenon and will continue to be monitored.

Nitrate concentrations of approximately 20 mg/L and 10 mg/L were identified in two wells, CFA-MON-A-002 and CFA-MON-A-003, respectively. Nitrate levels in CFA-MON-A-002 were inititally measured at 21 mg/L in 1995 and have declined to 16 mg/L in the most recent sampling round in March 2000. Nitrate levels in CFA-MON-A-003 have been measured between 8.65 and 11 mg/L, with an average concentration of 10 mg/L. Although these concentrations are below the calculated risk-based concentration (58 mg/L), the concentration in CFA-MON-A-002 exceeds the MCL identified in the National Primary Drinking Water Regulations (40 CFA 141). The MCL is 10 mg/L if the water is available to sensitive populations, such as infants below 6 months of age (40 CFA 141.62); the higher allowable limit is 20 mg/L if the water is not available to infants below 6 months of age or other sensitive populations (40 CFA 141.11). One risk from nitrate is “blue baby” syndrome in which nitrate preferentially replaces hemoglobin in a baby’s bloodstream, causing the skin to turn blue.

The Agencies initially decided to perform a separate groundwater RI/FS to assess the occurrence of nitrate in CFA-MON-A-002; that investigation was to be called OU 4-13B and the OU 4-13 RI/FS was referred to as OU 4-13A. On that basis, the Proposed Plan was issued in August 1999 as the OU 4-13A Proposed Plan and it summarized only the three remedial actions described previously.

Subsequent to the issuance of the Proposed Plan, trend analysis of the nitrate concentrations in CFA-MON-A-002 was performed, isotopic analysis of groundwater samples was conducted, a likely source was identified, and limited groundwater modeling was conducted (DOE-ID 2000b). The source was identified as CFA-08 Sewage Treatment Plan grainfield, which has not been used since February 1995. Per this ROD, the CFA-08 grainfield will be capped in 2002, thereby reducing subsurface infiltration. Modeling showed the plume is now diminishing and regression analysis showed that nitrate concentrations at CFA-MON-A-002 would likely go below the MCL of 10 mg/L in approximately 10 to 15 years. Nitrate concentrations in CFA-MON-A-002 have been below 20 mg/L in the last four sampling rounds since the fall of 1997. Regression analysis of nitrate data collected over a four-year period also showed a statistically significant downward trend for nitrate in CFA-MON-A-002 (DOE-ED 2000b).

The ultimate goal and applicable or relevant and appropriate MCL requirement for nitrate is 10 mg/L, which is predicted be achieved within 15 years at CFA-MON-A-002. Because CFA-MON-A-002 is a monitoring well that is presently located on the INEEL which is under DOE institutional control, the Agencies agreed that the groundwater is currently protective under this land use scenario. On that basis, further investigation of nitrate is not required. Nitrate concentrations will be determined annually at CFA-MON-A-002, and CFA-MON-A-003 per the Post-ROD Monitoring Work Plan that addresses groundwater monitoring at WAG 4 (DOE-ED 1997a). The State of Idaho and EPA

will be notified of the concentrations annually as required by 40 CFA 141.11. Additionally, nitrate concentrations and trends will be evaluated during the five-year reviews planned for WAG 4. If deviations to the predicted trend are noted the approach described herein will be re-evaluated by the Agencies, which may require a ROD amendment for active rededication. After the nitrate concentration falls below the MCL of 10 mg/L, annual reporting to the State and EPA will cease but the wells will continue to be monitored as necessary based on five-year reviews.

As a result of this evaluation DOE requested and the Agencies concurred that the OU 4-13B investigation should be discontinued and that this ROD become the Comprehensive OU 4-13 ROD for WAG 4 (DOE-ID 2000c).

5. SITE CHARACTERISTICS

5.1 Physical Characteristics

The INEEL is located on the Eastern Snake River Plain, a large topographic depression extending from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. The surface of the INEEL, in general, is covered by basalt flows and intermittent, discontinuous pockets of sediment.

Surface hydrology includes water from three streams that flow intermittently onto INEEL and local runoff caused by precipitation and melting snow. No ponds and streams are within WAG 4 except very briefly in conjunction with spring runoff. The Big Lost River is the nearest surface water feature and is not influenced by activities at WAG 4.

The vadose zone is the unsaturated region extending from land surface down to the water table, and varies in thickness from approximately 61 m (200 ft) thick in the northern part of INEEL to more than 274 in (900 ft) in southern portions of the Site (Irving 1993). The vadose zone is a complex series of heterogeneous basalt flows with thin layers of interbedded sediments. The basalt flows consist of thick dense intervals as well as large void spaces resulting from rubble zones, lava tubes, undulatory basalt-flow surfaces, and fractures. Sediment interbeds in the vadose zone consist of sand, silt, and clay and are generally thin and discontinuous. The vadose zone is approximately 146 m (480 ft) thick beneath CFA.

The Snake River Plain Aquifer (SRPA) underlies most of INEEL. The aquifer, defined as the saturated region beneath the vadose zone, arcs approximately 325 km (200 mi) through the eastern Idaho subsurface and varies in width from approximately 80 to 112 km (50 to 70 mi). The total area is about 25,000 km^2 (9,600 mi^2) . The SRPA discharges approximately 8.8E+09 m^3 (7.1 million acre/ft) of water annually to springs and rivers (EG&G 1993). The aquifer contains thick sequences of numerous, relatively thin basalt flows extending to depths of 1,067 in (3,500 ft) below ground surface (bgs). 7he SRPA also contains sediment interbeds within the basalt flows that are typically discontinuous. The aquifer has an estimated capacity of 2.5E+12 m^3 (8.8E+13 ft^3) of water (EG&G 1986).

The SRPA is recharged primarily by infiltration from precipitation and deep percolation of irrigation water. Regional groundwater flows to the south-southwest; however, the flow direction can be affected locally by recharge from rivers, surface water spreading areas, and heterogeneity in the aquifer. Locally at CFA, the groundwater flow direction is to the south. Estimates of flow velocities within the aquifer range from 1.5 to 6.1 m/day (5 to 20 ft/day) (EG&G 1993). Flow in the aquifer is primarily through fractures, through interflow zones in the basalt, and in the highly permeable rubble zones located at the top of basalt flows. The aquifer is considered heterogeneous and anisotropic (having properties that differ depending on the direction of measurement) because of the permeability variations within the aquifer that are caused by basalt irregularities, fractures, void spaces, rubble zones, and sediment interbeds. The heterogeneity of the basalt bedrock results in a high variability in transmissivity values (measures of the ability of the aquifer to transmit water). Transmissivity measurements in wells on the INEEL range from 1.0E-01 to 1.1E+06 m^2/day (1.1E+00 to 1.2E+07 ft^2/day) (INEEL 1995a). Concerns about groundwater contamination from INEEL operations have prompted an extensive monitoring system over all of INEEL (EG&G 1993).

5.2 Climate

Meteorological and climatological data for the INEEL and the surrounding region are collected and compiled from several meteorological stations and three stations that are located at INEEL operated by the National Oceanic and Atrnospheric Administration field office in Idaho Falls, Idaho.

The region is classified as and to semiarid (DOE-ID 1989) with an annual average precipitation of 22.1 cm (8.7 in.). The rates of precipitation are highest during the months of May and June and lowest during July. Normal winter snowfall occurs from November through April, though occasional snowstorms occur in May, June, and October. Snowfall at the INEEL ranges from about 17.3 cm (6.8 in.) per year to about 151.6 cm (59.7 in.) per year, and the annual average is 70.1 cm (27.6 in.) (DOE-ID 1989). The INEEL is subject to severe weather episodes throughout the year. Thunderstorms are observed mostly during spring and summer. An average of two to three thunderstorms occurs during each month from June through August (EG&G 1981). Thunderstorms are often accompanied by strong gusty winds that may produce local dust storms. Precipitation from thunderstorms at INEEL is generally light. Occasionally, however, rain resulting from a single thunderstorm on INEEL exceeds the average monthly total precipitation (EG&G 1984).

The average summer daytime maximum temperature is 28EC (83EF), while the average winter daytime maximum temperature is -0.6EC (31EF). Recorded temperature extremes at the INEEL vary from a low of -44EC (47EF) in January to a high of 38EC (101EF) in July (DOE-ID 1989). The relative humidity at INEEL ranges from a monthly average minimum of 18% during the surnmer months to a monthly average maximum of 55% during the winter. The relative humidity is directly related to diurnal temperature fluctuations. Relative humidity reaches a maximum just before sunrise (the time of lowest daily temperature) and a minimum in midafternoon (the time of maximum daily temperature) (DOE-ED 1989).

The INEEL is in the belt of prevailing westerly winds, which are channeled within the Eastern Snake River Plain to produce a west-southwest or southwest wind approximately 40% of the time. The average midspring windspeed recorded at a height of 6 m (20 ft) is 9.3 mph, while the average midwinter windspeed is 5.1 mph (EG&G 1993).

5.3 Flora and Fauna

Six broad vegetation categories representing nearly 20 distinct habitats have been identified on the INEEL: (1) juniper-woodland, (2) native grassland, (3) shrub-steppe off lava, (4) shrub-steppe on lava (5) modified, and (6) wetlands. Though small riparian and wetland regions exist along the Big Lost Rivet and Birch Creek, nearly 90% of the site is covered by shrub-steppe vegetation. The most common varieties are big sagebrush, saltbush, rabbitbrush, and native grasses.

The INEEL serves as a wildlife refuge because a large percentage of the Site is undeveloped and human access is restricted. Grazing and hunting are prohibited in the central part of the site. Mostly undeveloped, this tract may be the largest relatively undisturbed sagebrush steppe in the Intermountain West outside of the national parklands (DOE-ID 1996). More than 270 vertebrate species including 43 mammalian, 210 avian, 11 reptilian, nine fish, and two amphibious species have been observed on the site. Hundreds of birds of prey and thousands of pronghom antelope and sage grouse have often wintered on INEEL. Mule deer and elk also reside at the Site. Observed predators include: bobcats, mountain lions, badgers, and coyotes. Bald eagles, classified as a threatened species, are commonly observed on or near the site each winter. Peregrine falcons, which are classified as endangered, have also been observed. In addition, other species that are candidates for listing as threatened or endangered by the U.S. Fish and

Wildlife Service may either inhabit or migrate through the area. Candidate species that may frequent the area include ferruginous hawks, pygmy rabbits, Townsend's big-eared bats, burrowing owls, and loggerhead shrikes.

The flora and fauna existing around CFA are representative of those found across the INEEL (Arthur et al. 1984; Reynolds et al. 1986). Wildlife species present in and around the CFA include birds, mammals, and reptiles that are associated with facilities, sagebrush-rabbitbrush, grasslands, and disturbed habitats, deciduous trees and shrubs, and water (e.g., facility ponds and drainage areas). Both aquatic and terrestrial species are potentially present. Sagebrush habitats in areas adjacent to facilities support a number of species including sage grouse and pronghorn antelope (game species) and areas of grassland provide habitat for species such as the western meadowlark (*Sturnella neglecta*) and mule deer (*Odocoileus hemionus*), also a game species. Buildings, lawns, ornamental vegetation, and disposal/drainage ponds at WAG 4 are also used by a number of species such as waterfowl, raptors, rabbits, mule deer, and bats. No areas of critical habitat as defined in the 40 CFR Part 300 are known to exist in or around CFA.

5.4 Demography

The human populations potentially affected by INEEL activities include INEEL employees, ranchers who graze livestock in areas on or near the INEEL, hunters on or near the site, residential populations in neighboring communities, and highway travelers.

Nine separate facilities at INEEL, Figure1-1, include approximately 450 buildings and more than 2,000 other support facilities. Presently, the INEEL employs 8,348 contractor and government personnel. Employee totals at INEEL locations include 250 at the Waste Management Facility; 1,049 at the CFA; 433 at Test Area North; 511 at the Test Reactor Area; 622 at the Naval Reactors Facility; 1,201 at the Idaho Nuclear Technology and Engineering Center; 732 at Argonne National Laboratory–West; and 193 within the remaining site-wide areas, which include the Auxiliary Reactor Area. Approximately 3,231 INEEL employees occupy numerous offices, research laboratories, and support facilities in Idaho Falls.

The INEEL is bordered by five counties: (1) Bingham, (2) Bonneville, (3) Butte, (4) Clark, and (5) Jefferson (see Figure 5-1). The nearest communities to INEEL are Atomic City, located south of the INEEL border on U.S. Highway 26; Arco, 11 km (7 mi) west of INEEL; Howe, west of INEEL on U.S. Highway 22/33; and Mud Lake and Terreton on the northeast border of INEEL. Other communities located near the INEEL include Blackfoot and Shelley in Bingham County; Idaho Falls and Ammon in Bonneville County; Arco in Butte County; and Rigby in Jefferson County.

5.5 Cultural Resources

Over the past two decades, detailed inventories of cultural resources at some parts of the INEEL have been assembled. Initial surveys have been focused on areas within and around major operating facilities at the Site. Proposed future construction areas also have been examined. As of January 1, 1998, approximately 6.6% (37,681 acres) of the 2,305 km^2 (890 mi^2) comprising the INEEL has been systematically surveyed for archaeological resources and 1,839 archaeological localities have been identified. The inventory includes prehistoric resources representing a span of approximately 12,000 years, as well as historic resources representing the last 150 years. Cultural resources on INEEL also include a number of more recent buildings, structures, and objects that have made significant contributions to the broad patterns of American history through the Site's association with World War II,

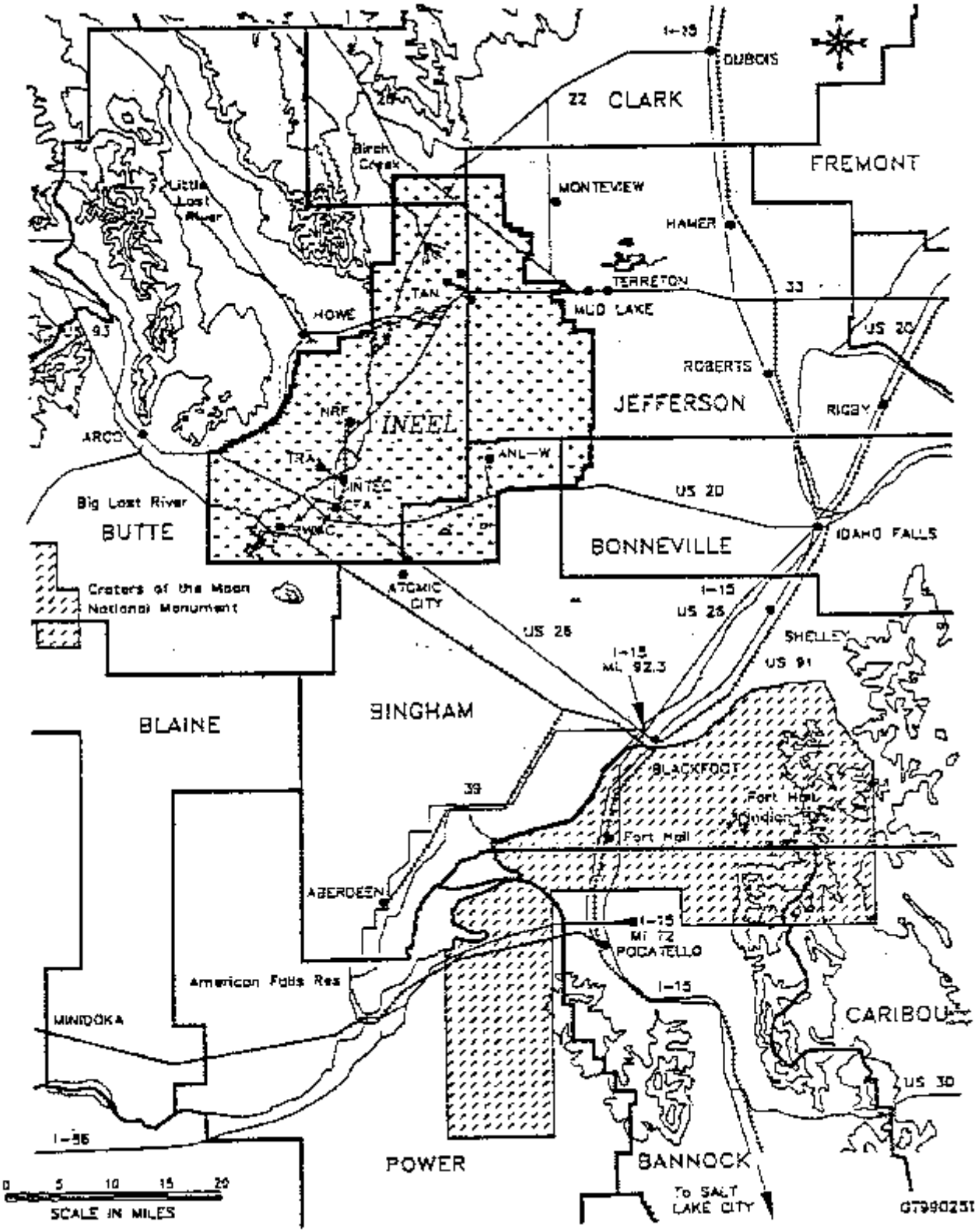

Figure 5-1. Counties surrounding the INEEL.

the Cold War, and important advances in nuclear science and technology. One INEEL facility, Experimental Breeder Reactor I, is recognized as a national historic landmark.

Local Native American people, particularly the Shoshone-Bannock tribal members of Fort Hall, Idaho, view all of the prehistoric sites on the INEEL as ancestral and of traditional cultural significance. A variety of natural features are also important to Native Americans. Native American burial sites, though rare, are of special concern on INEEL.

5.6 Conceptual Site Models

The conceptual site models used in the OU 4-13 Comprehensive RI/FS to evaluate potential risk from surface soil, underground storage tanks and buried waste, and liquid discharge are shown in Figures 5-2 through 5-4. The models illustrate hypothetical exposure routes to current and future workers, future residents, and ecological receptors. Future occupational and residential scenarios are assumed to begin in 100 years. The models are based on land-use assumptions and the exposure assessment conducted for the OU 4-13 RI/FS. The human health conceptual site models (Figures 5-2 through 5-4) are based on the following land use assumptions:

- The INEEL will remain under government ownership and institutional control for at least the next 100 years (i.e., until the year 2095, 100 years from the date the INEEL land-use projections were established [DOE-ID 1996]).
- No residential development will occur within the INEEL boundaries within the institutional control period.

The complete conceptual site model for the ecological risk assessment (Figure 5-5) reflects the locations of contaminated media to which ecological receptors may be exposed. For a more detailed conceptual site model, see Section 7 of the OU 4-13 Comprehensive RI/FS (DOE-ID 1999a).

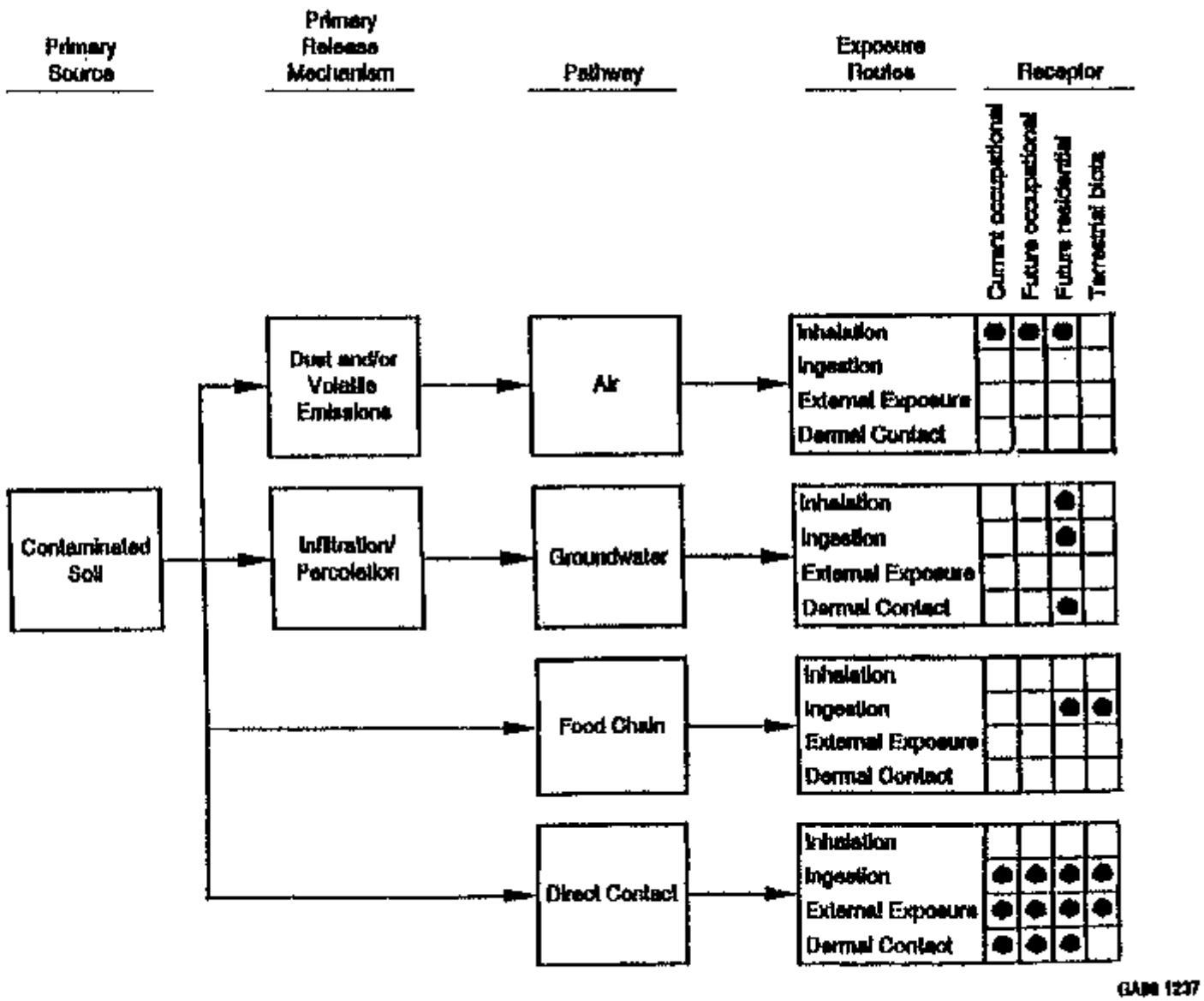

Figure 5-2. Conceptual site model for contaminated soil sites at CFA.

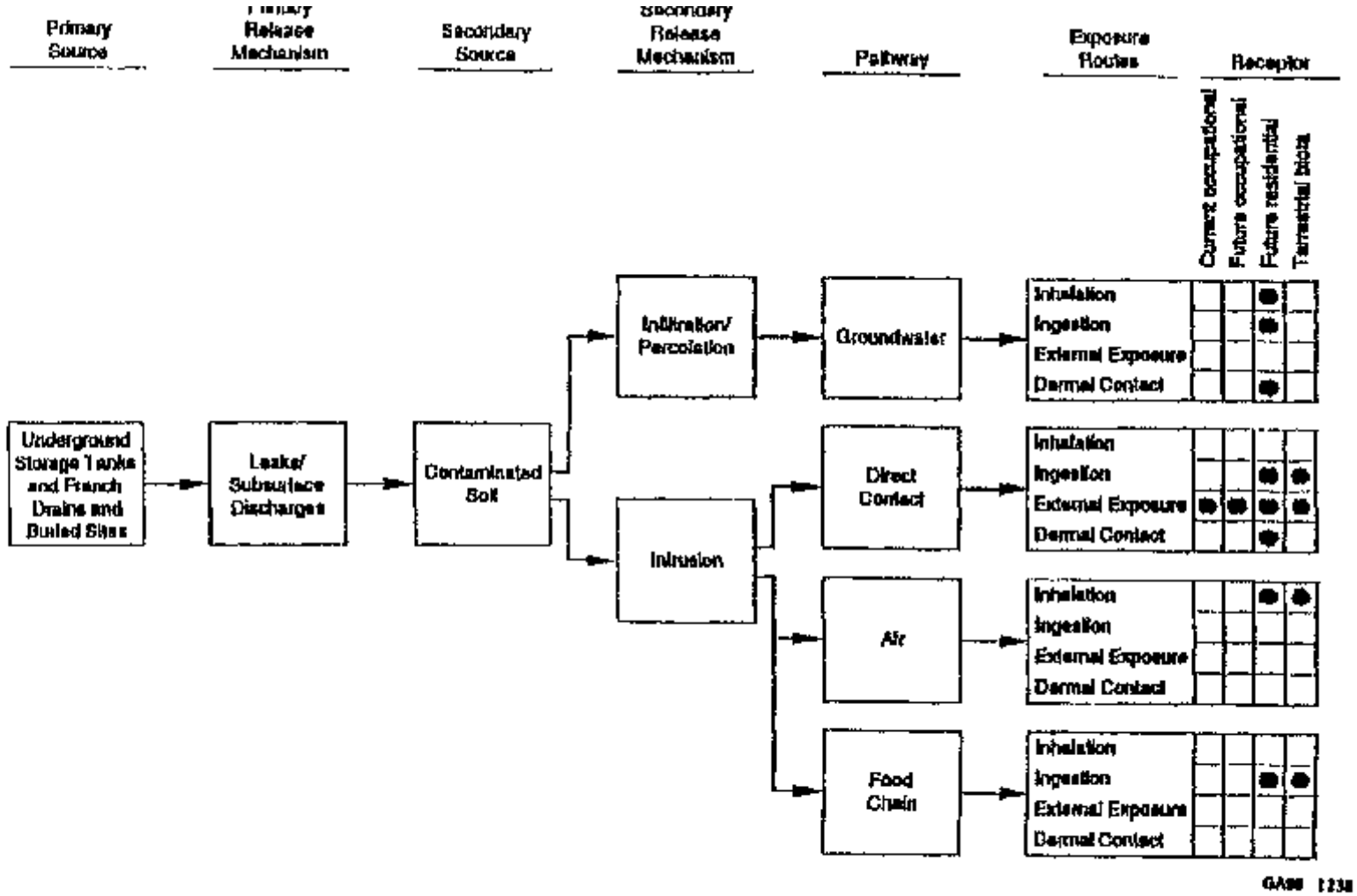

Figure 5-3. Conceptual site model for underground storage tanks and buried waste sites at CFA.

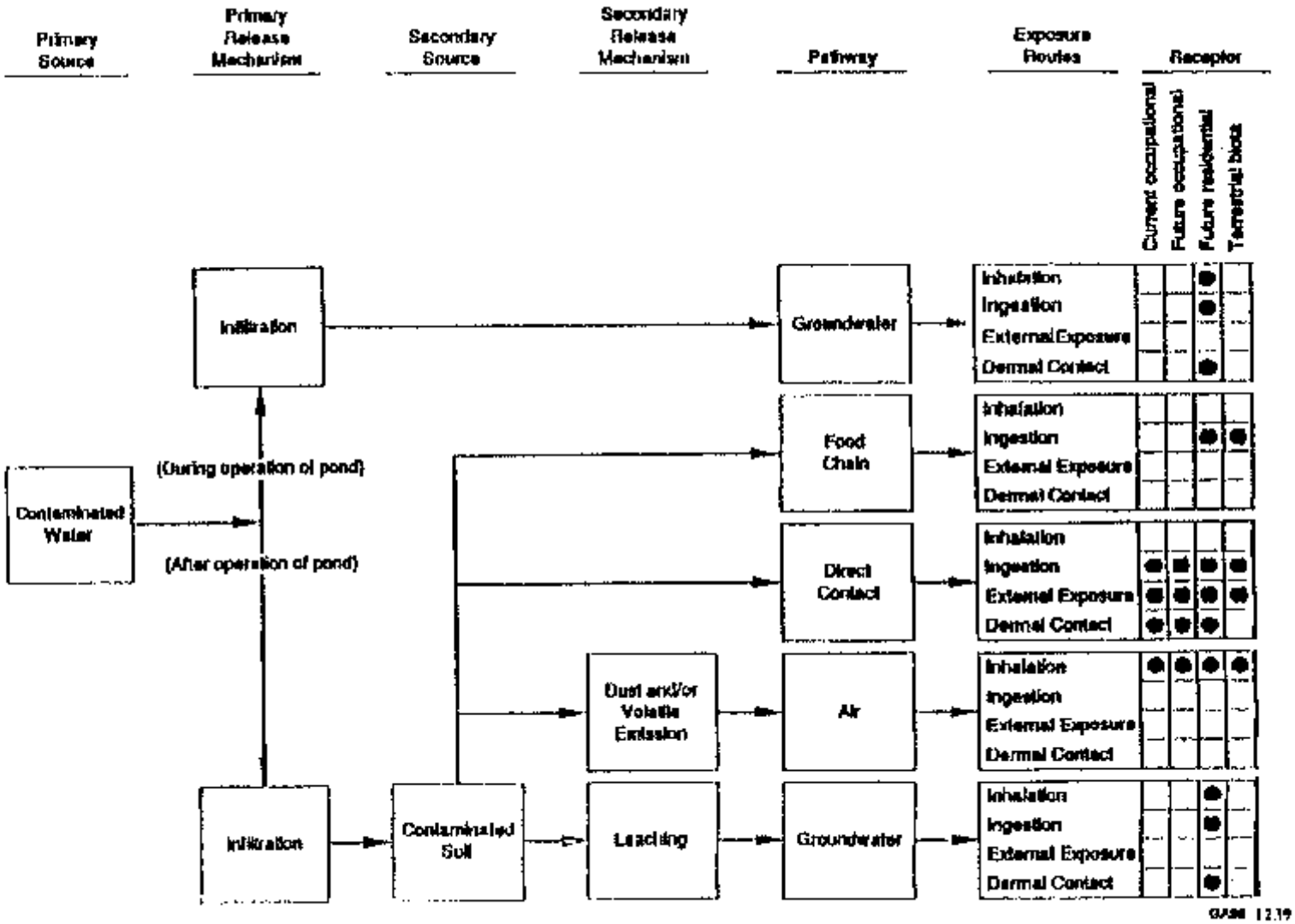

Figure 5-4. Conceptual site model for liquid discharge sites at CFA.

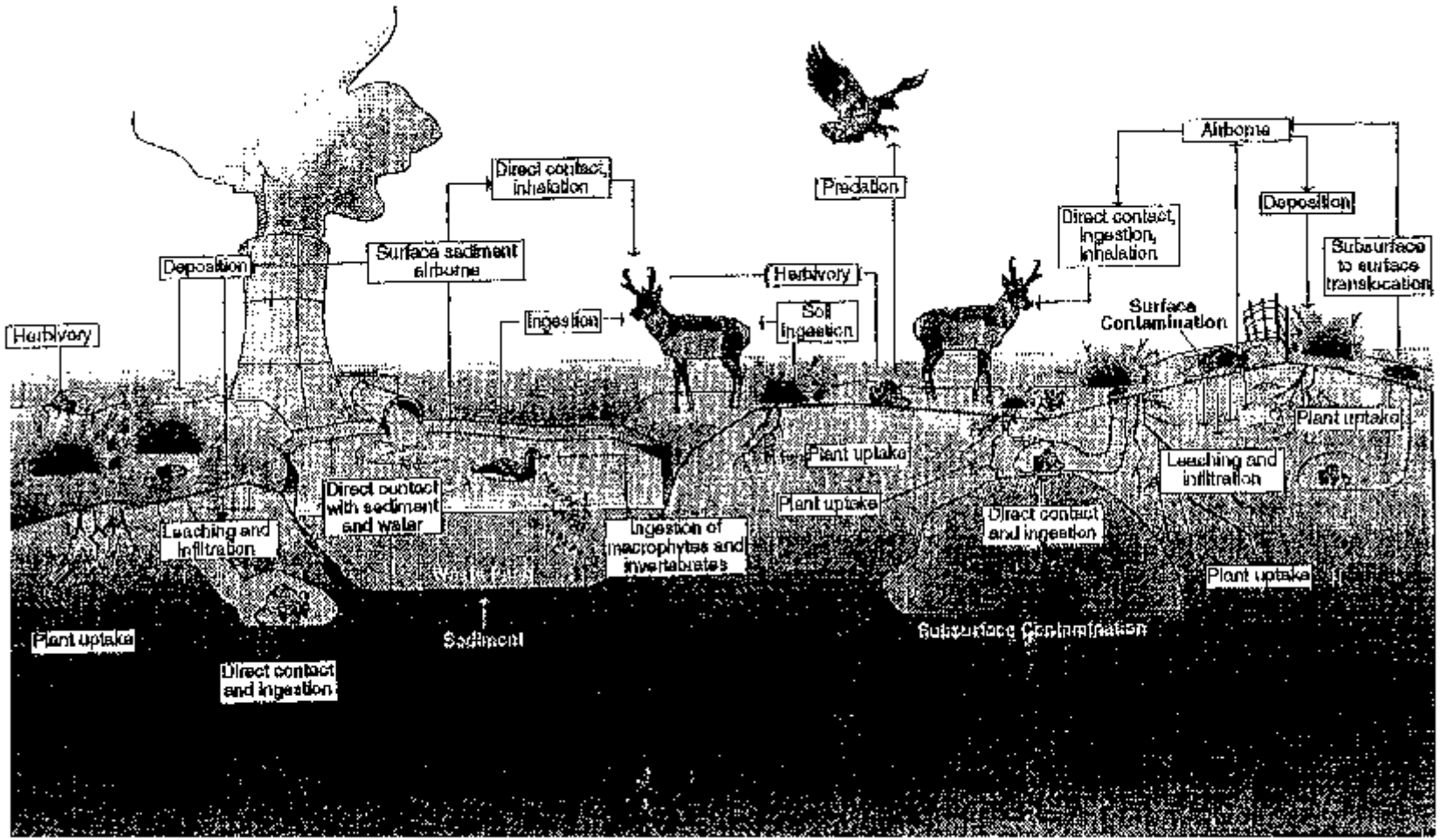

Figure 5-5. Complete conceptual site model for ecological receptors at WAG 4.

6. CURRENT AND POTENTIAL SITE AND RESOURCE USES

The INEEL has an area of approximately 2,305 km^2 (890 mi^2) or (230,266 ha ƒ569,000 acres„). Approximately 98% of this land, has not been impacted by INEEL operations. The land use at the INEEL was evaluated in the Comprehensive Facility and Land Use Plan (CFLUP) (DOE-ID 1996). Land use on the entire INEEL is restricted. Though public highways traverse the INEEL, public access beyond the highway right-of-way is not allowed. Access to facilities requires proper clearance, training, or escort. There are specific controls in place to limit exposure to sites. Current and projected land use as described in the report is summarized below.

6.1 Current Land Use

The land within INEEL is classified as industrial or mixed use by the U. S. Bureau of Land Management (BLM) (DOE-ID 1996). The INEEL land use consists of wildlife management, government industrial operations, and waste management. As shown in Figure 6-1, large tracts of land are reserved as buffer and safety zones around the boundary of the INEEL. Operations are generally restricted to the INEEL proper. Aside from the operational facilities, the land within INEEL proper is largely undeveloped and used for environmental research, ecological preservation, and sociocultural preservation. No residential areas are located within the INEEL boundaries.

The buffer surrounding INEEL consists of 1,295 km^2 (500 mi^2) of grazing land (DOE-ID 1996) administered by the BLM. Grazing areas around the INEEL support cattle and sheep, especially during dry conditions. Controlled hunts of game animals managed by the Idaho Department of Fish and Game are permitted on INEEL and within the buffer zone during selected years (DOE-ID 1996). Hunters are allowed access to an area that extends 0.8 km^2 (0.5 mi) inside INEEL boundary on portions of the northeastern and western borders of INEEL (DOE-ID 1996).

State Highways 22, 28, and 33 cross the northeastern portion of the Site. U.S. Highways 20 and 26 cross the southern portion (Figure 1-1). As much as 145 km (90 mi) of paved highways used by the general public and 23 km (14 mi) of Union Pacific Railroad tracks traverse the southern portion of the Site (DOE-ID 1996). A government-owned railroad passes from the Union Pacific Railroad at the CFA to the Naval Reactors Facility. An additional spur runs from the Union Pacific Railroad to the Radioactive Waste Management Complex.

In the counties surrounding the INEEL, approximately 45% of the land is used for agriculture, 45% is open land, and 10% is urban (DOE-ID 1996). Land use includes grazing, livestock production, and dairy farming (EG&G 1984). Major crops produced on land surrounding INEEL are wheat, alfalfa, barley, potatoes, oats, and corn. Sugar beets are grown within 64 km (40 mi) of INEEL in the vicinity of Rockford, Idaho. The land surrounding the INEEL is owned by either private individuals or the U.S. Government. The BLM administers the government land on INEEL (DOE-ID 1996).

6.2 Future Land Use

The future land use within the INEEL is projected to remain essentially the same as the current use: research facilities within the INEEL boundaries, agriculture, and open land surrounding the INEEL (Figure 6-1). The CFLUP was developed using a stakeholder process that involved a public participation forum, a public comment period, and the INEEL CAB. The public participation forum included members from local counties and cities, Shoshone-Bannock Tribes, BLM, DOE, U.S. Forest Service, U.S. National Park Service, Idaho Department of Transportation, Idaho Fish and Game, and eight businesses, education,

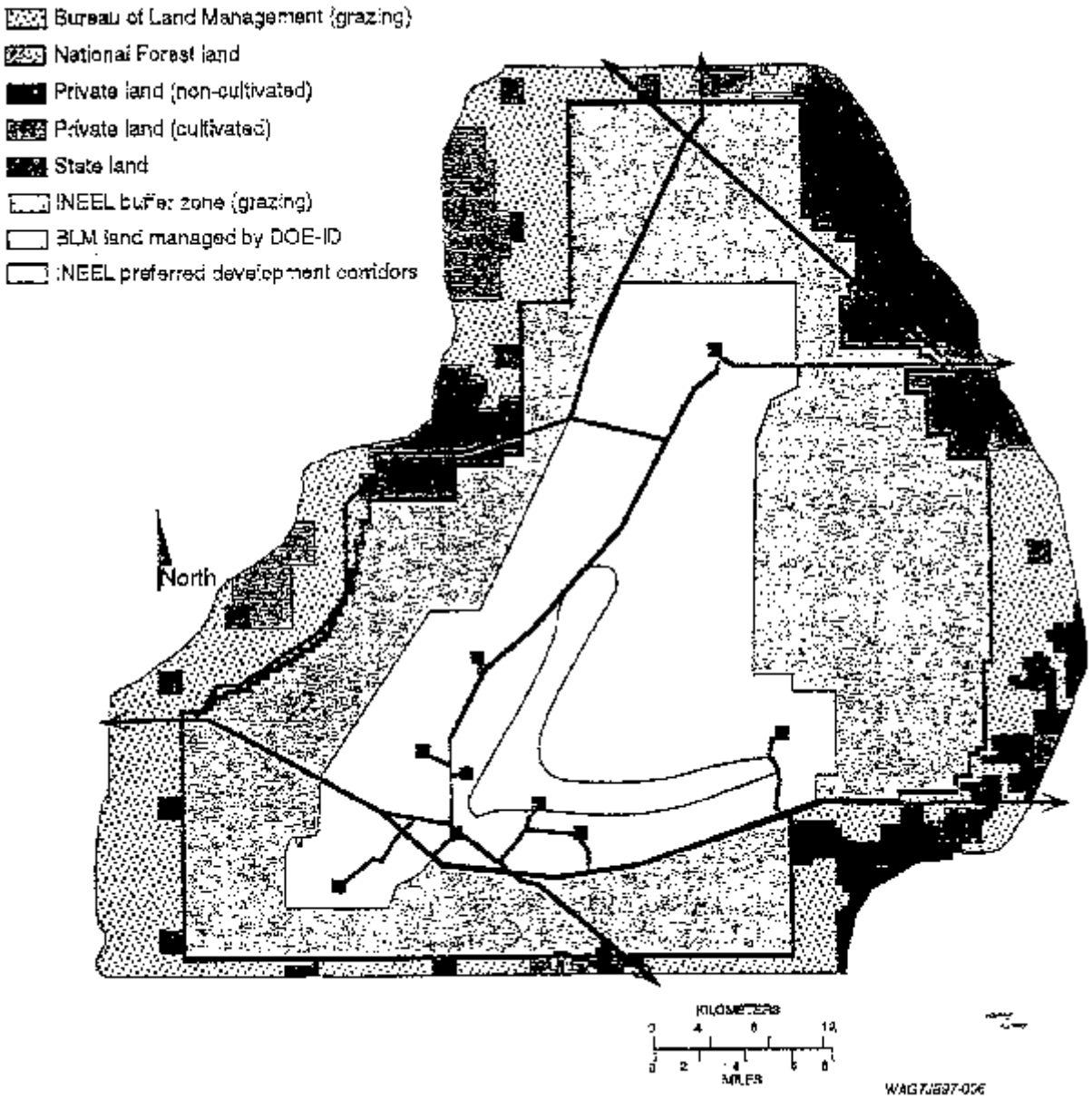

Figure 6-1. Land ownership distribution in the vicinity of the INEEL and on-INEEL areas open for permitted grazing.

and citizen organizations. EPA and IDHW participated in an ex officio capacity. Following review and comment by the public participation forum, the CFLUP underwent a 30-day public comment period and was subsequently submitted to the INEEL CAB for review and recommendations. No recommendations for residential use of any portions of the INEEL within the next 100 years have been received to date.

Land use projections are based on the following assumptions and factors:

- The INEEL will remain under government management and institutional control for at least the next 100 years
- DOE projections for the future of its national laboratory research and development activities and nuclear reactor programs
- The presence of active industrial and research facilities
- The presence of an industrial infrastructure
- The likely inability to “green field” (e.g., return to natural state with unrestricted land-use) the industrial complex without total removal of waste
- No nonindustrial land use within the INEEL, other than grazing
- Recommendations from the INEEL CAB and other stakeholders about future use assumptions.

Land use on the INEEL is anticipated to include unrestricted industrial uses, government-controlled industrial uses, unrestricted areas, controlled areas for wildlife management and conservation, and waste management areas. No residential development will be allowed within the INEEL boundaries, and no new major private developments (residential or nonresidential) on public lands are expected in areas adjacent to the Site. Grazing will be allowed to continue in the buffer area (DOE-ID 1996).

Regardless of the future use of the land now occupied by the INEEL, the federal government has an obligation to provide adequate institutional controls (i.e., limited access) to areas that pose significant health or safety risks until those risks diminish to acceptable levels (see Section 12.2). Fulfillment of this obligation is contingent on the continued viability of the federal government and on congress appropriating sufficient funds to maintain the institutional controls for as long as necessary.

6.3 Groundwater Use

Current use of SRPA groundwater at CFA is for drinking and irrigation. Groundwater is extracted from two production wells at CFA (CFA-1 and CFA-2). A drinking water program was initiated in 1988 to monitor drinking water wells on the INEEL for compliance with drinking water system standards as established by EPA, the State of Idaho, and applicable DOE orders.

6.4 Groundwater Classification and Basis

The eastern portion of the aquifer was granted sole source status by the EPA on October 7, 1991 (56 FR 50634). The definition of a sole source aquifer is that more than 50% of the people who live above the water use it for beneficial use. Idaho water quality standards are dictated primarily by the

recently promulgated Idaho Groundwater Quality Rule and the Idaho Water Quality Standards and Wastewater Treatment Requirements. The National Primary Drinking Water Regulations can also apply (IDAPA 16.01)

Three categories of protectiveness apply to the aquifer and its associated resources under Idaho regulations: (1) Sensitive Resources; (2) General Resources; and (3) Other Resources. Because no previous action to categorize the SRPA under Idaho regulations has occurred, the aquifer defaults to the "General Resources" category. General Resource aquifers are protected to ensure that groundwater quality is not jeopardized. Idaho's groundwater standards incorporate federal radiation exposure and drinking water standards (10 CFR 20, 1999, Appendix B, Table 2; 40 CFR 141, 1998; and 143, 1998).

7. BASELINE RISK ASSESSMENT METHODOLOGY

The Baseline Risk Assessment (BRA) developed for WAG 4 (DOE-ID 1999a) evaluated the risk potential associated with contaminated media at CFA. The evaluation simulated a No Action alternative, meaning that mitigative measures to reduce risk were not considered. Methodologies implemented to evaluate the baseline human health and ecological risks are outlined below, followed by a summary of the results. Three sites were found to pose unacceptable risk to human health and the environment. For those three sites, components of the risks assessment specific to the selected remedies, such as contaminants of concern, contaminant concentrations, and risk estimates, are presented in detail in Section 8.

7.1 Human Health Risk Evaluation Summary

The human health risk assessment approach used in the BRA was based on the EPA *Risk Assessment Guidance for Superfund* (EPA 1989, 1992a), INEEL Track 2 Guidance (DOE-ID 1994), and the INEEL cumulative risk assessment guidance protocol (INEEL 1995b). The tasks associated with development of the human health risk assessment included the following:

- Data evaluation
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Qualitative uncertainty analysis.

These tasks are described in the subsections below.

7.1.1 Data Evaluation

Data evaluation tasks that were completed as part of the BRA included site screening, contaminant screening, and development of data sets for use in the-risk assessment. The screening processes were designed to be conservative so that only sites and contaminants that clearly do not pose an unacceptable risk to human health and the environment are eliminated.

Initial site screening consisted of a review of previous risk assessments conducted for WAG 4 sites identified in the FFA/CO. As a result of the site screening, 19 of the individual sites, including the sites identified in the FFA/CO, were retained for quantitative risk assessment in the comprehensive BRA. The remaining sites either exhibited no risk potential (e.g., the site had no source of contamination) or a risk potential sufficiently below threshold values to preclude a significant contribution to cumulative risk. Individual sites with risk estimates greater than or equal to 1E-06 or hazard indices greater than or equal to 1 were retained.

Site screening also involved a CFA Facilities Analysis that evaluated all operating, abandoned and demolished non-CERCLA facilities proximal or co-located to WAG 4 CERCLA sites. The analysis assessed their potential impacts to cumulative risk estimates to ensure that all historical releases were identified and assessed. The analysis included a review of past and present operational activities at CFA, existing facilities and structures, and management control procedures for mitigating the effects of future

environmental releases of contaminants. No facilities or structures were identified in the facilities analysis that would affect the cumulative risk calculations at WAG 4.

Contaminant screening consisted of comparing maximum detected concentrations to INEEL background concentrations (INEEL 1996a) and EPA risk-based concentrations (RBCs) (EPA 1995, 1997a). The Risk Based Concentrations (RBC) used to screen contaminants were calculated using the soil ingestion, soil inhalation, and external exposure pathways for a calculated lifetime cancer risk of 1E-06 or a Hazard Quotient (HQ) of 1. The most restrictive RBC was compared to the maximum detected soil concentration of each contaminant of concern. The most contaminants that exceeded the screening criteria were identified as contaminants of potential concern and retained for quantitative analysis in the BRA. Potential exposure routes were also identified in conjunction with contaminant screening using the conceptual site models (Section 5.6).

All sampling data collected at WAG 4 sites were evaluated to determine whether the data were appropriate and adequate for use in the BRA. This evaluation was conducted generally in accordance with EPA guidance (EPA 1992a). As a result of the screening process, 19 of the individual sites including the sites identified in the FFA/CO, were retained for quantitative risk assessment in the BRA.

7.1.2 Exposure Assessment

The exposure assessment quantities the receptor intake of contaminants of potential concern for those exposure pathways that may cause adverse effects. The assessment consists of estimating the magnitude, frequency, duration, and exposure route of contaminants to receptors. The following parameters are considered in estimating exposure assessment:

- Exposed populations
- Complete exposure pathways
- Contaminant concentrations at the points of exposure for the complete exposure pathways
- Intake rates
- Intake factors.

Both populations and exposure pathways evaluated in the WAG 4 comprehensive human health BRA are illustrated in the conceptual site models (Figure 5-2 through 5-4). Land-use assumptions and projections discussed in Section 6 were used to identify exposure scenarios, pathways, and routes.

- Exposure scenarios
  - Occupational
  - Residential intrusion
- Exposure pathways
  - Groundwater pathway (cumulative)
  - Air pathway (cumulative)
  - Soil pathway

- Exposure routes
  - Soil ingestion
  - Inhalation of fugitive dust
  - Inhalation of volatiles
  - External radiation exposure
  - Dermal absorption from soil (organics and arsenic only)
  - Groundwater ingestion (residential scenario only)
  - Ingestion of homegrown produce (residential scenario only)
  - Dermal absorption of contaminants in groundwater (residential scenario only)
  - Inhalation of volatiles from indoor use of groundwater (residential scenario only).

Contaminant concentrations at the points of exposure for complete exposure pathways were calculated using upper confidence limits (UCLs) derived from analytical data. If sufficient data were not available for calculating UCL concentrations, the maximum detected concentration was used. For radioactive contaminants, radioactive decay was incorporated into the intake calculations. No degradation mechanisms for reducing the concentrations of organic or inorganic contaminants over time were considered.

Groundwater fate and transport modeling was used to predict the maximum contaminant concentrations that could occur in the aquifer frorn leaching and transport of nonradionuclide and radionuclide contaminants at WAG 4. The GWSCREEN model was used to simulate the potential release of contaminants from the release sites and the transport of the contaminants through the vadose zone to the aquifer.

To calculate intake rates, default intake factors from the EPA guidance (EPA 1989, 1991, and 1992a) and Track 2 guidance for the INEEL (DOE-ID 1994) were used. In conjunction with conversion factors and site-specific contaminant concentrations, these values were used to calculate contaminant intakes. The specific exposure parameters used for each receptor and exposure pathway are given in the OU 4-13 RI/FS (DOE-ID 1999a). Generally, occupational scenarios reflect workers exposed to contaminants for 8 hours/day, 250 days/year for 25 years and residential scenarios reflect exposures to contaminants for 24 hours/day, 350 days/year, for 30 years. Standard values were used to simulate the human body (e.g., mass, skin area, inhalation rates, and soil ingestion rates).

To satisfy the objective of the comprehensive risk assessment, risks produced through the air and groundwater exposure pathways were analyzed cumulatively. Cumulative risks were estimated by calculating one risk number for each contaminant of potential concern (COPC) in air and groundwater exposure routes (e.g., inhalation of fugitive dust and ingestion of groundwater) for each collection of sites in close proximity to one another. Analyzing risks for the air and groundwater pathways in a cumulative manner was necessary because contamination from all sites within an area can contribute to local air and groundwater contaminant concentrations. Conversely, individual sites within a WAG are typically isolated from one another relative to the soil pathway exposure routes (e.g., external exposure and

ingestion of soil). As a result, site-specific soil pathway exposures were analyzed. However, the BRA is comprehensive because it evaluates risks from all known sites within WAG 4, and it is cumulative because risks from multiple sites are evaluated in the air and groundwater exposure pathways.

7.1.3 Toxicity Assessment

The toxicity assessment evaluated the relationship between intake of a substance and incidence of an adverse health effect in the exposed population. Toxicity assessments evaluate the results from studies with laboratory animals or from human epidemiological studies. These evaluations were used to extrapolate from high levels of exposure, for which adverse effects are known to occur, to low levels of environmental exposures, for which effects could be postulated. Results of these extrapolations were used to establish quantitative indicators of toxicity.

Health risks from all routes of exposure were characterized by combining the chemical intake information with numerical indicators of toxicity (i.e., slope factors for carcinogens and reference doses for noncarcinogens). Toxicity constants used in the BRA were obtained from several sources. The primary source of information is the EPA online Integrated Risk Information System (IRIS) (EPA 1997b). The IRIS database contains only those toxicity constants that have been verified by EPA work groups. The IRIS database is updated monthly and supersedes all other sources of toxicity information. If the necessary data are not available in IRIS, EPA Health Effects Assessment Summary Tables (EPA 1994a) are used. The toxicity constant tables are published annually and updated approximately twice per year. The Health Effects Assessment Summary Tables contain a comprehensive listing of provisional risk assessment information that has been reviewed and accepted by individual EPA program offices, but has not had enough review to be recognized as high-quality, agency-wide information (EPA 1994a). Toxicity profiles for the contaminant of concern (COC) addressed in the selected remedies to mitigate unacceptable risk are presented below.

7.1.3.1 Lead. Lead is classified as a metal. No critical effects due to exposures to lead have been reported. However, many organs and systems are adversely affected by lead exposure. The major target organs and systems are the central nervous system, the peripheral nerves, the kidney, the gastrointestinal system, and the blood system (Sittig 1985). Anemia can be an early manifestation of lead poisoning. Other early effects of lead poisoning can include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms, abdominal pains, and decreased appetite. The major central nervous system effects can include dullness, irritability, headaches, muscular tremors, inability to coordinate voluntary muscles, and loss of memory. The most sensitive effect for adults in the general population may be hypertension (Amdur, Doull, and Klaassen 1991).

Ingestion and inhalation of lead have the same effects on the human body. Large amounts of lead can result in severe convulsions, coma, delirium, and possibly death. A high incidence of residual damage, similar to that following infections or traumatic damage or injury, has been observed from sustained exposure to lead. Most of the body burden of lead can be in the bone (ATSDR 1990). Lead effects in the peripheral nervous system are primarily manifested by weakness of the exterior muscles and sensory disturbances. Lead also has been shown to adversely affect sperm and damage other parts of the male reproductive system (ATSDR 1990). Dermal absorption of inorganic lead compounds was reported to be much less significant than absorption by inhalation or oral routes of exposure (ATSDR 1990).

Behavioral effects of lead exposure are a major concern, particularly in children. Exposure to lead can cause damage to the central nervous system, mental retardation, and hearing impairment in children. Levels of exposure that may have little or no effect on adults can produce important biochemical alterations in growing children that may be expressed as altered neuropsychological behavior (Martin 1991).

Though the ability of lead to cause cancer in humans has not been shown, EPA has classified lead as a probable human carcinogen through both the ingestion and inhalation routes of exposure. Lead classification was based on the available evidence of cancer from animal studies. Rats ingesting lead demonstrated statistically increased incidence of kidney tumors (ATSDR 1990). According to some epidemiological studies, lead workers have an increased incidence of cancer. Data used in these studies are considered inadequate to demonstrate or refute the carcinogenicity of lead to humans. The EPA has not established toxicity values for lead.

7.1.3.2 Cesium-137. The radioactive isotope Cesium-137 is a fission product produced by nuclear reactors and nuclear weapons detonations. Cesium-137 is rapidly absorbed into the bloodstream and is distributed throughout the active tissues of the body. Metabolically, cesium-137 behaves as an analog of potassium and is distributed throughout the body. Its daughter, Barium-137m, an isomer, is an energetic beta and gamma radiation source and emits a 0.662-megaelectron volt gamma ray. Absorbed cesium-137 results in essentially whole-body irradiation (Amdur, Doull, and Klaassen 1991). The radioactive half-life of cesium-137 is 30 years. Its biological half-life in adults is 50 to 150 days, and in children is 44 days. The whole body is the critical organ for cesium-137 exposure.

7.1.3.3 Mercury. The chemistry of mercury in the environment is complex. It has various oxidation states, biotic and abiotic methylation and demethylation processes, complexation with organic and inorganic ligands, and differential solubility and volatility forms. Speciation is a major determinant of the fate, bioavailability, absorption, and toxicologic characteristics of mercury compounds.

Although the generally more toxic organic forms of mercury, such as methylmercury, are unlikely to persist in the environment, they may form in biotic tissues and are known to biomagnify through ecosystems, particularly aquatic systems (Wren 1986, Scheuhammer 1987).

Because of its chemical stability and lipophilicity, methylmercury readily penetrates the blood-brain barrier. Thus, the central nervous system is a major target organ in both mammals and birds. However, adverse reproductive effects have been reported. Methylmercury can be converted to inorganic mercury in muscle tissues. The homolytic cleavage of the mercury-carbon bond leads to generation of reactive intermediates, e.g., methyl and metal radicals, which cause cellular damage (Wren 1986; Scheuhammer 1987; Manzo et al., 1992). The inhalation “no observed adverse effects level” (NOAEL) and “lowest observed adverse effects level” (LOAEL) are 0.000 and 0.009 mg/m^3 , respectively (EPA 1997a).

7.1.4 Risk Characterization

The characterization of risk involves combining results of the toxicity and exposure assessments to estimate health risks. These estimates are either a comparison of exposure levels with appropriate toxicity criteria for noncarcinogens or an estimate of the lifetime cancer risk associated with a particular intake for carcinogens. The nature and weight of evidence supporting the risk estimate and the magnitude of uncertainty surrounding the estimate are also considered in risk assessment.

To determine human health risks, contaminant intakes are compared to the applicable contaminant toxicity data. The complete results of BRA risk characterization process, including risk estimates for each of the retained sites, are presented in Appendix D of the RI/FS report (DOE-ID 1999a). The generalized equations for calculating carcinogenic risk and noncarcinogenic hazard quotients from contaminant intake and toxicity information are provided in the following subsections.

7.1.4.1 Carcinogenic Health Effects. The following equations are used to obtain numerical estimates, (i.e., unitless probability) of lifetime cancer risks. The risk probability is the product of intake and slope factor, as follows, in Equation (7-1):

$$Risk = Intake \times SF \tag{7-1}$$

where

Risk = potential lifetime cancer risk (unitless)

Intake = chemical intake (mg/kg/day), or radionuclide intake (pCi)

SF = slope factor, for chemicals $(mg/kg/day)^{-1}$, or radionuclides $(pCi)^{-1}$.

The linear low-dose equation shown in Equation (7-1) is valid at risk levels lower than 1E-02. In accordance with EPA guidance (EPA 1989), risks that are greater than 1E-02 are calculated using the following one-hit equation, Equation (7-2):

$$Risk = 1 - exp(-Intake \times SF) \tag{7-2}$$

where

Risk = potential lifetime cancer risk (unitless)

Intake = chemical intake (mg/kg/day), or radionuclide intake (pCi)

SF = slope factor: for chemicals $(mg/kg/day)^{-1}$ or radionuclides $(pCi).^{-1}$

To develop a total risk estimate for a given rate at a given site, cancer risks are summed across all potential carcinogens at the site as shown in Equation (7-3):

$$Risk_r = 3\ Risk_i \tag{7-3}$$

where

$Risk_T$ = total cancer risk, expressed as a unitless probability for a given exposure and a given route

$Risk_i$ = risk estimate for the ith contaminant for the route.

Similarly, risk values for each exposure route are summed to obtain the total cancer risk for each site.

7.1.4.2 Noncarcinogenic Effects. Health risks associated with exposure to individual noncarcinogenic compounds are evaluated by calculating the hazard quotient (HQ). The HQ is the ratio of the intake rate to the reference dose, as shown in Equation (7-4):

$$HQ = Intake / RfD \tag{7-4}$$

where

HQ = noncarcinogenic hazard quotient (unitless)

Intake = chemical intake (mg/kg/day)

RfD = reference dose (mg/kg/day).

Hazard indices are calculated by summing hazard quotients for each chemical across all exposure routes. If the hazard index for any contaminant of potential concern (COPC) exceeds unity, potential health effects may be a concern from exposure to the contaminant of potential concern. The hazard index is calculated using Equation (7-5):

$$HI = 3\frac{Intake_i}{RfD_i} \qquad (7\text{-}5)$$

where

HI = hazard index for a given COPC (unitless)

$Intake_i$ = exposure level (intake) for the ith COPC (mg/kg/day)

RfD_i = reference dose for the ith COPC (mg/kg/day).

In Equation (7-5), intake and reference doses are expressed in the same units and represent the same exposure time period. Hazard indices may be summed across multiple contaminants to develop a total hazard index for a site.

7.1.5 Qualitative Uncertainty Analysis

Risk assessment results depend on the methodologies applied to develop risk estimates. These analysis methods were developed over a period of several years by INEEL risk management and risk assessment professionals to provide realistic, yet conservative estimates of human health risks. Nonetheless, if different risk assessment methods had been used, the BRA would have likely produced different risk assessment results. To ensure the risk estimates are conservative (i.e., generate upper-bound risk estimates), health protective assumptions that tend to bound the plausible upper limits of human health risks were applied throughout the BRA. Therefore, risk estimates that may be calculated by other risk assessment methods are not likely to be significantly higher than estimates developed for the OU 4-13 RI/FS.

Uncertainty factors are present in all four stages of risk analysis (i.e., data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization). Uncertainties associated with parameters used in the risk assessment are listed in Table 7-1. The conservative assumptions and uncertainties in risk estimates for the three sites identified for remediation are summarized in Table 7-2. Qualitative consideration of the collective impact of all the assumptions indicates that risks are more likely to be overestimated than underestimated.

Table 7-1. BRA human health assessment uncertainty factors.

Uncertainty factor	Effect of uncertainty	Comments and Assumptions
Source term assumptions	May overestimate risk	All contaminants are assumed to be completely available for transportation away from the source zone. In reality, some contaminants may be chemically or physically bound to the source zone and unavailable for transport.
Natural infiltration rate	May overestimate risk	A conservative value of 10 cm/year was used for this parameter.
Moisture content	May overestimate or underestimate risk	Soil moisture contents vary seasonally in the upper vadose zone and may be subject to measurement error.
Water table fluctuations	May slightly overestimate or underestimate risk	The average value used is expected to be representative of the depth over the 30-year exposure period.
Mass of contaminants in soils is estimated by assuming a uniform contamination concentration in the source zone	May overestimate or underestimate risk	There is a possibility that most of the mass of a contaminant at a site may exist in a hotspot that was not detected by sampling. If this condition existed, the mass of the contaminant used in the analysis might be underestimated. However, 95% UCLs or maximum detected contamination were used for all mass calculations, and these concentrations are assumed to exist at every point in each waste site; therefore, the mass of contaminants used in the analysis is probably overestimated.
Plug flow assumption in groundwater transport	Could overestimate or underestimate risk	Plug flow groundwater models will likely estimate a greater mass of contaminants will be transported to the aquifer than would occur under natural conditions, with respect to concentrations because dispersion is neglected, and mass fluxes from the source to the aquifer differ only by the time delay in the unsaturated zone (the magnitude of the flux remains unchanged). For nonradiological contaminants, the plug flow assumption is conservative because dispersion as completed in the models is now allowed to dilute the contaminant groundwater concentrations. For radionuclides, the plug flow assumption may or may not be conservative. Based on actual travel time, the radionuclide groundwater concentrations could be overestimated or underestimated because a longer travel time allows for more decay. If the concentration decreases because the travel time delay is larger than the neglected dilution from dispersion, the model will not be conservative.
All infiltration into WAG 4 is assumed to occur through the contaminated sites	Will overestimate risk	Infiltration that normally occurs between contaminated sites is assumed to be concentrated on contaminated sites. This assumption results on a probable overestimate of risk because more water is available in the model calculations to carry contaminants to the aquifer.
No migration of contaminants from the soil source prior to 1994	Could overestimate or underestimate risk	The effect of not modeling contaminant migration from the soil before 1994 is dependent on the contaminant half-life, radioactive in growth, and mobility characteristics.
Contaminant source terms assumed to be lognormally distributed	Could overestimate risk	If sampling data at a given site fits a normal distribution rather than a lognormal distribution, the 95% UCL of the near concentrations calculated for the site could be as much as 50% too high.

Table 7-1. (continued).

Uncertainty factor	Effect of uncertainty	Comments and Assumptions
Chemical form assumptions	Could overestimate or underestimate risk	In general, the methods and inputs used in contaminant migration calculations, including assumptions made about the chemical forms of contaminants, were chosen to err on the protective side. All contaminant concentration and mass are assumed available for transport. This assumption results in a probable overestimate of risk.
Exposure scenario assumptions	May overestimate risk	The likelihood of future scenarios has been qualitatively evaluated as follows: resident - improbable; industrial - credible. The likelihood of future on-INEEL residential development is small. If future residential use of this site does not occur, then the risk estimates calculated for future on-INEEL residents are likely to overestimate the true risk associated with future use of this site.
Exposure parameter assumptions	May overestimate risk	Assumptions regarding media intake, population characteristics, and exposure patterns may not characterize actual exposures.
Receptor locations	May overestimate risk	Groundwater ingestion risks are calculated for a point at the downgradient edge of an equivalent rectangular area. The groundwater risk at this point is assumed to be the risk from groundwater ingestion at every point within the WAG 4 boundaries. Changing the receptor location will affect only the risks calculated for the groundwater pathway because all other risks are site-specific or assumed constant at every point within the WAG 4 boundaries.
For the groundwater pathway analysis, all contaminants are assumed to be homogeneously distributed in a large mass of soil	May overestimate or underestimate risk	The total mass of each COPC is assumed to be homogeneously distributed in the soil volume beneath the WAG 4 retained sites. This assumption tends to maximize the estimated groundwater concentrations produced by the contaminant inventories because homogeneously distributed contaminants would not have to travel far to reach a groundwater well drilled anywhere within the WAG 4 boundary. However groundwater concentrations may be underestimated for a large mass of contamination located in a small area with a groundwater well drilled directly downgradient.
The entire inventory of each contaminant is assumed to be available for transport along each pathway	May overestimate risk	Only a portion of each contaminant's inventory is actually transported by each pathway.
Exposure duration	May overestimate risk	The assumption that an individual will work or reside at a contaminated site for 25 or 30 years is conservative. Short-term exposures involve comparison to subchronic toxicity values, which are generally less restrictive than chronic values.
Noncontaminant-specific constants (not dependent on contaminant properties)	May overestimate risk	Conservative or upper limit values were used for all parameters incorporated into intake calculations.

Table 7-1. (continued).

Uncertainty factor	Effect of uncertainty	Comments and Assumptions
Exclusion of some hypothetical pathways from the exposure scenarios	May underestimate risk	Exposure pathways are considered for each scenario and estimated only if the pathway is either incomplete or negligible compared to other evaluated pathways.
Poorly defined dermal absorption factor values for most WAG 4 contaminants	May underestimate risk	A lack of absorption factor values for most WAG 4 contaminants may mean that dermal absorption risks are higher than expected. The possibility of unacceptable dermal absorption from soil risks being produced by WAG 4 contaminants is considered to be unlikely.
Model does not consider biotic decay	May overestimate risk	Biotic decay would tend to reduce contamination over time.
Occupational intake value for inhalation	Slightly overestimates risk	Standard exposure factors for inhalation have the same value for occupational as for residential scenarios. The time of exposure is assumed to be the same in the risk calculations for occupational workers as it is for residents.
Use of cancer SFs	May overestimate risk	Nonradionuclide SFs are associated with upper 95th percentile confidence limits and radionuclide SFs are central estimates of cancer incidence per unit intake. They are considered unlikely to underestimate true risk.
Toxicity values are derived primarily from animal studies	May overestimate or underestimate risk	Extrapolation from animal to humans may induce error caused by differences in absorption, pharmacokinetics, target organs, enzymes, and population variability.
Toxicity values are derived primarily from high doses; most exposures are at low doses	May overestimate or underestimate risk	Assumes linearity at low doses. Tends to have conservative exposure assumptions.
Toxicity values and classification of carcinogens	May overestimate or underestimate risk	Not all values represent the same degree of certainty. All are subject to change as new evidence becomes available.
Lack of SFs	May underestimate risk	COPCs without SFs, may or may not be carcinogenic through the oral pathway.
Lack of RfDs	May underestimate risk	COPCs without RfDs may or may not have noncarcinogenic adverse effects.
Risk/HQs are combined across pathways	May overestimate risk	Not all of the COPC inventory will be available for exposure through all applicable exposure pathways.

Table 7-2. Summary of source-term uncertainties site with selected remedies.

ID No.	Release Sites	Source, Term Uncertainties and/or Assumptions
CFA-04	Pond (CFA-674)	Exposure point concentrations used for depth interval and volume-weighted concentrations are based on the 95% UCL or maximum detected concentration, whichever is less, instead of average (arithmetic mean) concentrations. The area of contamination is assumed to exist uniformly across the site, even though only two of the six COPCs were detected in 100% of the site-wide samples. The other COPCs were detected in at least 48.0% of the samples. The area of contamination is assumed to exist uniformly across the site. Contamination is assumed to exist down to 5.5 m (18 ft), even though positive detections of chemicals in the vadose zone are reported only to a depth of 2.4 m (8 ft bgs). The depth of contamination is based on the assumption that mobility of dissolved phase chemicals in the vadose zone (i.e., waste water) at CFA-04 is 3 m (10 ft). This assumption is made to ensure that potential risks from exposures at CFA-04 are not underestimated (Section 8). These assumptions may cause the calculated risks at the site to be overestimated.
CFA-08	Sewage Plant Drainfield	Exposure point concentrations used for depth interval and volume-weighted concentrations are based on the 95% UCL or maximum detected concentration, whichever is less, instead of average (arithmetic mean) concentrations. Of the nine calculated site-specific exposure point concentrations, seven are based on the maximum detected concentration. The area of contamination is assumed to exist uniformly across the drainfield, even though site-wide detection frequencies for each of the three COPCs are no greater than 72.3%. Contamination is assumed to exist at 10 m (32 ft) bgs. The depth to basalt is assumed to occur at 10 m (32 ft). It is assumed that COPCs will not migrate downward beyond 10 m (32 ft) due to the presence of basalt at 10 m (32 ft). These assumptions may cause the calculated risks at the site to be overestimated.
CFA-10	Transformer Yard	Exposure point concentrations used for depth interval and volume-weighted concentrations are based on the 95% UCL or maximum detected concentration, whichever is less, instead of average (arithmetic mean) concentrations. The area of contamination is the area of the site based on process knowledge that there was no specific pattern of waste disposal. The maximum depth of contamination is 0.6 m (2 ft) bgs based on depths of measured concentrations. For purposes of evaluating residential exposure pathways, contamination from 0 to 3.05 m (0 to 10 ft) soil interval is assumed. This assumption is made to ensure that potential risks from exposures at CFA-10 are not underestimated (Section 8). These assumptions may cause the calculated risks at the site to be overestimated.

7.2 Ecological Risk Evaluation Summary

Results of the WAG 4 ecological risk assessment (ERA) will be integrated into an INEEL-wide evaluation of potential risks to ecological receptors as a component of the WAG 10 OU 10-04 ERA. The WAG 4 ERA was conducted as outlined in the guidance for the INEEL.

An ecological site and contaminant screening was conducted to determine which sites and contaminants would be subjected to further analysis in the comprehensive RI/FS. The screening was completed and documented as part of the OU 4-13 Work Plan (DOE-ID 1997b). A site-by-site evaluation of risks to ecological resources as a result of exposure to contaminants was developed in the RI/FS. The evaluation included a review of screening completed in the Work Plan to ensure that sites or contaminants were not inappropriately omitted from further evaluation. Complete details of the ERA are presented in Sections 7 and 8 of the OU 4-13 RI/FS report (DOE-ID 1999a). The primary components of the ERA, discussed below, include problem formulation, analysis, risk characterization, and transition to the INEEL-wide ERA.

7.2.1 Problem Formulation

The goal of the problem formulation step is to investigate interactions between the stressor characteristics (i.e., contaminant characteristics), the ecosystem potentially at risk, and potential ecological effects (EPA 1992b). Site screening was conducted to identify the sites that could pose unacceptable risk.

Contaminant screening and data evaluation were conducted to identify COPCs and define exposure point concentrations. For the most part, results of the data evaluation conducted for the human health BRA were applied to the ERA. For those contaminants that were not retained for evaluation in the human health risk assessment, additional data evaluation to support the completion of the ERA was performed. Contaminant concentrations were compared to background concentrations and ecologically based screening levels. All radioactive contaminants were eliminated on the basis of this comparison.

Site-specific data characterizing contaminant concentration in biota for the INEEL ERAs are sparse. Consequently, the definition of assessment and measurement endpoints (i.e., ecological receptors) is primarily based on pathway and exposure analyses. Pathway and exposure models for contaminated surface and subsurface media were combined with a food web analysis to characterize the potential risks illustrated in the complete ERA conceptual site model (see Figure 5-2).

7.2.2 Analysis

In the analysis component of the ERA, the likelihood and significance of an adverse reaction from exposure to stressors were evaluated. Exposure assessment involved relating contaminant migration to exposure pathways for ecological receptors. The behavior and fate of contaminants of potential concern in the terrestrial environment were presented in a general manner because formal fate and transport modeling was not conducted for the WAG ERA. The ecological effects assessment consisted of a hazard evaluation and a dose-response assessment. The hazard evaluation involved a comprehensive review of toxicity data for contaminants to identify the nature and severity of toxic properties. The doses from multiple media (surface and subsurface soil) identified at WAG 4 were developed and used to assess potential risk to receptors. Because dose-based toxicological criteria exist for few ecological receptors, it was necessary to develop appropriate toxicity reference values (TRVs) for contaminants and functional groups at INEEL. A semiquantitative analysis was used, augmented by qualitative information and professional judgment as necessary.

Exposures for each functional group, threatened or endangered species, and sensitive species were estimated based on site-specific life history and when possible, feeding habits. Quantification of group and individual exposures incorporated species-specific numerical exposure factors including body weight, ingestion rate, and the fraction of diet composed of vegetation or prey, and soil consumed from the affected area. Parameters used to model contaminant intakes by functional groups were derived from a combination of parameters that produced the most conservative overall exposure for the group. Parameter values and associated information sources are discussed in further detail in the RI/FS (DOE-ID 1999a). The development of TRVs for those contaminants targeted for remediation based on unacceptable ecological risks is described in the following subsections.

7.22.1 Lead. Lead is a ubiquitous trace constituent in rocks, soil, plants, water, and air. The average concentration of lead in the earth's crust is 16 mg/kg (Eisler 1988). Lead has four stable isotopes with the following percentages of occurrence: Pb-204 (1.5%), Pb-206 (23.6%), Pb-207 (22.6%), and Pb-208 (52.3%). Lead occurs in four valence states: (1) elemental (Pb), (2) monovalent (Pb^{+}), (3) divalent (Pb^{+2}) , and (4) tetravalent (Pb^{+4}). In nature, lead occurs mainly as Pb^{+2} and is oxidized to $Pb.^{+4}$ Metallic lead is relatively insoluble in hard water; some lead salts are somewhat soluble in water. Of the organoleads, tetraethyllead and tetramethyllead are the most stable and are highly soluble in many organic solvents but are fairly insoluble in water. Both undergo photochemical degradation in the atmosphere to elemental lead and free organic radicals. Organolead compounds are primarily anthropogenic (Eisler 1988).

Lead is neither essential nor beneficial to living organisms. Lead affects the kidneys, blood, bone, and the central nervous system. The effects of lead on the nervous system are both functional and structural. Lead toxicity varies widely with the form and dose of administered lead. In general, organolead compounds are more toxic than inorganic lead. A significant cause of mortality among regulatory waterfowl is ingestion of lead shot.

Hatchlings of chickens, quail, and pheasants are relatively tolerant to moderate lead exposure (Eisler 1988). Dietary levels of 500 mg/kg had no effect on hatchling growth of these species, and levels at 2,000 mg/kg of lead had no effect on survival (Hoffman et al. 1985 as cited in Eisler 1988). For avian herbivores, a TRV was estimated using a study of mallards (Dieter and Finley 1978). Altricial species are generally more sensitive to lead than precocial species (Eisler 1988) of avian insectivores. An oral study using European starlings (Osborn, Eney, and Bull 1983) was used to generate a TRV for trimethyllead chloride. Because organic lead compounds are generally more toxic than inorganic lead, the toxicity quotients generated using this TRV should be interpreted with caution. American kestrels (*Falco sparverius*) exposed to 50 mg/kg/day of metallic lead in diets exhibited no effects on survival or reproductive success (Colle et al. 1980). Using these studies, TRVs were developed for avian functional groups.

Studies of rats administered lead in drinking water (Kimmel et al. 1980), lead toxicity of calves (Zmudzki et al. 1983), and lead toxicity of dogs (DeMayo et al. 1982) were used to develop TRVs for mammalian receptors. A critical concentration of 2,000 mg/kg of lead in food on a dry weight basis for reproduction was reported in a study on the toxicity of lead nitrate to the isopod (*Porcellio scaber*).

The recommended screening benchmark concentration for phytotoxicity in soil for lead of 50 mg/kg was used as the TRV for terrestrial plants (Suter, Will, and Evans 1993).

7.2.2.2 Mercury. Mercury exists in the environment in three oxidation states: the elemental state, +1 (mercurous) state, and +2 (mercuric) state. The factors that affect the predominant oxidation state in an environment are the oxidation-reduction potential and the pH of the system. Particle-bound mercury can be converted to insoluble mercury sulfide, which can be bioconverted into more soluble or volatile

forms that may reenter the atmosphere or be taken up by biota and bioaccumulated in the terrestrial food chain. Mercury forms many stable organic complexes that generally are more soluble in organic matter than in water. Inorganic and organic particles strongly sorb mercury. Mercury can be transformed in the environment by biotic and abiotic oxidation and reduction, bioconversion of organic and inorganic forms, and photolysis. Mercury can be strongly concentrated by living organisms (Callahan et al. 1979). The chemistry of mercury in the environment is complex, not only because of its various oxidation states, but also because of biotic and abiotic methylation and demethylation processes, complexation with organic and inorganic ligands, and the differential solubility and volatility of various forms. Because speciation is a major determinant of the fate, bioavailability, absorption, and toxicological characteristics of mercury compounds, lack of knowledge of the state of the mercury in INEEL soil is a large source of uncertainty in both exposure assessment and TRV development.

Though the generally more toxic organic forms of mercury are unlikely to persist in the environment, they (in particular, methylmercury) may be formed in biotic tissues and are known to biomagnify through ecosystems, particularly aquatic systems (Wren 1986; Scheuhammer 1987). Thus, to ensure that mercury TRVs for WAG ERAs are protective of receptors at all levels of ecological organization, TRVs are developed from studies of the toxic effects of organic mercury. This measure is highly conservative and tends to result in an overestimate of risks for receptors lower in the food web because the majority of mercury in soil and plants (i.e., the majority of exposures to plants and soil-dwelling and herbivorous animals) is expected to be inorganic.

Because of its chemical stability and lipophilicity, methylmercury readily penetrates the blood-brain barrier. Therefore, the central nervous system is a major target organ in both mammals and birds. However, reproductive effects have been reported at even lower doses. Methylmercury can be converted to inorganic mercury in tissues. The homolytic cleavage of the mercury-carbon bond leads to generation of reactive intermediates (e.g., methyl and metal radicals, which cause cellular damage) (Wren 1986; Scheuhammer 1987; Manzo et al. 1992).

The effects of mercury on avian herbivores, insectivores, and carnivores were evaluated. For herbivores, the effects of organic mercury compounds on galliformes (e.g., domestic chickens, quail, and pheasants) have been investigated by several groups. However, no study was reviewed that identified a NOAEL. The LOAEL for relevant endpoints (i.e., reproductive success) of several similar studies was found in a study of the effects of mercury on birds (Fimreite 1979). Reduced egg production, shell thickness, and hatchability in pheasants that were fed seed, treated with organomercurial fungicide, were observed. This study was selected over others because of its use of a wild species and lower dose levels. A TRV was derived from this study.

Three goshawks were fed a diet of chickens that had eaten wheat dressed with an organomercurial fungicide (Borg et al. 1970). Their tissues contained 10 to 40 ppm of mercury, mostly as methylmercury. The hawks died after 30 to 47 days, and their total mercury intake was about 20 mg/bird.

Two studies examined the effects of subchronic methylmercury exposure on the reproductive competence of male and female rats (Khera and Tabacova 1973; Khera 1973). The NOAEL identified for both sexes was 0.25 mg/kg/day. Much less information is available about methylmercury toxicity to herbivores. In a study of acute methylmercury toxicity in mule deer (*Odocoileus hemionus*), 17.88 mg/kg was said to be the lethal dose of 50% of the exposed organisms (Eisler 1987). A number of studies have examined the effects of chronic methylmercury ingestion on carnivorous mammals, particularly house cats (e.g., Albanus et al. 1972; Charbonneau et al. 1976; Eaton, Secord, and Hewitt 1980) and mink (e.g., Aulerich, Ringer, and Iwamoto 1974; Wobeser, Neilson, and Schiefer 1976; Wren et al. 1987). The study of the chronic toxicity of house cats was considered superior to other available studies because of its long duration (two years), use of relatively large group sizes, detailed examination of endpoints,

identification of both no-effect and effect levels, and administration of mercury via both contaminated fish and addition to diet (Charbonneau et al. 1976).

A TRV of 0.3 mg/kg was assigned for mercury for terrestrial plants based on the toxicological benchmark (Suter, Will, and Evans 1993).

7.2.3 Risk Characterization

Risk characterization is the final step of the ERA process. The risk evaluation determines whether risk is indicated from the contaminant concentrations and the calculated dose for the INEEL functional groups, threatened or endangered species, and species of concern. The risk characterization considers the uncertainty inherent in the assessment. For a WAG ERA, the risk characterization step has two components: a description of estimation of risk, and a summary of results.

Risk is estimated by comparing the calculated dose to the TRV. If the dose from the contaminant does not exceed its TRV (i.e., if the HQ is less than 1.0 for nonradiological contaminants), adverse effects to ecological receptors from exposure to that contaminant are not expected and no further evaluation of that contaminant is required. Hence, the HQ is an indicator of potential risk. Hazard quotients are calculated using Equation (7-6):

$$HQ = \frac{Dose}{TRV} \tag{7-6}$$

where

HQ	=	hazard quotient (unitless)
Dose	=	from all media (mg/kg/day)
TRV	=	toxicity reference value (mg/kg/day).

HQs were derived for all contaminants, functional groups, threatened or endangered species, and species of concern identified in WAG 4 for each site of concern. When information is not available to derive a TRV, then an HQ cannot be developed for that particular contaminant and functional group or species combination.

An HQ greater than the threshold value indicates that exposure to a given contaminant, at the concentrations and for the duration and frequencies of exposure estimated in the exposure assessment, may cause adverse health effects in exposed populations. However, the level of concern associated with exposure may not increase linearly as the HQ values exceed the threshold value. Therefore, the HQs cannot be used to represent a probability or a percentage because an HQ of 10 does not necessarily indicate that adverse effects are 10 times more likely to occur than an HQ of 1. It is only possible to infer that the greater the HQ, the greater the concern about potential adverse effects to ecological receptors.

In general, the significance of a HQ exceeding 1 depends on: (a) the perceived “value” (i.e., ecological, social, or political) of the receptor (or species represented by that receptor), (b) the nature of the endpoint measured, and (c) the degree of uncertainty associated with the process as a whole. Therefore, the decision to take no further action, order corrective action, or perform additional assessment must be determined on a site-, chemical-, and species-specific basis. With the exception of threatened or endangered species (EPA 1992b), the unit of concern in ERA is usually the population as opposed to the

individual. Therefore, exceeding conservative screening criteria does not necessarily mean that significant adverse effects to populations of receptors are likely.

Three sites, CFA-04, CFA-08, and CFA-10, with ecological HQs up to 30,000, 30, and 5,000 respectively, were retained for evaluation of remedial alternatives in the Comprehensive Feasibility Study (DOE-ID 1999a). These sites also pose an unacceptable risk to human health. Six other sites will be evaluated for ecological risk as part of the WAG 10 Sitewide assessment. These sites are CFA-01, CFA-02, CFA-05, CFA-13, CFA-41, and CFA-43.

Principal sources of uncertainty apply to the use of data not specifically collected for ERA and in the development of exposure assessment. Uncertainties inherent in exposure assessment are associated with estimated receptor ingestion rates, selected acceptable HQs, estimated site usage, and estimated risk assessment parameters (e.g., plant uptake factors and bioaccumulation factors). Additional uncertainties are associated with the depicted site characteristics, the determined nature and extent of contamination, and the derived TRVs. A large area of uncertainty is the inability to evaluate risk to many receptors because of the lack of appropriate toxicity data for many chemicals. This is especially a problem for certain receptors such as reptiles. In addition, because of the conservative nature of assumptions made to compensate for the lack of site-specific uptake and bioaccumulation factors, ecologically based screening levels for some chemicals are lower than their sample quantitation and detection limits. In WAG-4 analysis, this occurs for metals, polychlorinated biphenyls (PCBs), and some other organics. All of these uncertainties likely influence risk estimates. Major sources and effects of uncertainties in the ERA are reviewed in Table 7-3.

7.2.4 Transition to the INEEL-Wide Ecological Risk Assessment

The third phase of the ERA process is WAG 10 (OU 10-04) ERA, which will integrate WAG ERAs to evaluate risk to the INEEL-wide ecological resources. This assessment will evaluate effects resulting from past contamination, and their potential for adversely impacting the INEEL-wide ecological resources including residual impacts from completed remedial actions.

Sites identified in the WAG 4 ERA with an HQ greater than 10, and a concentration greater than 10 times the background concentration, will be considered in the INEEL-wide ecological risk assessment. The INEEL-wide ERA will be conducted as a component of the comprehensive RI/FS for OU 10-04. The WAG 10 comprehensive investigation will be referenced during the five-year review process for WAG 4 to determine if the decisions implemented by WAG 4 are still protective of the environment. If the OU 10-04 ERA determines that those WAG 4 sites screened at greater than 10 times background, or HQ greater than 10, require further action, it will be determined during the WAG 4, five-year review. Future remediation may be necessary if the WAG 10 INEEL-wide assessment indicates that a cumulative ecological risk is exceeded for a population of receptors or if land-use changes.

7.3 Risk Assessment Summary

The human health and ERA results are summarized in Table 7-4. The risks and HQ for the three sites and their COCs selected for remedial action are shown.

At the CFA-04 Pond, risk assessment calculations indicate that mercury poses a potential unacceptable risk to future residential receptors via ingestion of homegrown produce. The calculated hazard index for this exposure route is 80. Cancer risk at CFA-04 was less than 1E-04. Mercury was detected at depths to 0.6 m (2 ft) below pond bottom. Mercury also poses an ecological risk at CFA-04.

Table 7-3. Sources and effects of uncertainties in the ecological risk assessment.

Uncertainty Factor	Effect of Uncertainty (Level of Magnitude)	Comment
Estimation of ingestion rates (soil and food)	May overestimate or underestimate risk (moderate)	Few intake (ingestion) estimates used for terrestrial receptors are based on data in the scientific literature (preferably site-specific) when available. Food ingestion rates are calculated by using allometric equations available in the literature (Nagy 1987). Soil ingestion values are generally from (Beyer et al. 1994).
Estimation of bioaccumulation and plant uptake factors	May overestimate or underestimate risk and the magnitude of error cannot be quantified (high)	Few bioaccumulation factors or Plant Uptake Factors are available in the literature because they must be both contaminant- and receptor-specific. In the absence of more specific information, Plant Uptake Factors and bioaccumulation factors for metals and elements are obtained from (Baes et al. 1994), and for organic compounds from (Travis and Arms 1988).
Use of human health exposure concentrations	May overestimate (high) risk	Exposure concentrations were derived from data obtained as a product of biased sampling of WAG 4 sites. Samples were generally obtained from areas where contamination was believed the greatest.
Estimation of toxicity reference values	May overestimate (high) or underestimate (moderate) risk	To compensate for potential uncertainties in the exposure assessment, various adjustment factors are incorporated to extrapolate toxicity from the test organism to other species.
Use of functional grouping	May overestimate (high) risk	Functional groups were designed as an assessment tool that would ensure that the ERA would address all species potentially present at the facility. A hypothetical species is developed using input values to the exposure assessment that represents the greatest exposure of the combined functional group members.
Site use factor	May overestimate (high) or underestimate (moderate) risk	Site use factor is a percentage of the site of concern compared to the home range. This is extrapolated from literature values and allometric equations and may vary from season to season and year to year depending on environmental conditions. It is highly uncertain.

Table 7-4. Summary of major risks and hazard quotients at individual sites and contaminants of concern that are addressed by the selected remedy for WAG 4.

Site	COC	Exposure Pathway	Risk	Hazard Quotient
Future Residential Exposure Scenario				
CFA-04	Mercury	Ingestion of homegrown produce	b	80
CFA-08	Cesium-137	External radiation exposure	4E-04	NA[d]
CFA-10	Lead	Ingestion of soil	a	a
Current Occupational Scenario				
CFA-04	Mercury	Ingestion of soil	b	0.3
CFA-08	Cesium-137	External radiation exposure	2E-03	NA[d]
CFA-10	Lead	Ingestion of soil	a	a
Future Occupational Scenario				
CFA-04	Mercury	Ingestion of soil	b	0.3
CFA-08	Cesium-137	External radiation exposure	2E-04	NA[d]
CFA-10	Lead	Ingestion of soil	a	a
Ecological Risk Assessment				
CFA-04	Mercury	Ecological exposure		<1 to 30,000
CFA-10	Lead	Ecological exposure		<1 to 5,000
CFA-10	Copper	Ecological exposure		<1 to 70[c]

a. Risks and hazard quotients could not be estimated for lead because human health toxicity data are not available. However, concentrations in excess of the EPA screening level of 400 mg/kg (EPA 1994b) will be remediated.

b. Risk is less than 1E-04

c. Copper contamination exists in the surface soil and any remedial action for lead contamination is expected to also remove copper.

d. NA–Not Applicable

The carcinogenic risks at the CFA-08 Drainfield are greater than 1E-04 for external radiation exposure to current and future occupational workers and future residents to cesium-137. The noncarcinogenic HI at CFA-08 is less than one. Cesium-137 was detected from ground surface to between 1.2 m (4 ft) and 2.4 m (8 ft) bgs. Concentrations of cesium-137 are highest in the top 0.9 m (3 ft) of soil.

Lead was detected in surface soil between 0 to 0.6 m (0 to 2 ft) bgs at the CFA-10 Transformer Yard site. There are no toxicity data available for lead. Five samples reported concentrations above the 400 mg/kg EPA screening level. Lead also poses a risk to ecological receptors at CFA-10.

Groundwater risks were evaluated for 26 COCs identified in the OU 4-13 RI/FS (DOE-ID 1999a). The GWSCREEN modeling results indicate that WAG 4 does not contain sources of contamination that have the potential to produce risk greater than 1E-04 or an HQ greater than 1 for those COCs via the groundwater pathways (e.g., groundwater ingestion). No collection of sites showed risks in the air and groundwater residential scenarios greater than threshold values.

8. CONTAMINATED SOIL SITES CFA-04, CFA-08, AND CFA-10

Remedial actions are required for three soil sites: (1) the CFA-04 Pond, (2) the CFA-08 Drainfield, and (3) the CFA-10 Transformer Yard site. Sections 8.1 through 8.3 address each of the sites, including the nature and extent of contamination and BRA results. More detailed information about the contaminated soil sites may be found in the OU 4-13 RI/FS report (DOE-ID 1999a).

8.1 CFA-04 Pond (OU 4-05)

The CFA-04 pond will be remediated to address the threat to human health and ecological receptors from mercury in soil. A summary of the site history, site investigations, nature and extent of contamination and estimated risks are presented below.

The CFA-04 Pond is a shallow, unlined surface depression that was originally a borrow pit for construction activities at the CFA. It is approximately 152 x 46 m (500 x 150 ft) and roughly 2 to 2.4 m (7 to 8 ft) deep; basalt outcrops are present within and immediately adjacent to the pond. It received laboratory wastes from the Chemical Engineering Laboratory (CEL) in Building CFA-674 between 1953 and 1969. The CEL was used to conduct calcine experiments on simulated nuclear wastes. (The calcining process was later used on actual nuclear wastes at the INEEL to change them from a liquid to a solid and to effect an overall volume reducton.) The CEL experiments used mercury to dissolve simulated aluminum fuel cladding as well as radioisotope tracers in the calcining process. The primary waste streams discharged to the pond from the CEL included approximately 76.5 m^3 (100 yd^3) of mercury-contaminated calcine that contained low-level radioactive wastes and liquid effluent from the laboratory experiments. Additionally, there is approximately 382 m^3 (500 yd^3) of rubble, consisting of laboratory bottles, asphalt and asbestos roofing materials, reinforced concrete and construction and demolition debris. The pond received runoff from the CFA site periodically between 1953 and 1995.

8.1.1 Site Investigations

The CFA-04 Pond was identified as a Track 2 investigation site in the FFA/CO (DOE-ID 1991). Visual inspections in 1994 revealed the presence of calcine on the bermed areas around the periphery of the pond. Following surface and subsurface soil data collection from the calcine and the pond berm in early and mid-1994, a time-critical removal action in September 1994 excavated approximately 218 m^3 (285 yd^3) of calcine and calcine-contaminated soil and a small amount of asbestos from the bermed area. The soil was remediated at a portable retort set up northeast of the pond. Verification soil sampling conducted after the removal action showed that the bermed areas had residual mercury concentration up to 233 mg/kg (DOE-ID 1999a).

During the 1995 Track 2 investigation, additional soil samples were collected from the pond inlet area as well as a deeper area of the pond near the inlet where laboratory effluent may have collected. The results of the 1994 and 1995 soil investigations revealed that concentrations of the following constituents exceeded background concentrations for the INEEL: aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, lead, magnesium, mercury, nickel, cesium-137, paladium-234m, strontium-90, thorium-234, uranium-234, uranium-235 and uranium-238. Aroclor-1254 was also detected at low levels. Preliminary risk screening indicated that the following constituents detected at the pond posed potential human health risks: aroclor-1254, arsenic, mercury, cesium-137, uranium-234, uranium-235, and uranium-238. On this basis, the site was recommended for further characterization in the OU 4-13 RI/FS (INEEL 1996b).

Additional soil samples were collected for the OU 4-13 RI/FS during 1997 and 1998 at four areas

along the length of the pipe connecting the CEL to the pond, in the area northeast of the pond known as the windblown area, and from the pond bottom. Data from these investigations confirmed the presence of mercury in these areas at concentrations up to 439 mg/kg (DOE-ID 1999a). Four of 88 samples exceeded the mercury RCRA characteristic hazardous waste level of 0.2 mg/L. Three of the four samples were in close proximity to one another in the pond and the fourth was an isolated occurrence in the windblown area and was eliminated. A contour line was drawn around the three closely spaced samples and the area was estimated. The depth of soil in the pond was conservatively estimated to be 2.4 m (8 ft) in the pond bottom and 0.15 m (0.5 ft) in the wind blown area, indicating that approximately 612 m^3 (800 yd^3) of soil is potentially characteristic waste per RCRA and is subject to Land Disposal Restrictions upon excavation.

8.1.2 Nature and Extent of Contamination

The only contaminant that poses an unacceptable risk to human health and the environment is mercury. Mercury-contaminated soil is present in the pond bottom, around the pond periphery in the berms, along the pipe connecting the CEL to the pond, and in the area northeast of the pond as a result of windblown contamination, an area encompassing approximately 183 x 91 m (600 x 300 ft) (Figure 8-1). The OU 4-13 RI/FS conservatively estimated the volume of mercury-contaminated soil to be approximately 6,338 m^3 (8,290 yd^3), based on the dimensions of the pond bottoms, wind blown area and pipeline at depths of 2.4 m (8 ft), 0.15 m (0.5 ft), and 1.8m (6 ft) respectively.

8.1.3 Summary of Site Risks

The CFA-04 Pond was retained for quantitative risk analysis in the OU 4-13 RI/FS to evaluate human health risks from aroclor-1254, arsenic, mercury, cesium-137, Ra-226, U-234, U-235, U-238; and ecological risks from arsenic, barium, cadmium, chromium-III, cobalt, copper, lead, mercury, nickel, nitrate, silver and vanadium. Refer to the OU 4-13 RI/FS (DOE 1999a) for the details of the risk assessment process.

8.1.3.1 Human Health Risk Assessment. Mercury was identified as the only contaminant that poses an unacceptable risk to human health at CFA-04 with a noncarcinogenic HQ of 80. Table 8-1 summarizes the data for mercury at the CFA-04 Pond.

The estimated total risk for the current and future occupational worker is less than 1E-04. The noncarcinogenic hazard index for both current and future occupational scenarios is less than 1.

The total excess cancer risk, from the BRA, for the future residential scenario is 4E-05 (4 in 100,000). The estimated HQ for future residential scenario is 80. The majority of the noncancer risk is from mercury (97%) and the exposure route is ingestion of homegrown produce.

8.1.3.2 Ecological Risk Assessment. Mercury is the only contaminant that poses an unacceptable risk to ecological receptors. The maximum concentration of 439 mg/kg results in a hazard quotient of 30,000 (DOE-ID 1999a).

Table 8-1. Summary data for the human health and ecological COC at the CFA-04 Pond.

Contaminant of Concern	Units	Number of Samples	Number of Detections	Minimum Detected	Maximum Detected	Exposure Point Concentration	INEEL Background Concentration[a]
Human Health							
Mercury	mg/kg	267	247	0.9	439	146[b]	0.05
Ecology							
Mercury	mg/kg	267	247	0.9	439	439[c]	0.05

a. The background value for composited samples from INEEL 1996a.
b. Volume weighted average 95% UCL concentrations.
c. Maximum concentration detected.

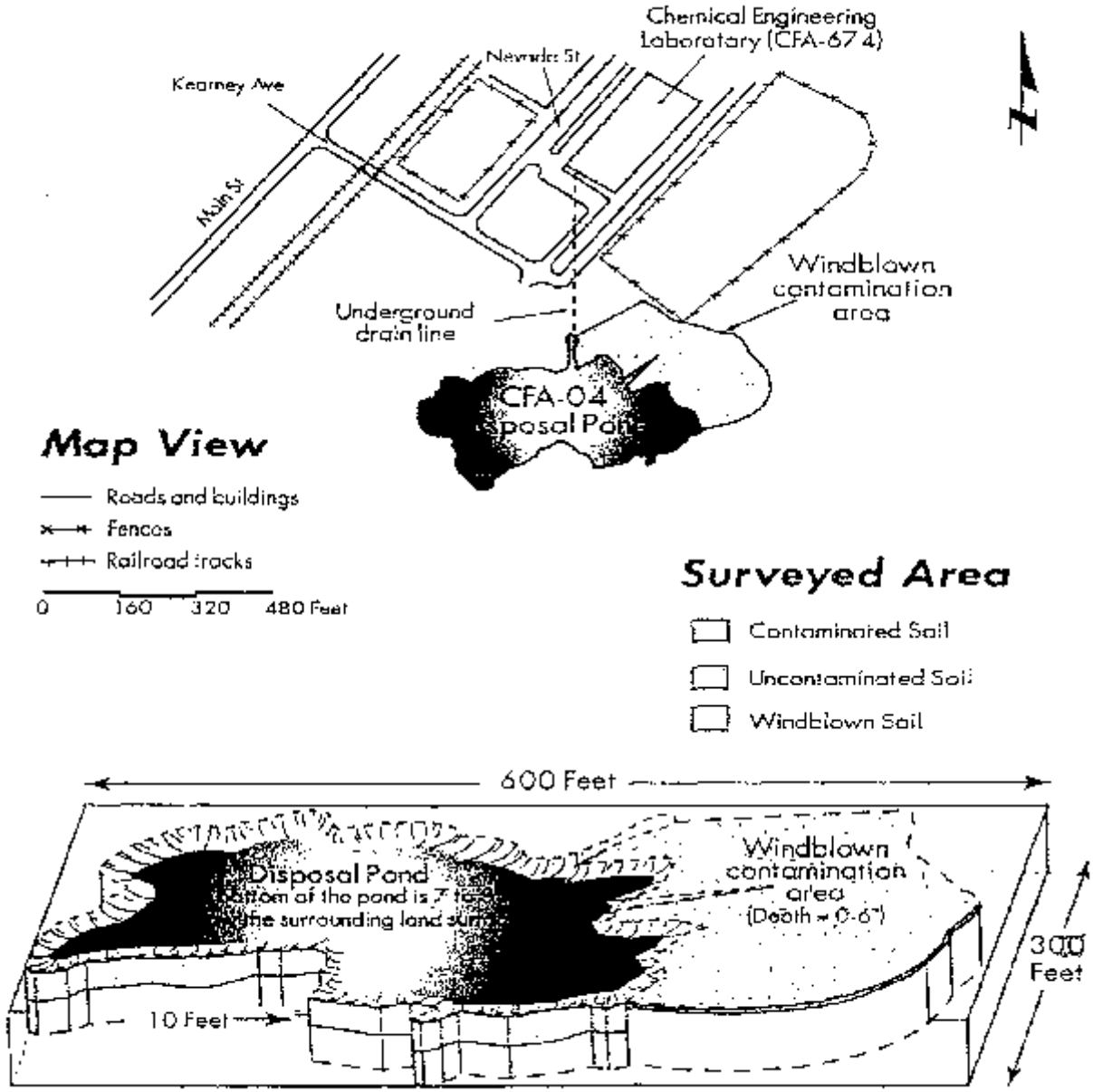

Figure 8-1. Pond (CFA-04).

8.2 CFA-08 Sewage Plant Drainfield (OU 4-08)

The CFA-08 (SP) Drainfield will be remediated to address the threat to human health from external radiological exposure from cesium-137 in soil. A summary of the site history, site investigations, nature and extent of contamination, and estimated risks are presented in this subsection.

The Navy first operated a sewage treatment facility at CFA from 1944 through 1953. This system consisted of a septic tank (CFA-716), a sludge drying bed, and two distribution areas. In 1953, a new system was constructed that utilized the original septic tank, a new sludge drying bed, and an expanded drainfield with additional distribution areas equipped with trickling filters, digesters, and two clarifiers. This system operated, with some modifications, until February 1995. It received effluent from sewage waste lines from chemical laboratories, craft shops, warehouses, photographic services, vehicle services, a medical dispensary, a maintenance repair shop and laundry facilities that processed low-level radiologically contaminated clothing. Average flow through the SP ranged between 416,350 L (110,000 gal) to 662,375 L (175,000 gal)/day (INEEL 1995c).

The CFA-08 site comprises three components in the FFA/CO (DOE-ID 1991): the SP building (CFA-691), the septic tank inside the SP (CFA-716) and the drainfield (Figure 8-2). Potential releases from the SP, the septic tank and associated piping/pipelines were investigated during decontamination and dismantlement activities that commenced in 1996. Those data were evaluated in the BRA portion of the OU 4-13 RI/FS (DOE-ID 1999a). The BRA concluded that concentrations of metals, radionuclides, herbicides, PCBs, volatile organic compound (VOCs), and SVOCs at the SP and the pipeline between the SP and the drainfield do not pose an unacceptable risk to human health and the environment. Those portions of the CFA-08 site require no further action.

The CFA-08 drainfield is approximately 61 x 305 m (200 x 1000 ft) with linear trenches that are approximately 1.8 m (6 ft) deep. It contains five distribution areas, each with 20 concrete drain pipes approximately 1.1 m (3.5 ft) bgs. The distribution pipes are surrounded by screened gravel in linear trenches 0.76 m (2.5 ft) wide, 1.8 m (6 ft) deep, and 61 m (200 ft) long. Basalt bedrock is encountered between 20 and 32 ft bgs in the vicinity of the drainfield. A sedimentary interbed was encountered at depths of approximately 102 ft bgs in two borings drilled adjacent to the drainfield (INEEL 1995c).

8.2.1 Site Investigations

The 1993 Track 2 investigation focused only on delineating potential releases from the drainfield because the SP, septic tank, and associated building piping were to be addressed under Decontamination and Deactivation activities (INEEL 1995d). Soil samples were collected from eight borings inside the drainfield, two borings outside the drainfield, and the Naval sludge drying bed. Perched water samples were obtained from two shallow wells within the drainfield and one well outside the drainfield at 102 ft bgs. Additionally, a radiological survey was performed over the soil surface downwind of the drainfield. Soil and water samples were analyzed for Contract Lab Program metals, VOCs, semi-volatile organic compounds, PCBs, tritium, and alpha, beta, and gamma-emitting radionuclides.

Concentrations of contaminants detected in the Naval sludge drying bed do not pose an unacceptable risk to human health or the environment. No windblown radiologic contamination above background levels was detected in surface soils downwind of the drainfield. Low levels of arsenic, barium, manganese, zinc and radionuclides were detected in the perched water samples. However, the perched water zones dissipated shortly after the SP ceased operation in 1995 (DOE-ID 1999a). The Track 2 preliminary scoping identified the following contaminants of concern for the CFA-09 drainfield: aroclor-1254, aroclor-1260, beryllium, cobalt-60, cesium-137, europium-152, europium-154, U-234, U-238, and Pu-239/240.

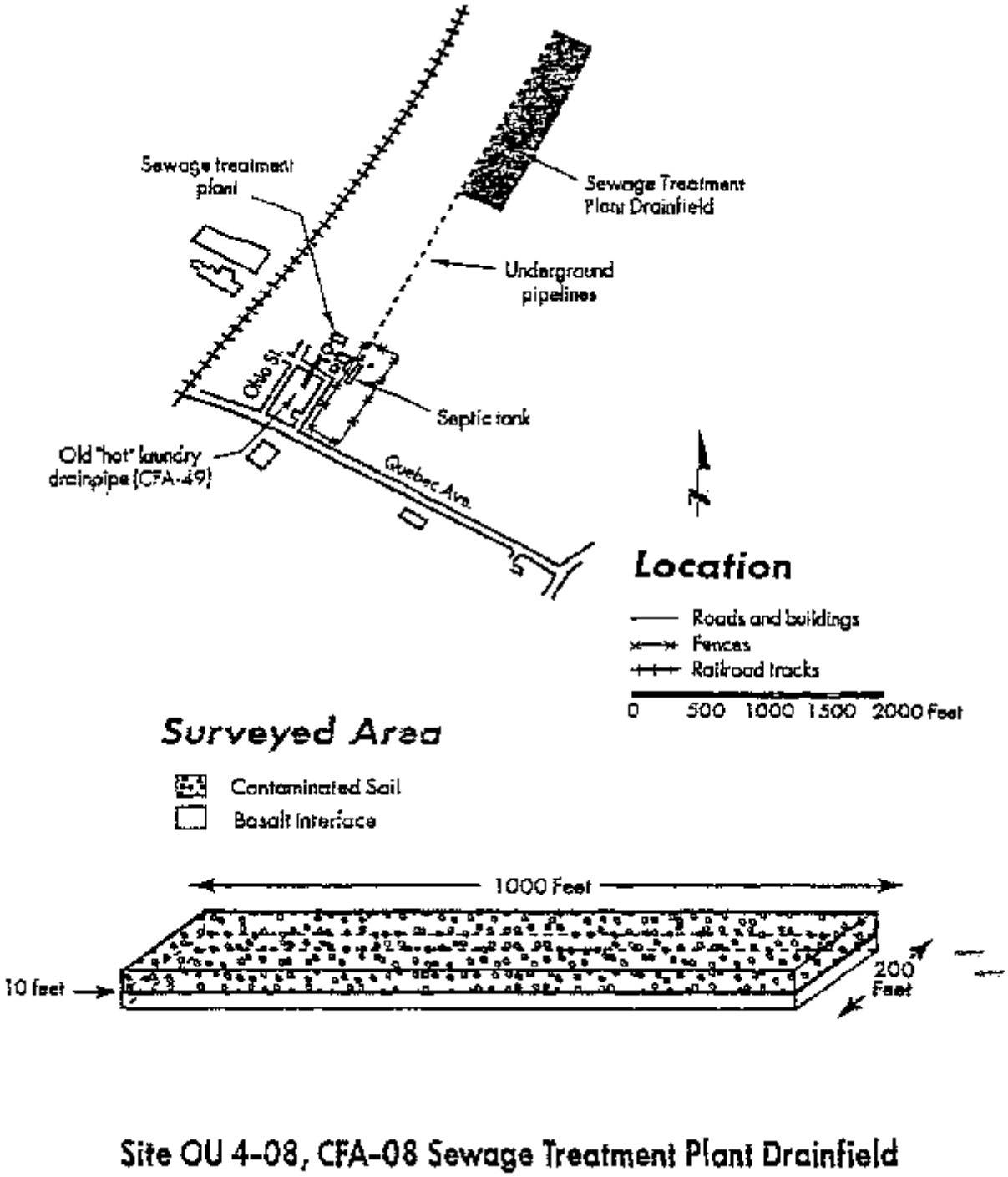

Figure 8-2. Sewage Plant Drainfield (CFA-08).

The OU 4-13 RI/FS investigation at the CFA-08 drainfield focused on collecting additional soil samples inside the drainfield and determining the lateral extent of contamination outside of the drainfield. The contaminant screening process retained aroclor-1254, cesium-137, Pu-239/240, and U-235 for evaluation of human health risks in the BRA.

8.2.2 Nature and Extent of Contamination

The nature and extent of contamination was estimated in the OU 4-13 RI/FS to be defined by the perimeter of the drainfield and estimated to be to a depth of 3.1 m (10 ft) bgs. The total volume is approximately 56,577 m^3 (74,000 yd^3).

8.2.3 Summary of Site Risks

The CFA-08 drainfield was retained for quantitative risk analysis in the BRA to evaluate human health risks from aroclor-1254, cesium-137, plutonium-239/240, and uranium-235. Ecological risks were evaluated for chloromethane, chromium-III, copper, lead, mercury, nickel, selenium, aroclor-1254, benzo(a)pyrene, and silver. Please refer to the OU 4-13 RI/FS (DOE 1999a) for the details of the risk assessment process. Refer to the OU 4-13 RI/FS (DOE 1999a) for the details of the risk assessment process.

8.2.3.1 Human Health Risk Assessment. Cesium-137 is the only contaminant at the CFA-08 drainfield that poses an unacceptable risk to human health. The maximum concentration of cesium-137 is 180 pCi/g and the exposure route is external exposure. Table 8-2 summarizes the cesium-137 data.

The total excess cancer risk for the current occupational work is 2E-03 (2 in 1,000). The majority of this risk (99%) is from external exposure to radiation from cesium-137 in soil. The noncarcinogenic hazard index is less than 1.

The total excess cancer risk for the future occupational work is 2E-04 (2 in 10,000). The major contributor is external exposure to radiation from cesium-137 in soil. The noncarcinogenic hazard index is less than 1.

The total excess cancer risk for the future residential scenario is 4E-04 (4 in 10,000). The majority of the risk (99%) is attributable to external radiation exposure to cesium-137 in soil. The noncarcinogemc hazard index is less than 1.

8.2.3.2 Ecological Risk Assessment. The ecological risk assessment determined that no contaminants pose an unacceptable risk to ecological receptors.

Table 8-2. Summary data for the human health COC at the CFA-08 drainfield.

Contaminant of Concern	Units	Number of Samples	Number of Detections	Minimum Detected	Maximum Detected	Exposure Point Concentration	INEEL Background Concentration[a]
Human Health							
Cesium-137	pCi/g	65	47	0.08	180	88.9[b]	1.28

a. The background value for composited samples (INEEL 1996a.)
b. Volume weighted average 95% UCL concentrations.

8.3 CFA-10 Transformer Yard (OU 4-09)

The CFA-10 site will be remediated to address the threat to human health and ecological receptors posed by lead-contaminated soil. A summary of the site investigations, nature and extent of contamination, and estimated risks are presented below.

The Transformer Yard site (see Figure 8-3) is an area approximately 19.8m x 42 m. The building and yard area were used for welding and metalworking between approximately 1958 and 1985 (INEEL 1996a). From 1985 to 1990, electrical transformers were stored on the concrete pad. Process knowledge indicates that the yard was not used for waste disposal, but accidental spills may have occurred at the site. Potential contaminants were identified as metals and PCBs in the Track 2 scoping process.

8.3.1 Site Investigations

The CFA-10 Transformer Yard site was identified as a Track 2 investigation site in the FFA/CO (DOE-ID 1991). Six surface soil samples were collected in the Track 2 investigation for PCB analyses and four samples were analyzed for metals. Two of seven possible PCBs were detected: aroclor-1254 and aroclor-1260 with maximum concentrations of 1.4 and 1.3 mg/kg, respectively. The Track 2 investigation identified arsenic, lead, aroclor-1254 and aroclor-1260 as COPCs, and the site was carried forward to the OU 4-13 RI/FS.

As part of the OU 4-13 RI/FS investigation, soil samples were collected at four additional locations for lead analyses. At each location, samples were collected at the surface and at depths of 0.3 m (1 ft) and 0.6 m (2 ft) bgs. The average lead concentration for the surface soil, soil at 0.3 m (1 ft) bgs, and soil at 0.6 m (2 ft) bgs is 1,848, 64, and 18 mg/kg, respectively. Only the average lead concentration for the surface soil exceeds the EPA residential lead screening level of 400 mg/kg. Additionally, samples collected from the three depths at the four locations were analyzed by the TCLP for lead; two samples exceeded the toxicity characteristic level for lead. Aroclor-1254 and aroclor-1260 were retained for evaluation of human health risk; lead was evaluated against the EPA screening criterion.

8.3.2 Nature and Extent of Contamination

The extent of contamination at the CFA-10 Transformer Yard encompasses the dimensions of the yard to a depth of 0.15 m (0.5 ft). The volume of lead-contaminated soil is estimated to be 123 m^3 (160 yd^3). Subsurface data indicate that lead concentrations above 400 mg/kg are confined to the upper 0.15 m (0.5 ft) of the yard.

8.3.3 Summary of Site Risks

Because there are no toxicity data for lead, lead concentrations were compared to the EPA screening criterion. Aroclor-1254 and aroclor-1260 were evaluated for potential risk to human health in the BRA. Antimony, arsenic, cadmium, chromium III, cobalt, copper, lead, manganese, mercury, nickel, zinc, and aroclor-1254 were evaluated for potential risks to ecological receptors. Please refer to the OU 4-13 RI/FS for the details of the risk assessment process.

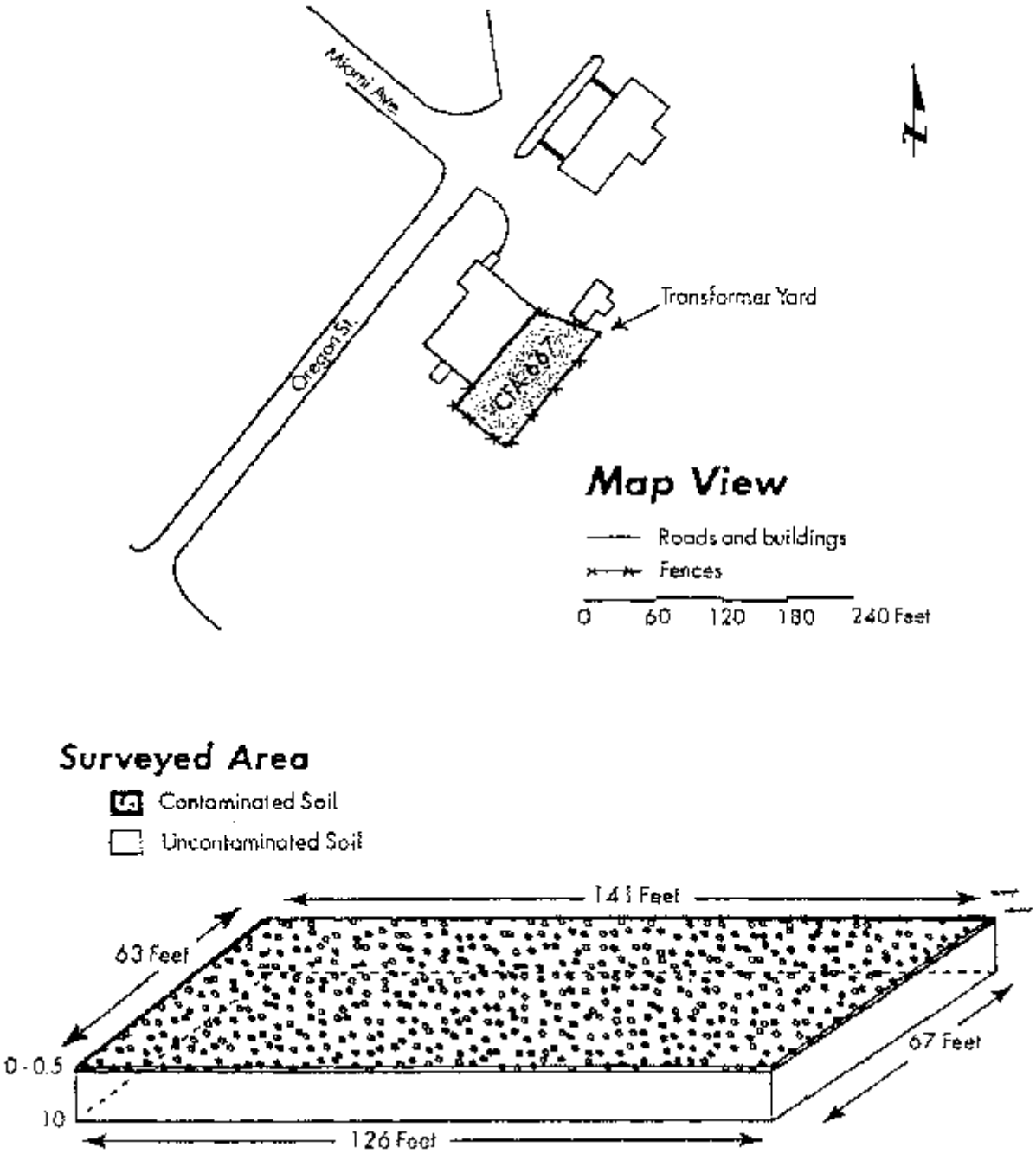

Figure 8-3. The Transformer Yard (CFA-10).

8.3.3.1 Human Health Risk Assessment. Lead is the only contaminant that poses an unacceptable risk to human health at CFA-10. Concentrations in the top 0.5 ft of soil exceed the EPA residential screening level of 400 mg/kg. Lead also poses an unacceptable ecological risk above 10 times background (170 mg/kg), in the top 0.15 m (0.5 ft) of soil. Data for lead at CFA-04 are summarized in Table 8-3.

The total excess cancer risk for the current and future occupational scenarios is less than 1E-04. The noncarcinogenic hazard quotient is less than 1 for both the current and future occupational scenarios.

8.3.3.2 Ecological Risk Assessment. Lead and copper were identified as a contaminant that poses unacceptable risks to ecological receptors at CFA-10. The exposure point concentration of 5,560 mg/kg for lead has a calculated hazard quotient of 5,000. The maximum copper concentration of 259 mg/kg is only slightly above the 10 background criteria of 220 mg/kg in one sample of four detected samples. Data for lead and copper are summarized in Table 8-3.

Table 8-3. Summary of data for the human health and ecological COC at the CFA-10 Transformer Yard.

Contaminant of Concern	Units	Number of Samples	Number of Detections	Minimum Detected	Maximum Detected	Exposure Point Concentration	INEEL Background Concentration[a]
Human Health							
Lead	mg/kg	17	17	16.5	5,560	305[b]	17
Ecological							
Lead	mg/kg	17	17	16.5	5,560[c]	5,560	17
Copper[c]	mg/kg	4	4	36	259	259	22

a. The background value for composited samples from INEEL 1996a.

b. Volume weighted average 95% UCL concentrations

c. Copper contamination was detected at the same depth of surface soil where lead contamination is and a remedial action for lead contamination is expected to also remediate the copper. Therefore, copper will not be evaluated as a COPC in the FS.

9. REMEDIAL ACTION OBJECTIVES AND FINAL REMEDIATION GOALS

The remedial action objectives (RAOs) and final remediation goals (FRGs) for sites CFA-04, CFA-08, and CFA-10 are discussed below. The remedial alternatives were evaluated collectively in the Feasibility Study, and are presented similarly in this ROD. Sections 9 through 11 address the remedial alternatives for each of the three sites. The remedial alternatives, a comparison of these alternatives, and the selected remedies are presented.

9.1 Remedial Action Objectives

These RAOs are based on the results of both human health and ecological risk assessments and are specific to the COCs and exposure pathways for each of the three sites.

The RAOs were developed in accordance with the NCP and CERCLA RI/FS guidance (EPA 1988) and refined through discussions among the Agencies (IDHW, EPA Region 10, and DOE-ID). During development of the RAOs it was assumed that CFA would serve as the primary area at INEEL for technical service and support functions for the next 100 years with access restrictions and other administrative and physical security controls.

Based on these assumptions the RAOs are to:

- Prevent direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than 1 in 10,000

- Prevent ingestion and inhalation of radionuclide and nonradionuclide COCs that would result in a total excess cancer risk greater than 1 in 10,000, or a total of hazard index greater than 1.0

- Prevent exposure to lead at concentrations over 400 mg/kg, the EPA residential screening level for lead

- Prevent exposure of ecological receptors to contaminated soil with concentrations greater than or equal to a screening level of 10 times background values that result in a hazard quotient greater than or equal to 10.

- Monitor the groundwater at WAG 4 until the nitrate level falls below the MCL of 10 mg/L.

9.2 Final Remediation Goals for the Selected Alternatives

The FRGs developed in the OU 4-13 RI/FS (DOE-ID 1999a) are based on risk-specific doses, applicable or relevant and appropriate requirements (ARARs), or EPA guidance and are summarized in Table 9-1. For sites, CFA-04 and CFA-10, the FRGs are based on screening level goals rather than further intensive analysis and the additional cost of further study, which would be necessary to refine the FRGs.

Table 9-1. Final Remediation Goals for sites with selected alternatives.

Site	Contaminant	FRG	Basis
CFA-04-Pond	Mercury	0.50 mg/kg	Ecological goal based on ten times average background concentration for composited samples.[a]
CFA-08 Sewage Plant Drainfield	Cesium-137	2.3 pCi/g[b]	Human health goal. See Footnote b.
CFA-10 Transformer Yard	Lead	400 mg/kg	EPA residential screening level (400 mg/kg)

a. Ecological goal is lower than human health goal of 1.27 mg/kg.

b. The maximum cesium-137 concentration at the CFA-08 drainfield (180 pCi/g) will naturally decay to 23 pCi/g in the 100-year IC period for the INEEL. However, the ultimate goal for unrestricted access is 2.3 pCi/g, the 1E-04 future residential risk-based concentration. That concentration will be achieved in an additional 89 years through continued natural decay. Note that 23 pCi/g is not a true "remediation goal" in that soil is not being removed to this level; it will be achieved through radioactive decay. Confirmatory soil sampling to demonstrate that this level is achieved in 100 years will not be performed under this remedy, because the known radioactive half-life for cesium-137 is 30 years (Benedict et al. 1981).

10. DESCRIPTION OF ALTERNATIVES

The alternatives listed below were developed to meet the RAOs for contaminated materials at sites CFA-04, -08, and -10.

1. No Action (with monitoring)

2. Limited Action

3. Excavation, treatment by stabilization, and disposal

    a. On-INEEL disposal

    b. Off-INEEL disposal

4. Containment.

A brief description of each alternative is presented in the sections below.

10.1 Alternative 1—No Action (With Monitoring)

The NCP [40 CFR 300.430(e)(6)] requires consideration of a No Action alternative to serve as a baseline for evaluation of other remedial alternatives. The primary elements of Alternative 1 are:

- No remedial actions would be taken.

- No land-use restriction, controls, or active remedial measures would be implemented at the site.

- Environmental monitoring may be warranted if contamination is left in place under this alternative. Monitoring would enable detection of contaminant migration within environmental media (air, groundwater, and soil) or other changes in site conditions that warrant future remedial actions. Monitoring would remain in effect for at least 100 years. For the sites in this ROD, environmental monitoring would consist of radiological surveys in appropriate areas, groundwater, and air monitoring. Any required air monitoring would be. performed as part of the INEEL air-monitoring program. The frequency and locations of all air monitoring activities would be determined during the remedial design.

10.2 Alternative 2—Limited Action

A Limited Action alternative was developed that consists of:

- Institutional controls (ICs) include property transfer restrictions in perpetuity. These restrictions would limit use of property if it is transferred from government control to private ownership. If the property is ever transferred to private ownership, the information required under Section 120(h) of CERCLA would be transferred with it. The property transfer documentation would provide notification to the new property owner disclosing former waste management and disposal activities that occurred on the site. It would limit property use to activities that would prevent human health risks from exceeding allowable levels. These restrictions may take the form of restrictive covenants or easements established in perpetuity.

- Access restrictions would be maintained during the institutional control period using fences and signs. Routine site inspections and monitoring for animal burrows, erosion, or subsidence also will be performed to assess maintenance requirements.

- Surface water would be controlled to minimize the potential for surface water accumulation at the site. This management would include inspection and maintenance of site drainage.

- Environmental monitoring may be warranted if contamination is left in place under this alternative. Monitoring would enable detection of contaminant migration within environmental media (air, groundwater, and soil) or other changes in site conditions that warrant future remedial actions. Monitoring would remain in effect for at least 100 years. For the sites in this ROD, environmental monitoring would consist of radiological surveys in appropriate areas and groundwater monitoring. Any required air monitoring would be performed as part of the INEEL air-monitoring program. The frequency and locations of all air monitoring activities would be determined during the remedial design.

10.3 Alternative 3—Excavation, Treatment, and Disposal

Remedial alternatives incorporating treatment were developed to meet ARARs and EPA's preference for treatment. Treatment may be required to dispose contaminated media removed from a site. Alternatives incorporating treatment were developed to allow risk managers to determine the relative cost-effectiveness and practicability. Excavation, treatment, and disposal alternatives could be applied to any of the three remediation sites.

10.3. 1 Alternative 3a—Excavation, On-INEEL Treatment, and Disposal

CFA-04. This alternative would consist of the actions listed below. No ICs would be required for the CFA-04 Pond after completing the remediation, providing soil exceeding the FRG is removed.

- Characterizing the site and excavating soil and sediments from the pond exceeding FRG. Soil contaminated at concentrations above the FRG will be excavated to a maximum depth of 3 m (10 ft) bgs or to basalt. No basalt will be excavated.

- Transporting excavated soil exceeding the FRG to the ICDF.

- Stabilizing soil exceeding the RCRA characteristic hazardous waste levels for mercury with cement.

- Disposing treated and nontreated soil at the ICDF.

- Performing verification sampling to ensure that there is no identified contamination remaining at the site exceeding the FRG.

- Backfilling the pond and any adjacent excavations with uncontaminated soil to grade. All excavations will be contoured to match the surrounding terrain and revegetated.

CFA-08. This alternative would consist of the actions listed below. No ICs are necessary at CFA-08 provided that soil exceeding the FRG is removed from the site. Note that in this instance the FRG for excavation would be 2.3 pCi/g for cesium-137; that concentration is the 1E-04 risk-based concentration for the future residential scenario for unrestricted access.

- Characterizing soil and excavating soil and sediments from the drainfield exceeding FRG. Soil contaminated at concentrations above the FRG will be excavated to a maximum depth of 3 m (10 ft) bgs or to basalt. No basalt will be excavated.

- Allowing sludges remaining in drainfield feeder lines to drain into soil during excavation.

- Transporting soil exceeding the FRG to the ICDF

- Performing verification sampling to ensure that there is no identified contamination remaining at the site exceeding the FRG.

- Returning soil contaminated at less than FRG to the excavation.

- Backfilling the excavation with uncontaminated native soil, creating final slopes that will divert water, and revegetating the site.

This alternative originally used soil separation as the treatment technology. However, a pilot-scale treatability study performed by WAG 5 in 1999 (INEEL 1999) concluded that this technology is not cost effective for this type of soil contamination. Therefore, soil separation was eliminated from the alternative. Soil excavated that exceeds the FRG would be disposed of at the ICDF.

CFA-10. This alternative would consist of the actions listed below. No ICs are necessary at CFA-10 provided that soil exceeding the FRG is removed from the site.

- Characterizing soil and excavating soil exceeding FRG. Soil contaminated at concentrations above the FRG will be excavated to a maximum depth of 3 m (10 ft) bgs or to basalt. No basalt will be excavated.

- Performing verification sampling to ensure that there is no identified contamination remaining at the site exceeding the FRG.

- Transporting soil contaminated above the FRG to the ICDF.

- Stabilizing soil that exhibits the RCRA toxicity characteristic for lead, and disposing of treated and nontreated soils to the ICDF.

- Returning soil contaminated at less than the FRG to the excavation.

- Backfilling the excavation with uncontaminated soil to grade. The excavation will be contoured to match the surrounding terrain and revegetated.

10.3.2 Alternative 3b—Excavation, Treatment, and Disposal Off-INEEL

CFA-04. This alternative would consist of the actions described in Section 10.3.1, Alternative 3a, for this site, except that soils exceeding the FRG would be treated, transported to, and disposed of at an off-INEEL TSDF.

CFA-08. This alternative would consist of the actions listed in Section 10.3.1, Alternative 3a, for this site, except that soils contaminated at levels exceeding the FRG would be transported to an off-INEEL low-level waste landfill for disposal.

CFA-10. This alternative would consist of the actions described in Section 10.3.1, Alternative 3a, for this site, except that soils exceeding the FRGs would be treated, transported to, and disposed of at an off-INEEL TSDF.

10.4 Alternative 4—Containment and Institutional Controls

The alternatives developed for containing contamination are based on capping technologies. These alternatives would be designed to meet RAOs by eliminating exposure pathways identified in the BRA. The cap must be designed to maintain integrity for the period of time that unacceptable exposure risks will be present. The functional life of a particular cover is dependent on how long failure mechanisms such as erosion, subsidence, geosynthetic failure, infiltration, biotic and human intrusion can be delayed. The human health risks due to cesium-137 contamination at CFA-08 will decline to acceptable levels for unrestricted access within 189 years through natural radioactive decay. Human health and ecological risks due to toxic metals at CFA-04 and -10 will not decrease due to time.

For CFA-04 and CFA-10, the cap would also be required to meet RCRA 40 CFR 264.310(a)(1-5), which would be an ARAR for those sites. This regulation specifies that the cap must meet the following functional requirements:

- Provide long-term minimization of infiltration
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settling and subsidence so that the cover's integrity is maintained
- Maintain permeability less than or equal to the permeability of any bottom liner system or natural subsoil present.

An engineered C-ET barrier was determined to best meet the functional requirements and was selected as the representative capping technology for Alternative 4 for all three.

Institutional controls, as described for Alternative 2, would be implemented. The cap would be maintained during the entire 100-year IC period. Long-term maintenance and inspection requirements would include reestablishing vegetation as necessary, repairing any subsidence, erosion furrows and animal burrows, and removing undesirable plants. Long-term monitoring requirements would include visual inspections and radiation surveys.

11. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives discussed in Section 10 were evaluated for each site using the nine evaluation criteria required under CERCLA (40 CFR 300.430[f][5][I]). The purpose of these comparisons is to identify the relative advantages and disadvantages of each alternative. Each criterion is described below and the alternatives are presented in decreasing order from the most to least advantageous. Table 11-1 provides a summary of the evaluation criteria for the alternatives and a ranking of alternatives for each criterion and each site.

11.1 Threshold Criteria

The selected remedial action must meet the threshold criteria of overall protection of human health and the environment, and compliance with ARARs.

11.1.1 Overall Protection of Human Health and the Environment

This criterion addresses the degree to which a remedy provides adequate protection of human health and the environment. Risks posed by the COCs at the site may be eliminated, reduced, or controlled through removal, treatment, engineering controls, or ICs. Long-term risk calculations in the BRA and short-term health effects associated with construction work in the field must be considered for this criterion.

- Alternatives 3a and 3b are the most protective, since contaminated soil above FRGs would be removed from WAG 4.

- Alternative 4 meets human health and ecological RAOs; however, it is less effective than Alternatives 3a and 3b, since contamination would remain at the sites. Mercury and lead would remain indefinitely at CFA-04 and CFA-10, respectively, while cesium-137 at CFA-08 would decay to allowable residential levels within 189 years.

- Alternative 2 does not meet the criterion at CFA-04, CFA-08, or CFA–10. Contamination remaining at CFA-04 and CFA–10 would exceed human health remediation goals. Contamination remaining at CFA-08 after 100 years of institutional control would exceed the human health unrestricted release criterion of 2.3 pCi/g cesium-137.

- Alternative 1 does not satisfy the criterion for any of these three sites, because site access and contact with the contaminated media are not prevented, and potential risks are not reduced. The no action alternative does not meet RAOs for protection of human health and the environment.

Table 11-1. Relative ranking of alternatives evaluated for the three WAG 4 OU 4-13 sites of concern.[a]

Evaluation Criteria	CFA-08	CFA-04	CFA-10
Overall protection of human health and the environment	(3b, 3a), 4 1 and 2 do not meet the criterion.	(3a, 3b), 4 1 and 2 do not meet the criterion.	(3a, 3b), 4 1 and 2 do not meet the criterion.
Compliance with ARARs	(3a, 3b, 4) 1 and 2 do not meet the criterion.	(3a, 3b, 4) 1 and 2 do not meet the criterion.	(3a, 3b, 4) 1 and 2 do not meet the criterion.
Long-term effectiveness and permanence	(3a, 3b), 4	(3a, 3b), 4	(3a, 3b), 4
Reduction of toxicity, mobility or volume through treatment	(3a, 3b), 4	(3a, 3b), 4	(3a, 3b), 4
Short-term effectiveness	4, (3a,3b)	4, (3a, 3b)	4, (3a, 3b)
Implementability	4, 3b, 3a	4, 3b, 3a	4, 3b, 3a
Cost	4, 3a, 3b	3a, 4, 3b	3a, 3b, 4

a. Ranking is from highest to lowest, except for costs, which are ranked from lowest to highest in net present value.

( ) =No significant difference between alternatives with respect to the criterion.

Alternative 1: No Action with monitoring.

Alternative 2: Institutional Controls.

Alternative 3a: Excavate, Treat, and ICDF Disposal

Alternative 3b: Excavate, Treat and Off-INEEL TSDF Disposal

Alternative 4: Containment with an engineered cover and Institutional Controls.

11.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Evaluation of compliance with ARARs for all alternatives is included in Table 11 -1 and summarized below. A complete list of ARARs for selected remedies are provided in Section 13, Table 13-1.

- Alternatives 3a, 3b, and 4 meet all ARARs identified in Section 13, Table 13-1 for CFA-04, CFA-08, and CFA-10.

- The RAOs for CFA-04 and CFA-08 would be met under Alternative 4 since contaminated soil would be capped and the exposure pathway eliminated. The engineered cover could meet the to-be-considered (TBC) requirements of DOE orders for low-level waste disposal for CFA-08 and would meet RCRA Subtitle C requirements of cap performance for CFA-04 and CFA-10.

- Alternative 2 would not meet (DOE Order 5400.5) for a period of 89 years after the 100-year institutional control period at CFA-08. Because hazardous constituents would be left in place, Alternative 2 would not meet RCRA Subtitle C standards for landfill closure and post-closure at CFA-04 and CFA- 10.

- Alternative 1 would not meet (DOE Order 5400.5) for 189 years at CFA-08. Alternative 1 would not meet RCRA Subtitle C standards for landfill closure and post-closure at CFA-04 and CFA- 10.

11.2 Balancing Criteria

The balancing criteria used in refining the selection of the candidate alternatives for the site include: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. Only alternatives 3a, 3b, and 4 are evaluated against balancing criteria because 1 and 2 do not fulfill the threshold criteria.

11.2.1 Long-Term Effectiveness and Permanence

This criterion includes consideration of residual risk that will remain on-INEEL following remedial action. The adequacy and reliability of controls are also considered.

- Alternatives 3a and 3b would achieve the highest level of long-term effectiveness and permanence because contaminated soil and debris would be completely removed from the sites. Solid waste generated would be managed in accordance with ARARs. The ICDF will be required to meet substantive requirements for a TSDF under the Hazardous Waste Management Act and RCRA. Institutional controls would ensure effectiveness of the remedy at any site where contaminated soil above FRGs was allowed to remain below 3 in (10 ft)bgs

- Alternative 4 would be highly effective at achieving long-term effectiveness and permanence at CFA-08. The effectiveness of the containment option is greater at the CFA-08 Drainfield than at CFA-04 and CFA-10 because the cap integrity needs to be maintained for a shorter period due to the radioactive decay of the COC. External exposure risks estimated for the CFA-08 drainfield, due to cesium-137, decrease to 1E-04 in approximately 189 years. However, human health and ecological risks from toxic metals at CFA-04 and CFA-10 would not decrease with time. Under Alternative 4, long-term effectiveness and permanence at CFA-04 and CFA-10 depends on the durability of the cap. Cap integrity monitoring, as well as periodic removal of undesirable vegetation and burrowing animals (if necessary), would be performed.

11.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently result in reduction of toxicity, mobility, or volume of the hazardous substances as their principal elements.

- No reduction in toxicity or volume would result from stabilization (Alternative 3) of mercury- or lead-contaminated soils at CFA-04 and CFA-10, respectively. Volume increase would likely be in the range of 200%. The overall mobility of lead and mercury would be reduced through stabilization.

- No reduction in volume through treatment would occur for Alternatives 3a and 3b for site CFA-08. These alternatives, as presented in the Proposed Plan (DOE-ID 1999b), incorporated treatment by segmented gate separation (SGS) of cesium-137 contamination. Application of this treatment at WAG 4 was contingent on acceptable results in a WAG 5 treatability study that investigated the viability of SGS on INEEL soils. The results of this study indicate that the radiological components in contaminated soil could not be effectively separated (INEEL 1999). The SGS system is, therefore, not considered further for CFA-08 for either of these alternatives.

- Alternative 4 does not include treatment.

11.2.3 Short-Term Effectiveness

The short-term effectiveness criterion addresses the time needed to implement remedies to reduce any adverse impacts on human health and the environment. This criterion specifically refers to risks that may be posed during the construction and implementation period of remedial action prior to achieving remedial goals. For this criterion, the alternative that provides the least amount of disturbance to contaminated materials ranks the highest in terms of short-term effectiveness because of the potential for worker exposure.

- Alternatives 3a and 3b provide a moderate degree of short-term effectiveness primarily due to potential worker exposure. Health risks to workers during excavation would be minimized to the extent possible. Potential exposures from removal and treatment of waste would be mitigated using standard administrative and engineering controls. These controls could include, but are not limited to dust suppression and appropriate personal protective equipment. Other measures may include the use of excavation equipment modified with positive-pressure ventilation systems and HEPA filters for use in contaminated areas. Environmental impacts for Alternatives 3a and 3b are minimal. No environmentally sensitive archaeological or historical sites, wetlands, or critical habitat exist at WAG 4.

- Alternative 4 also provides a moderate degree of short-term effectiveness primarily due to potential worker exposure. The possibility of direct radiation exposure of workers installing a protective cover at CFA-08 would be minimized by first placing a foundation layer over the contaminated soils. Emplacement of foundation material and the lowermost layer(s) of the cover would add additional shielding sufficient to eliminate subsequent exposure risks throughout the remainder of construction activities at CFA-08. Construction activities would be performed in accordance with the as low as reasonably achievable (ALARA) approach to radiation protection as required under (10 CFR 835). Inhalation and ingestion risks due to toxic metals in soil at CFA-04 and -10 would be minimized by the use of appropriate personal protective equipment, engineering controls, and adherence to health and safety protocols. Environmental impacts resulting from excavation and construction activities would be minimal.

11.2.4 Implementability

The implementability criterion addresses such factors as the availability of services and materials. Coordination with other governmental entities is also considered.

- The implementability of Alternative 3a for CFA-04, CFA-08, and CFA-10 is considered moderate. The technology to perform stabilization is readily implementable. Chemical

stabilization of lead and mercury has been previously performed at the INEEL. The moderate rating is primarily due to the uncertain availability of the ICDF, which is planned to begin operations in 2004.

- The implementability of Alternative 3b for site CFA-0.4 and -10 is considered high, due to the ready availability of an off-INEEL disposal facility. The technology associated with stabilization and disposal is also readily implementable. Off-INEEL disposal can be implemented sooner because the ICDF may not be complete for several years. The implementability of Alternative 3b for CFA-08 is high.

- Alternative 4 is highly implementable for all three sites due to the availability of materials and technology.

11.2.5 Cost

Table 11-2 presents a summary of the comparative costs of the alternatives for CFA-04, CFA-08, and CFA- 10.

CFA-04. Of the three alternatives that meet the threshold criteria, the least costly alternative for CFA-04 is Alternative 3a, Excavation, Treatment and disposal at ICDF. Alternative 4 is the next lowest cost. The operating and maintenance costs for Alternative 4 account for approximately 40% of the overall costs. Alternative 3b has the highest cost, primarily due to the cost of shipping contaminated soils to an off-INEEL facility.

CFA-08. Of the three alternatives that meet the threshold criteria, the least costly alternative for CFA-08 is Alternative 4, Containment. Approximately 35% of this total cost is attributable to operating and maintenance costs. Alternative 3a has the next lowest cost. The increase in costs for 3a is due to the excavation of drainfield soils and on-INEEL disposal. The costs for Alternative 3b are highest due to the additional cost of off-INEEL transport and disposal.

CFA-10. Of the three alternatives that meet the threshold criteria, the least costly alternative for CFA-10 is Alternative 3a, Excavate, Treat, and disposal at the ICDF. Alternative 3b has the next lowest cost. The slightly higher cost of Alternative 3b in comparison to 3a is primarily due to the additional cost of off-INEEL transport and disposal. Alternative 4, containment, has the highest cost. Approximately 55% of these costs are attributed to long-term operations and maintenance of a cover.

11.3 Modifying Criteria

The modifying criteria—state and community acceptance—are used in the final evaluation of remedial alternatives. Consideration in evaluating state and community acceptance includes elements of the alternatives that are supported, unsupported, or strongly opposed.

11.3.1 State Acceptance

The IDHW has been involved in the development and review of the RI/FS report, the Proposed Plan, and this ROD. All comments received from IDHW have been resolved and incorporated into these documents. The IDHW has participated in public meetings where public comments and concerns have been voiced and responses offered.

The IDHW concurs with the selected remedial alternatives.

Table 11-2. Costs for the alternatives considered for CFA-04, CFA-08, and CFA- 10.

	Alternative 1 No Action	Alternative 3a on-INEEL	Alternative 3b off-INEEL	Alternative 4 containment
CFA-04				
Capital cost	$0.9	$4.8	$12.6	$4.8
O & M	0.2	N/A	0.2	3.1
Total cost	$1.1	$4.8*	$12.8	$7.9
CFA-08				
Capital cost	$0..9	$30.8	$36.5	$7.3
O & M cost	0.2	0.2	0.2	$3.5
Total cost	$1.1	$31.0	$36.7	$10.8
CFA-10				
Capital cost	$0.8	$1.3	$1.4	$2.1
O & M cost	N/A	N/A	N/A	2.7
Total Cost	$0.8	$1.3	$1.4	$4.8

Costs are in millions and net present value.

O&M costs are included in capital costs for CFA-10 alternatives 1, 3a and 3b.

N/A=Not Applicable

* These costs are lower than the $6.9M estimate presented in the Proposed Plan because the number of five-year reviews was reduced by one and ICDF disposal costs to be borne by WAG 3 have been removed (DOE-ID 2000d).

11.3.2 Community Acceptance

Community participation in the remedy selection process includes participation in the public meetings held in August, 1999, and review of the Proposed Plan during the public comment period that began August 5 and ended October 4, 1999. The highlights of community participation are included in Section 3. The Responsiveness Summary (Part III) includes verbal and written comments received from the public and the Agencies' responses to these comments.

Approximately 30 people not associated with the project attended the proposed plan public meetings. Overall, 12 people provided formal comments; of these, five people provided verbal comments, and seven provided written comments. All comments received on the Proposed Plan were considered during the development of this ROD.

In general, the public was supportive of the preferred alternatives for the three sites to be remediated at WAG 4. Two stakeholders questioned the need for cleanup and the cost estimates for the remedial projects. It was explained that the sites were selected on the basis of CERCLA cleanup criteria, and that costs will be refined as the projects progress through the RD/RA process. Please refer to the Responsiveness Summary in Part III for more details.

12. SELECTED REMEDY

12.1 Description of Selected Remedy

12.1.1 CFA-04 Pond (OU 4-05)

12.1.1.1 ***Selected Remedy.*** The Agencies have selected Alternative 3a, Excavation, Treatment by Stabilization, and on-INEEL Disposal for the CFA-04 Pond mercury-contaminated soil. The selected alternative most cost-effectively meets the threshold and balancing criteria of the three alternatives considered. Under this alternative, approximately 6,338 M^3 (8,290 yd^3) of contaminated soil will be excavated. Soil with concentrations above the RCRA characteristic hazardous waste levels (estimated as 608 m^3 [796 yd^3]) will be stabilized with cement to comply with 40 CFR 268.49. The pond and adjacent excavations will be backfilled with clean soil to grade. The ground surface will be contoured to match the surrounding terrain or sloped to promote drainage and revegetated.

This remedy will consist of the following actions:

1. Characterizing the site and excavating soil from CFA-04 that exceeds the mercury FRG of 0.50 mg/kg. Soil contaminated at concentrations above the FRG will be excavated to 10 ft. (bgs), or to basalt. No basalt will be excavated.

2. Transporting and disposing of soil that exceed the mercury FRG to the proposed ICDF.

3. Stabilizing soil with TCLP mercury concentrations greater than 0.2 mg/L using cement and verification that all LDRs are met.

4. Performing verification sampling to ensure that soil exceeding the FRG of 0.50 mg/kg mercury has been removed.

5. Backfilling the pond, and adjacent areas that have been excavated, with uncontaminated soil to grade or sloped to promote drainage. All excavations will be contoured to match the surrounding terrain and revegetated.

Long-term institutional controls are not anticipated for the CFA-04 Pond, but will be evaluated after remediation.

12.1.1.2 ***Evaluation.*** Alternative 3a will protect human health and the environment and will comply with ARARs. This alternative will be highly effective long-term because it removes the contamination. It will only be moderately effective short-term because of the possibility of worker exposure during excavation, transport, and disposal. Alternative 3a will not reduce toxicity or volume through treatment, but will reduce contaminant mobility through stabilization. Implementability of Alternative 3a is moderate, because availability of the disposal facility on the INEEL is uncertain.

Compared to the other alternatives that meet the threshold criteria (3b and 4), Alternative 3a will be as or more effective long-term, and equally effective short-term. Its ranking for reduction of toxicity, mobility, or volume through treatment is the same or better. Its implementability is lower than for Alternatives 3b and 4, given the uncertain availability of the on-INEEL disposal facility; however, all other required technologies and personnel are available. The estimated $4.8 million cost is the lowest of the three alternatives that meet threshold criteria. Therefore, this alternative 3a is the selected remedy.

12.1.1.3 ***Performance Standards.*** Performance standards will be implemented to ensure that excavation. treatment, and disposal activities will result in protection against direct exposure to mercury during excavation and after disposal. The performance standards identified for this alternative include:

- Removing mercury contaminated soil where concentrations exceeding the FRG (0.5 mg/kg) are detected.
- Sampling soil at the pond to confirm that the cleanup meets or exceeds FRGs.
- Sampling of contaminated soil removed from the pond to confirm that soil disposed to the ICDF meets treatment standards for mercury and all underlying hazardous constituents (40 CFR 268.48). It must also meet the waste acceptance criteria of the ICDF. Soil meeting this standard must be less than 0.2 mg/L using TCLP analysis. Contaminated soil that does not meet treatment standards and requires treatment will be treated prior to disposal.

12.1.2 CFA-08 Sewage Plant Drainfield (OU 4-08)

12.12.1 ***Selected Remedy.*** The Agencies have selected Alternative 4, Containment, for the CFA-08 SP Drainfield. The selected alternative most cost-effectively meets the threshold and balancing criteria, of the three alternatives considered. Under this alternative, the contaminated site will be covered with an engineered protective cover. This cover will be an engineered barrier, constructed of layers of rock and soil with a vegetative cover. This barrier will isolate the waste and minimize water infiltration. The cover will be designed to isolate the low-level radioactive contaminants from human and biotic intrusion and to provide radiation shielding for a period of 189 years. The following remedial actions will be performed at the site:

1. Constructing an engineered ET cover. Clean native soil will be used for fill material as needed.
2. Contouring and grading the surrounding terrain to direct the surface water runoff away from the cover.

The continued effectiveness of this remedy will be evaluated through soil cover integrity monitoring and above-ground radiological surveys. Because contamination is to be left in place, ICs are necessary for CFA-08 to restrict access until the land can be released for unrestricted use. Institutional controls to be implemented at CFA-08 include:

- Restricting access through the use of signs and permanent markers
- Controlling land use leasing and property transfers
- Establishing and publishing surveyed boundaries
- Controlling activities on the land.

12.1.2.2 ***Evaluation.*** Alternative 4 was selected for CFA-08 because it is protective of human health and the environment and complies with ARARs. It will have high long-term effectiveness because it will eliminate the direct exposure pathway and contain the contamination until the risks to human health posed by the cesium-137 drop below threshold levels. In addition, it will eliminate the ecological risk exposure pathway to the mercury. Short-term effectiveness will be moderate due to the possibility for worker

exposure during construction. This alternative will not reduce toxicity, mobility, or volume through treatment. Implementability of Alternative 4 is high, because the technology, personnel, and materials are readily available. Institutional Controls are required for the selected option.

Compared to the other alternatives that meet the threshold criteria (3 a and 3b), Alternative 4 will have the same or greater long-term effectiveness and implementability. Its short-term effectiveness is greater than that for Alternatives 3a and 3b because of reduced worker exposure to site risks. Its ranking for reduction of toxicity, mobility, or volume through treatment is the same as for Alternative 2, and is lower than Alternatives 3a and 3b, because Alternative 4 involves no treatment. The estimated $9.9 million cost is significantly lower than for Alternatives 3a and 3b. Therefore Alternative 4 is the selected remedy.

12.1.2.3 ***Performance Standards.*** The performance standards identified for Alternative 4 include the following design requirements for the cover:

- Develop and implement surface monitoring and maintenance programs to detect cesium-137 and contain it within the site boundary.
- Institute restrictions limiting land use/access for at least 189 years. Institutional controls will be maintained and transferred, as applicable, until cesium- 137 has decayed to an acceptable risk level.
- Implement surface water controls to direct surface water away from the capped drainfield.
- Eliminate, to the extent practicable, the need for ongoing active maintenance following construction so that only surveillance, monitoring, and minor custodial care are required.
- Design and construct an adequate cover to inhibit erosion by natural processes for the specified design life of the cover.
- Incorporate features that will inhibit biotic intrusion into the contaminated drainfield.

12.1.3 CFA-10 Transformer Yard (OU 4-09)

12.1.3.1 ***Selected Remedy.*** The Agencies have selected Alternative 3b, Excavation, Treatment by Stabilization, and Off-INEEL Disposal for CFA-10 Transformer Yard. The selected alternative most cost-effectively meets the threshold and balancing criteria of the three alternatives considered. Under this alternative, the contaminated soil (approximately 122 m^3 [160 yd^3) will be excavated. The soil will be transported to an off-Site disposal facility and soil requiring treatment per 40 CFR 268.49 will be stabilized before disposal; soil not requiring treatment will be disposed of directly. The excavation will be backfilled with clean soil, contoured to match the surrounding terrain, sloped to divert water, and revegetated.

This remedy will consist of the following actions:

1. Characterizing the site and excavating soil from CFA-10 that exceeds the lead FRG of 400 mg/kg
2. Performing verification sampling in the excavated yard to ensure that soil exceeding the FRG of 400 mg/kg for lead has been removed

3. Stabilizing, with cement, soils with lead concentrations above the RCRA characteristic hazardous waste level of 5 mg/L, if any, and sampling stabilized soil to meet LDRs

4. Transporting and disposing of excavated and stabilized soil to a permitted off-INEEL TSDF

5. Backfilling areas that have been excavated with uncontaminated soil to grade or sloping it to promote drainage. All excavations will be contoured to match the surrounding terrain and revegetated.

No long-term ICs are anticipated for the CFA-10 Transformer Yard site, but they will be evaluated after remedial action.

12.1.3.2 Evaluation. At the CFA-10 site, Alternative 3b is protective of human health and the environment, and complies with ARARs. The alternative will have high long-term effectiveness because it will remove the contamination from the INEEL. Its short-term effectiveness will be moderate, because of the possibility for worker exposure during excavation, transport, and disposal activities. Alternative 3b will not reduce toxicity through treatment, but will reduce mobility through stabilization. The treatment with cement will increase volume. Implementability of this alternative is high, because the technology, off-INEEL disposal facility, and personnel are readily available.

Compared to the other alternatives that meet the threshold criteria (3a and 4), Alternative 3b will have the same or greater long-term effectiveness and the same short-term effectiveness. It ranks the same or better compared with the other alternatives for reduction of toxicity, mobility, or volume through treatment. The implementability of Alternative 3b is greater than other alternatives. The estimated $1.4 million cost is slightly more than for Alternative 3a but substantially lower than for Alternative 4. Alternative 3b, is relatively equal in all other respects and was selected by the Agencies because it can be implemented more rapidly than Alternatives 3a or 4.

12.1.3.3 Performance Standards. Performance standards will be implemented to ensure that excavation, treatment, and disposal activities will result in protection against direct exposure to lead during excavation and after disposal. The performance standards identified for this alternative include:

- Removing lead contaminated soil where concentrations exceeding the FRGs (400 mg/kg) are detected. Sampling of the stabilized soil to confirm that soil disposed meets treatment standards for lead and all underlying hazardous constituents.

- Sampling the transformer yard soil to confirm that the cleanup meets or exceeds FRGs.

12.2 Institutional Controls

Institutional controls or land use restrictions will be maintained by DOE at any INEEL CERCLA site where residual contamination precludes unrestricted land use per EPA Region 10 Policy (EPA 1999a). A site is considered available for unrestricted land use if potential risks to a current resident are less than 1E-04. ICs may be discontinued if contaminant conditions or potential risk levels change; if these situations occur, they will be documented during CERCLA five-year reviews.

In accordance with CFLUP (DOE-ID 1996), DOE will provide ICs for sites subject to land-use restrictions over the next 100 years unless a CERCLA five-year review concludes that unrestricted land use is allowable. After 100 years, DOE may no longer manage INEEL activities but controls will remain in place in the form of land-use restrictions. The Hall Amendment of the National Defense Authorization

Act of 1994 (Public Law 103-160) requires concurrence from EPA on the lease of any site on the National Priorities List (NPL) during the period of DOE-ID control. CERCLA (42 USC 9620 § 120[h]) requires that the state be notified of a lease involving a site, where contaminants may be present. DOE-ID is also required under CERCLA (42 USC 9620 § 120[h]) to indicate the presence of contamination and any restrictions at the time of property transfer.

Table 12-1 summarizes the IC evaluation for all sites at WAG 4. Long-term ICs are planned for four sites that include the CFA-08 SP Drainfield and the CFA I, II, and III Landfills (OU 4-12). The Drainfield will require ICs because of the residual risk from cesium-137 that will remain at the site for approximately 189 years. ICs were identified as part of the selected remedy for the Landfills in the OU 4-12 ROD to ensure that future activities would not compromise the integrity of the covers (DOE-ID 1995). A description of ICs that will be applied for these sites is provided in Table 12-2 and the estimated costs for ICs at CFA-0.8 are included in Table 12-3.

Additional ICs are not planned for CFA-04 Pond and CFA-10 Transformer Yard prior to remediation since there is only a residential use concern and INEEL has adequate land use controls in place to prevent residential use during current DOE operations. Also these sites are being permanently fenced with locked gates and require the approval of the ER WAG 4 Manager and the CFA Site Area Director to enter. Any soil disturbance would require a Soil Disturbance Notification which requires Agency approval. One of the 47 no action sites at WAG 4 also requires ICs. The CFA-07 French Drain has residual lead contamination above the 400 mg/kg screening level below 10 ft.

A comprehensive approach for establishing, implementing, enforcing, and monitoring institutional controls will be developed in accordance with Environmental Protection Agency (EPA) “Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities” (EPA 1999b). The following elements for WAG 4 institutional controls will be developed in the operation and maintenance (O&M) plan and will involve a facility-wide land use plan and procedures for controlling activities as outlined in the policy:

- A comprehensive facility-wide list of all WAG 4 areas or locations covered by any and all decision documents at the facility that have or should have institutional controls for protection of human health or the environment. The information on this list will include, at a minimum, the location of the area, the objectives of the restriction or control, the timeframe that the restrictions apply, and the tools and procedures that the facility will use to implement the restrictions or controls and to evaluate the effectiveness of the restrictions or controls.

- Cover, and legally bind where appropriate, all entities and persons, including, but not limited to, employees, contractors, lessees, agents, licensees, and invitees. In areas where the facility is aware of routine trespassing, trespassers will be covered.

- Cover all activities and reasonably anticipated future activities, including, but not limited to, any future soil disturbance, routine and nonroutine utility work, well placement and drilling, recreational activities, groundwater withdrawals, paving, training activities, construction, renovation work on structures or other activities.

- A tracking mechanism that identifies all land areas under restriction or control.

- A process to promptly notify both EPA and the State prior to any anticipated change in land use designation, restriction, land users, or activity for any institutional control required by a decision document.

Within 6 months of signature of this ROD, a monitoring report on the status of institutional controls at WAG 4 will be submitted to the EPA and Idaho Department of Health and Welfare. An updated institutional control monitoring report will be submitted to the EPA and Idaho Department of Health and Welfare at least annually thereafter. After the facility's comprehensive facility-wide approach is well established and the facility has demonstrated its effectiveness, the frequency of future monitoring reports may be modified subject to approval by EPA and the State. The institutional control monitoring report will contain at a minimum:

- A description of how DOE is meeting the facility-wide institutional control requirements
- A description of how DOE is meeting the WAG 4 specific objectives, including results of visual field inspections of all areas subject to WAG 4 specific restrictions
- An evaluation of whether or not all the WAG specific and facility-wide institutional control requirements are being met
- A description of any deficiencies and the efforts or measures that have been or will be taken to correct problems.

EPA and State review of the institutional control monitoring report will follow existing procedures for agency review of documents.

The DOE will notify EPA and the State immediately upon discovery of any activity that is inconsistent with the WAG specific institutional control objectives, or of any change in the land use or land use designation of a site addressed in the WAG 4 list of areas or locations covered by institutional controls. DOE will work together with EPA and the State to determine a plan of action to rectify the situation except in the case where DOE believes the activity creates an emergency situation, the DOE can respond to the emergency immediately upon notification to EPA and the State and need not wait for EPA or State input to determine a plan of action. DOE will identify a point of contact for implementing, maintaining, and monitoring institutional controls. DOE will also identify what went wrong with the institutional control process, evaluate how to correct the process to avoid future problems, and implement these changes after consulting with EPA and the State.

DOE will notify EPA and the State at least 6 months prior to any transfer, sale or lease of any property subject to institutional controls required by an EPA decision document so that EPA and the State can be involved in discussions to ensure that appropriate provisions are included in the conveyance documents to maintain effective institutional controls. DOE will not delete or terminate any institutional control unless EPA and the State have concurred in the deletion or termination. If it is not possible for DOE to notify EPA and the State at least 6 months prior to any transfer, sale or lease, then DOE will notify EPA and the State as soon as possible but no later than 60 days prior to the transfer, sale, or lease of any property subject to institutional controls.

12.3 Estimated Costs for the Selected Remedies

A summary of the estimated costs for each of the selected remedies for CFA-04, CFA-08 and CFA-10 is presented in Table 12-3. All initial and future life-cycle costs are normalized to net present

value (NPV). The NPV is the cumulative worth of all costs, as of the beginning of the first year of activities, accounting for inflation of future costs. All NPV costs were estimated assuming variable annual inflation factors for the first 10 years, per DOE guidance and cost estimating procedures. A constant 5% discount rate is assumed. An O&M period of 100 years was assumed, consistent with the assumed 100 year institutional control period. The estimates were prepared to meet the accuracy range of +50% to -30% required by CERCLA.

It should be noted that the costs presented in Table 12-2 for CFA-04 differ from the costs presented in the OU 4-13 RI/FS and the Proposed Plan. The revised cost estimate is $4.8 million NPV versus the previous estimate of $6.9 million NPV. The cost estimate is lower because the five-year review costs have been reduced and ICDF disposal costs that will be borne by WAG 3 have been eliminated. These modifications are documented in (DOE-ID 2000d).

Table 12-1. Institutional control evaluation for WAG 4 sites.

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
Evaluations of sites that have had or will have remedial actions.					
CFA-01 CFA-02 CFA-03	Landfill I Landfill II Landfill III	OU 4-12 RI/FS	Yes	Landfill waste was left in place after remediation under the OU 4-12 ROD. Risks for all exposure pathways are less than 1E-04. A groundwater monitoring plan for the remaining 26 years out of 30 years is in place.	Maintain land use controls and re-evaluate at the five-year review.
CFA-04	Pond	OU 4-05 Track 2 OU4-13 RI/FS	No	Future 100-year residential hazard index of 80 which will be remediated per this ROD.	None
CFA-08	Sewage Plant Drainfield	OU 4-08 Track 2 OU 4-13 RI/FS	Yes	Current occupational risk is 2E-03. Future 100-year residential risk is 4E-04. Contaminated soil will be left in place after implementation of the remediation prescribed in the ROD.	Maintain land use controls for 189 years to inhibit intrusion into the buried waste. Restrict residential land use until risk is less than 1E-04 (2.3 pCi/g cesium-137) or the released based on the results of a five-year review.
CFA-10	Transformer Yard	OU 4-03 Track 2 OU 4-13 RI/FS	No	Lead concentration in excess of the EPA residential screening level of 400 mg/kg will be remediated per this ROD.	None
Evaluation of no action and no further action sites.					
CFA-05	Motor Pool Pond	OU 4-11 ROD OU 4-13 RI/FS	No	All human health risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-11 ROD, was further evaluated and determined to be a no action site in the OU 4-13 RI/FS.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-06	Lead Shop (outside areas)	OU 4-06 Track 2, Time Critical Removal Action OU 4-13 RI/FS	No	Lead and arsenic contaminated soil removed. Lead concentrations are below the 400 mg/kg screening level. Arsenic slightly above background, is naturally occurring. No quantifiable risk or hazard was evident after removal action. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-07	French Drains E/S (CFA-633)	OU 4-07 Track 2 Non-time critical removal action OU4-13 RI/FS	Yes	French drains were removed. Total Risk is less than 1E-06. Total hazard index is less than 1 for contaminants between the surface and 3 m (10 ft) below grade. Suspected lead concentrations above 400 mg/kg and radionuclides at depths greater than 4 m (13 ft). This site is recommended as a no further action site per this ROD.	Limit land use at depths greater than 3 m (10 ft) until otherwise evaluated and documented in a five-year review.
CFA-08	Sewage Treatment Plant	OU 4-08 Track 2 OU 4-13 RI/FS	No	All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
	Pipeline	OU 4-08 Track 2 OU 4-13 RI/FS	No	No COCs. No quantifiable risk or hazard.	None
CFA-09	Central Gravel Pit	OU 10-05 Interim Action ROD	No	Using geophysical techniques a suspected ordnance shell was not located. No quantifiable risk or hazard was indicated. This site was determined to be a no action site in OU 10 -05 Interim Action ROD.	NA

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-11	French Drain	OU 10-05 Interim Action ROD	No	Using geophysical techniques a suspected ordnance shell was not located. No quantifiable risk or hazard. This site was determined to be a no action site during the OU 10-05 Interim Action ROD.	None
CFA-12	French Drains (2) (CFA-690)	OU 4-07 Track 2 Time-critical Removal Action OU 4-13 RI/FS	No	The dry wells were removed. Contamination removed to basalt. All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action in the OU 4-13 RI/FS.	None
CFA-13	Dry Well (south of CFA-640)	OU 4-02 Track 1 Non-time Critical Removal Action OU 4-13 RI/FS	No	The dry well was removed. Total risk is less than 1E-06 for and current and future resident, after elimination of naturally occurring Ra-226 and arsenic. Total hazard index is less than 1 for current and future resident. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-14	Two Dry Wells	OU 4-02 Track 1	No	Dry wells were never found after demolition of Building CFA-665 in 1998. Original building plans indicate they would have received rainwater from roof drains. No quantifiable risk or hazard was found at this site. This site was eliminated as a no action site from the OU 4-13 RI/FS.	None
CFA-15	Dry Well (CFA-674)	OU 4-02 Track 1 Non time Critical Removal Action OU 4-13 RI/FS.	No	The drywell was removed. Risk is less than 1E-06 for current and future resident after elimination of naturally occurring Ra-226. This site was determined to be a no action site in the OU 4-13 RI/FS.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-16	Dry Well (south of CFA-682 pumphouse)	OU 4-02 Track 1	No	The drywell was left in place. No quantifiable risk or hazard to residential receptor was identified. This site was eliminated as a no action site in the OU 4-13 RI/FS.	None
CFA-17	Fire Department Training Area, bermed	OU 4-05 Track 2 Non-time Critical Removal Action OU 4-13 RI/FS	No	Contaminated soil removed. All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-18	Fire Department Training Area, Oil Storage Tanks	OU 4-03 Track 1	No	The tank was removed with no evidence of leakage. No quantifiable risk or hazard. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-19	Gasoline Tanks (2) East of CFA-606	OU 4-02 Track 1 OU 4-03/-12 ROD	No	The former tank location was investigated with ground penetrating radar; tanks were not located. No quantifiable risk or hazard was found at this site. This site was determined to be a no action site in the OU 4-03/-12 ROD and was not further evaluated in this ROD.	None
CFA-20	Fuel Oil Tank at CFA-609 (CFA-732)	OU 4-02 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No quantifiable risk or hazard was found at this site. This site was determined to be a no action site in the OU 4-03/12 ROD.	None
CFA-21	Fuel Tank at Nevada Circle 1 (South by CFA-629)	OU 4-02 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/12 ROD and was not further evaluated in this ROD.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-22	Fuel Oil at CFA-640	OU 4-03 Track 2	No	The tank was removed. Contaminants in remaining soil were analyzed and evaluated to have a risk less than 1E-06 and a hazard index less than 1. This site was eliminated as a no action site in the OU 4-13 RI/FS.	None
CFA-23	Fuel Oil Tank at CFA-641	OU 4-03 Track 1	No	The tank was removed. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-24	Fuel Oil Tank at Nevada Circle 2 (South by CFA-629)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No holes or signs of leakage were observed. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-25	Fuel Oil Tank at CFA-656 (North Side)	OU 4-02 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage observed. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-26	CFA-760 Pump Station Fuel Spill	OU 4-09 Track 2	No	The tank was removed. All risks due to soil exposure are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-27	Fuel Oil Tank at CFA-669 (CFA-740)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. Contaminated soil was removed. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-28	Fuel Oil Tank at CFA-674 (West)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage was found. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-29	Waste Oil Tank at CFA-664	OU 4-03 Track 2 OU 4-03/-12 ROD	No	The tank was removed. Contaminated soil was removed. No contaminants were detected that exceed risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-30	Waste Oil Tank at CFA-665, active	OU 4-03 Track 2 OU 4-03/-12 ROD	No	The tank was removed. Contaminated soil was removed. No contaminants were detected that exceed 1E-06 risk-based concentrations. No active quantifiable risk or hazard was found. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-31	Waste Oil Tank at CFA-754, active	OU 4-03 Track 1	No	The tank was removed. Contaminated soil was removed. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03 /-12 ROD.	None
CFA-32	Fuel Oil Tank CFA-667 (North Side)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage was found. No contaminants were detected. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-33	Fuel Tank at CFA-667 (South Side)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. Contaminated soil near filling post was removed. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-34	Diesel Tank at CFA-674 (South)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. Contaminated soil was removed. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-35	Sulfuric Acid Tank at CFA-674 (West Side)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage was found. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-36	Gasoline Tank at CFA-680	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage was found. No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-37	Diesel Tank at CFA-681 (South Side)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No evidence of leakage was found. No contaminants were detected that exceed 1E-06 risk-based concentrations. No quantifiable risk or hazard. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-38	Fuel Oil Tank, CFA-683	OU 4-04 Track 1 OU 4-03/-12 ROD	No	The tank was removed. No contaminants were detected that exceed is less than risk-based concentrations. This site was determined to be a no action site in the OU 4-03/-12 ROD.	None
CFA-39	Drum Dock (CFA-771)	OU 4-03 Track 1 OU 4-03/-12 ROD	No	No source-term. This site was determined to be a no action site in the OU 4-04 Track 1.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-40	Returnable Drum Storage-South of CFA-601	OU 4-04 Track 1	No	No quantifiable risk or hazard was found. This site was determined to be a no action site in the OU 4-04 Track 1.	None
CFA-41	Excess Drum Storage — south of CFA-674	OU 4-04 Track 1	No	No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was determined to be a no action site in the OU 4-04 Track 1.	None
CFA-42	Tank Farm Pump Station Fuel Spills	OU 4-09 Track 2, Non-time Critical Removal Action OU 4-13 RI/FS	No	Petroleum contaminated soil was removed. All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-43	Lead Storage Area	OU 4-06 Track 2, Time Critical Removal Action OU 4-13 RI/FS	No	Lead and antimony contaminated soil was removed. Lead and antimony concentrations are less than 400 mg/kg screening level and risk- based concentration of 31, respectively. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-44	Spray Paint Booth Drain	OU 4-06 Track 2, Time Critical Removal Action OU 4-13 RI/FS	No	Lead concentrations are less than 400 mg/kg screening level. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-45	Underground Storage Tank	OU 4-03 Track 2	No	No contaminants were detected that exceed 1E-06 risk-based concentrations. This site was eliminated as a no action site in the OU 4-13 RI/FS.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-46	Cafeteria Oil Tank Spill (CFA-721)	OU 4-09 Track 2 OU 4-13 RI/FS	No	All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-47	Fire Station Chemical Disposal	OU 4-05 Track 2, Non-time Critical Removal Action OU 4-13 RI/FS	No	Petroleum contaminated soil removed. Lead concentrations are less than 400 mg/kg screening level. Total risk is less than 1E-06 for current and future resident. Total hazard index is less than 1 for current and future resident. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-48	Chemical Washout South of CFA-633	OU 4-07 Track 2	No	No COCs identified, however mercury was detected. Total risk is N/A. Total hazard index is less than 1 for current and future resident. This site was eliminated as a no action site in the OU 4-13 RI/FS.	None
CFA-49 (Part of CFA-08 SP)	Hot Laundry Drain Pipe	OU 4-08 Track 2, OU 4-13 RI/FS	No	No COCs identified. All risks are less than 1E-06 and the hazard index is less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None
CFA-50	Shallow Well East of CFA-654	OU 4-05 Track 2,	No	No COCs identified. Lead concentrations are less than 400 mg/kg. Risk - Not quantifiable, Total HI is less than 1. This site was eliminated as a no action site in the OU 4-13 RI/FS.	None
CFA-51	Drywell at North End of CFA-640	OU 4-13 RI/FS	No	No COCs identified. Lead concentrations are less than 400 mg/kg. This site was determined to be a no action site in the OU 4-13 RI/FS.	None

Table 12-1. (continued).

Site Code	Site Name	FFA/CO Classification	Institutional controls (Yes/No)	Basis for No Action or Institutional Controls	Description of Institutional Controls
CFA-52	Diesel Fuel UST (CFA-730) at Bldg CFA-613 Bunkhouse	OU 4-13 RI/FS	No	All risks are less than 1E-06 and the hazard index less than 1. This site was determined to be a no action site in the OU 4-13 RI/FS.	None

Table 12-1. Institutional control requirements for WAG 4 Remediated sites.

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Site CFA-01, CFA-02, CFA-03 Landfills I, II and III, respectively, (OU 4-12). Cumulative risk is less than 1E-04 for future resident. Covers emplaced as presumptive remedies.					
Current DOE operations	Landfill— no unauthorized intrusion into capped area	Buried waste including abestos	Maintain integrity of soil cover	1. Visible access restrictions (warning signs and permanent markers) 2. Control of activities (drilling or excavating and drilling of residential drinking water wells) 3. Publication of surveyed boundaries and descriptions of controls in the INEEL Land Use Plan (DOE-ID 1996)	Federal Facility Agreement and Consent Order (DOE-ID 1991) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERLA [42 USC 9620 § 120(h)]
DOE control post operations (i.e., after operations cease)	Landfill— no unauthorized intrusion into capped area	Buried waste including abestos	Maintain integrity of soil cover	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with this ROD 4. Notice to affected stakeholders (e.g., Bureau of Land Management, Sho-Ban Tribal Council, local county governments, IDHW, and EPA) for any change in land-use designation, restriction, or land users	Federal Facility Agreement and Consent Order (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act[c] (Public Law 103-160) Property release restrictions (DOE Order 5400.5)

Table 12-1. (continued)

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Landfill— no unauthorized intrusion into capped area	Buried waste including abestos	Maintain integrity of soil cover	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with this ROD.	FFA/CO (DOE-ID 1991) CERLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][c] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR Criteria for Bureau of Land Management Excess property reporting requirements Property release restrictions (DOE Order 5400.5)
CFA-08 Sewage Plant Drainfield. Subsurface radiological contamination to be remediated by capping in accordance with this ROD. Contaminant of Concern cesium-137					
Current DOE operations—prior to remediation	Industrial	Radionuclides—external radiation	Prevent exposure to contaminated soil, except for approved activities pursuant to the FFA/CO	1. Visible access restrictions (radioactivity barriers) 2. Control of activities (drilling or excavating)	FFA/CO (DOE-ID 1991) Worker protection (10 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)] Radiation protection of the public and ALARA principles (DOE Order 5400.5)

Table 12-1. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Current DOE operations after remediation	Landfill— no unauthorized intrusion into capped area	Exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Publication of surveyed boundaries and descriptions of land-use controls in the INEEL Land Use Plan (DOE-ID 1996)	FFA/CO (DOE-ID 1991) Worker protection (10 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120(h)] Radiation protection of the public and ALARA principles (DOE Order 5400.5)
DOE control post operations	Landfill— no unauthorized intrusion into capped area	Exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land-use consistent with this RODs	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act[c] (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)
Post DOE control	Landfill— no unauthorized intrusion into capped area	Exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with this ROD.	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR Criteria for Bureau of Land Management acceptance Excess property reporting requirements Property release restrictions (DOE Order 5400.5)

Table 12-1. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
DOE control post operations	Limited residential	Various-minimal concern	Limit residential land use for depths greater than 10 feet	1. Visible access restrictions/ signs 2. Property lease requirements including control of land-use consistent with this ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][b] Hall Amendment of the National Defense Authorization Act (Public Law 103-160)[c] Property release restrictions (DOE Order 5400.5)
Post DOE control	Limited residential	Various-minimal concern	Limited residential land use	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with this ROD.	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372-1)[i] Criteria for Bureau of Land Management acceptance of property 43 CFR 2374.2[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

a. Institutional controls are applicable only to sites where hazardous substances, pollutants, or contaminants are present that preclude unlimited land use. Surveillance will be conducted every 5 years to ensure that controls are in place.
b. Notification to states of leases involving contamination. Concurrence of the EPA is requested on leases of NPL (54 FR 48184) sites.
c. Consult with and request concurrence of EPA with proposed leases of sites that are on the NPL.
d. A statement that remedial action is complete is required in the deed.
e. If response action for which the federal government is responsible is not complete, restrictions, the response guarantee, the schedule for investigation and completion of all necessary response actions, and budget assurances must be included in the deed.
f. A clause allowing the U.S. government access to the property must be included in the deed.
g. A notice of information about hazardous substances present on the property must be included in the deed.
h. Uncontaminated parcels of land must be identified and concurred with by the EPA administrator before termination of operations.
i. A Notice of Intent with contamination information and protection needs is required to relinquish the property to the U.S. Department of Interior.
j. Transfer to the U.S. Department of Interior must indicate continuation of DOE responsibility, as applicable.
k. Report to the General Services Administration on contamination information and allowable land use for excess real property.

Table 12-3. Cost estimate summary for selected remedy at OU 4-13: Pond (CFA-04), SP Drainfield (CFA-08), AND Transformer Yard (CFA-10).

Planned Activity	Cost FY-99 (dollars)		
	Pond (CFA-04) Alternative 3a	SP Drainfield (CFA-08) Alternative 4	Transformer Yard (CFA-10) Alternative 3b
FFA/CO management and oversite	$437,500	$312,500	$219,000
Remedial action			
Document preparation			
RD/RA SOW	$54,000	$54,000	$54,000
RA work plan	$63,000	$63,000	$63,000
Packaging, shipping, transportation documentation	N/A	N/A	$78,000
Remedial action report	$48,000	$48,000	$48,000
WAG-Wide RA — Five-Year Review	$176,000	$811,000	N/A
RD documentation preparation			
Safety analysis documentation (ASA and HSP)	$100,500	$100,500	$100,500
Sampling and analysis plan	$108,000	$108,000	$108,000
Prefinal inspection report	$7,500	$7,500	$7,500
Remedial design			
Added institutional controls - Five-Year Reviews	$10,000	$200,000	N/A
Title design construction document package	$85,000	$59,500	$60,000
Remedial action — construction subcontract			
Site characterization	$1,394,000	$248,000	$76,000
Construction subcontract/GFE	$1,245,059	$3,280,000	$322,000
Project/construction management allowance	$202,701	$534,000	$37,000
Total Capital Costs	$3,931,260	$5,826,000	$1,173,000
Operations (100-year Duration)			
Program management	N/A	$3,385,000	N/A
Continued/new construction CFA caretaker/maintenance	N/A	$2,460,000	N/A
Surveillance and monitoring	N/A	$420,000	N/A
Total Operations Costs	0	$6,265,000	0

Table 12-3. (continued).

Planned Activity	Cost FY-99 (dollars)		
	Pond (CFA-04) Alternative 3a	SP Drainfield (CFA-08) Alternative 4	Transformer Yard (CFA-10) Alternative 3b
Capital Cost Subtotal	$3,931,260	$5,826,000	$1,173,000
Contingency @ 30%	$1,179,378	$1,747,800	$351,900
Total Capital Cost in FY99 Dollars	$5,110,638	$7,573,800	$1,524,900
Total Capital Cost in Net Present Value	$4,766,092	$6,508,000	$1,442,000
O&M Cost Subtotal	N/A	$6,265,000	N/A
Contingency @ 30%	N/A	$1,879,500	N/A
Total O&M Cost in FY99 Dollars	N/A	$8,144,500	N/A
Total O&M Cost in Net Present Value	N/A	$3,486,000	N/A
Total Project Cost in FY 1999 Dollars	$5,110,638	$15,718,300	$1,524,900
Total Project Cost in Net Present Value Dollars	$4,766,092	$9,994,000	$1,442,000

ASA = Auditable Safety Analysis
HSP = Health and Safety Plan
GFE = government furnished equipment.

13. STATUTORY DETERMINATIONS

13.1 CFA-04 Pond

13.1.1 Protection of Human Health and the Environment

The selected remedy for CFA-04 Pond—excavation and disposal of mercury-contaminated soil to an approved facility at INEEL—provides highly effective, long-term protection of human health and the environment. The selected remedy most cost-effectively meets the threshold and balancing criteria of the three remedies considered. The removal of the mercury-contaminated soil from CFA-04 will eliminate potential short-term and long-tern human health and environmental threats. The ICDF will provide isolation of the contaminated soil and prevent adverse effects to human health or the environment.

13.1.1.1 Compliance with ARARs. The selected remedy will be designed to comply with all action-specific and location-specific federal and state ARARs as listed in Table 13-1. The selected remedial design will achieve the FRG of 0.50 mg/kg for mercury. This represents 10 times the background concentration of mercury. Available data indicate that approximately 612 m^3 (800 yd^3) of soil to be excavated from CFA-04 contain levels of leachable mercury above the RCRA characteristic hazardous waste levels. This soil will be treated prior to disposal to meet applicable RCRA land disposal restriction treatment standards. All applicable emission control standards shown in Table 13-1 will be met during the excavation and disposal of the soil. Applicable provisions of Department of Energy Order 5400.5, *Radiation Protection of the Public and the Environment* will be met. The selected remedy will comply with all ARARs.

13.1.2 Cost-Effectiveness

Cost-effectiveness is a determination of whether the cost of a remedy is proportional to the overall effectiveness of the remedy. The long-term effectiveness is rated as high because mercury-contaminated soil will be permanently removed and disposed of to a RCRA-compliant facility. The portion of the soil that exceeds RCRA characteristic hazardous waste levels will be treated by stabilization with cement to achieve land disposal restrictions. A reduction in mobility for that portion of the contaminated soil will be achieved. The short-term effectiveness is moderate because some workers may be exposed to contaminated soil during excavation. Off-INEEL disposal could be implemented sooner than on-INEEL disposal. However, the costs would almost double if off-site disposal is required. The selected remedy is the most cost-effective alternative.

13.1.3 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy uses a permanent solution to the maximum extent practicable. Treatment through stabilization with cement will be used for that portion of the soil that exceeds the TCLP standard for mercury. The mobility of mercury in CFA-04 soil above the FRG will be reduced by placement in an approved disposal facility. Mercury-contaminated soil above the FRG will be permanently removed from the CFA-04 Pond and disposed in an approved facility, thereby eliminating human and environmental exposure. This alternative will prove to be very effective in the long term and provides the best balance between long-term effectiveness and permanence.

13.1.4 Preference for Treatment as a Principal Element

Alternatives incorporating ex situ treatment of the mercury-contaminated soil do not significantly increase the long-term effectiveness, permanence, or protection of human health and the environment-

Table 13-1. ARARs and TBCs for the selected remedies for CFA-04, CFA-08, and CFA-10

Category	Citation	Reason	Relevancy[a]
Action Specific ARARs			
Rules for the Control of Air Pollution in Idaho	Toxic Air Emissions (IDAPA 16.01.01.585 and .586) Fugitive Dust (IDAPA 16.01.01.650 and .651)	The release of carcinogenic and noncarinogenic contaminants into the air must be estimated before the start of construction, controlled, if necessary, and monitored during excavation and sorting of soil.	A
National Emission Standards for Hazardous Air Pollutants	Radionuclide Emissions from DOE Facilities (40 CFR 61.92)	Requires control of dust during excavation and removal of soil.	A
	Emission Monitoring (40 CFR 61.93)	Limits exposure of radioactive contamination release to 10 mrem/year for the off-Site receptor and establishes monitoring and compliance requirements.	A
Resource Conservation and Recovery Act— Standards Applicable to Generators of Hazardous Waste	Hazardous Waste Determination (IDAPA 16.01.05.006) (40 CFR 262.11)	A hazardous waste determination is required for the soil and any secondary waste generated during remediation. Not an ARAR for CFA-08.	A
	Temporary Units IDAPA 16.01.05.008 (40 CFR 264.553)	Applies to temporary (<1 year) storage or treatment units.	A
	Remediation waste stagging piles IDAPA 16.01.05.008 (40 CFR 264.554)	Excavated soils can be temporarily stage prior to disposal.	A
	Storm water discharge during construction 40 CFR 122.26	Will be met during excavation and disposal through engineering controls.	A
	Land disposal restrictions (LDR) IDAPA 16.01.05.011 (40 CFR 268)	Applies only to soils that have triggered placement. Not for CFA-08.	A
	Alternative LDR treatment standards for contaminated soils IDAPA 16.01.05.011 (40 CFR 268.49)	Applies only to soils that have triggered placement, not for CFA-08.	A

Table 13-1. (continued).

Category	Citation	Reason	Relevancy[a]
	Closure and Post Closure Care of Landfills	Although waste in CFA-08 is not RCRA hazardous, the design and maintenance for soil cover will be followed	B
	40 CFR 264.310(a)(1-5)		
Chemical-specific			
	Hazardous waste characteristics identification IDAPA 16.01.05.005 (40 CFR 261.20–24)	Applies if the soils are excavated and consolidated to facilitate their management and for soils that are treated or placed in a long-term storage unit.	A
Location-Specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal Agencies (16 USC 4691.2)	The site must be surveyed for cultural and archeological resources before construction and for appropriate actions taken to protect any sensitive resources	A
	Identifying Historic Properties (36 CFR 800.4)		A
	Assessing Effects (36 CFR 800.5)		A
Native American Graves Protection and Repatriation Act	Custody (25 USC 3002)	The site must be surveyed for cultural and archeological resources prior to construction and for appropriate actions taken to protect any sensitive resources.	A
	Repatriation (25 USC 3005) (43 CFR 10.10)		A
To-be considered (TBC) guidance			
Radiation protection of the Public and the Environment for CFA-08 only.	(DOE Order 5400.5, Chapter II [1][a,b])	Limited the effective dose to the public from exposure to radiation source and airborne releases.	B

a. Relevancy:
A = Applicable
B= TBCs are not classified as applicable or relevant and appropriate.
LDR - Land Disposal Restrictions

than removal and disposal alone. These methods are also more expensive. Treatment is only required for the portion of soil with mercury concentrations in excess of the RCRA characteristic hazardous waste levels for land disposal. The statutory preference for treatment is achieved to the maximum extent practicable.

13.1.5 Five-Year Reviews

Because this remedy will remove hazardous substances and contaminants above levels that allow for unlimited use and unrestricted exposure, five-year statutory reviews will not be required.

13.2 CFA-08 Sewage Plant Drainfield (OU 4-08)

13.2.1 Protection of Human Health and the Environment

The selected remedy for the CFA-08 SP Drainfield—containment of cesium-137- contaminated soil through capping—provides effective, long-term protection of human health and the environment. The selected remedy most cost-effectively meets the threshold and balancing criteria of the three remedies considered. It effectively isolates the contaminated soil and breaks the external exposure pathway in both the short- and long-term. Natural radioactive decay is projected to reduce the cesium-137 concentrations to levels that do not pose an unacceptable risk to human health and the environment in 189 years.

13.2.1.1 Compliance with ARARs. The selected remedy will be designed to comply with all action-specific and location-specific federal and state ARARs as listed in Table 13-1. Available data indicate that no RCRA contaminated media are present at the CFA-08 drainfield. All applicable emission control standards shown in Table 13-1 will be met during the construction. DOE Order 5400.5, “Radiation Protection of the Public and the Environment,” (DOE, 1990) will be met by implementing and enforcing applicable provisions of that order. Therefore, the selected remedy will comply with all ARARs.

13.2.2 Cost-Effectiveness

Cost-effectiveness is a determination of whether the costs of a remedy are proportional to the overall effectiveness of the remedy. The long-term effectiveness of capping the drainfield is rated as high because it would break the external exposure pathway until the human health risks from cesium-137 fall below threshold levels. The short-term effectiveness is moderate, because although the risks from direct exposure will be reduced in the near future, some workers potentially will be exposed to contaminated soil during construction. Although the containment remedy is approximately twice as expensive as the Limited Action (institutional control) alternative, the long-term effectiveness is greater because capping will prevent external exposure from cesium-137 during the calculated 189-year timeframe required for levels to fall below acceptable risk levels. Therefore, the selected remedy is the most cost-effective alternative.

13.2.3 Use of Permanent Solutions and Alternative Treatment Technologies

This selected remedy uses a permanent solution to the maximum extent practicable. The engineered cap is projected to be effective over the 189-year timeframe until natural radioactive decay of cesium-137 causes concentrations to fall below acceptable exposure levels. Therefore, this remedy achieves a high degree of long-term effectiveness. After 189 years, the remedy can be considered to be permanent because radiation from cesium-137 will no longer pose an unacceptable risk to human health.

13.2.4 Preference for Treatment as a Principal Element

This remedy does not use treatment to reduce toxicity, mobility or volume for the following reasons. Natural radioactive decay is the only means to reduce the toxicity of radionuclides. Reduction in mobility is not applicable because the risk from the cesium-137 contaminated soil is from external exposure. Other attempts to reduce the volume of radionuclide-contaminated soil through physical separation have not been successful at the INEEL.

13.2.5 Five-Year Reviews

ICs consisting of monitoring, access restriction, and runoff-control technologies will be used as a part of this remedy. Therefore, five-year statutory reviews will be required for this remedy.

13.3 CFA-10 Transformer Yard (OU 4-09)

13.3.1 Protection of Human Health and the Environment

The selected remedy for the CFA-10 Transformer Yard—excavation, treatment and disposal of lead-contaminated soil at an off-site facility—provides highly effective, short- and long-term protection of human health and the environment. The selected remedy most cost-effectively meets the threshold and balancing criteria of the remedies considered. The removal of the lead-contaminated soil from CFA-10 will eliminate potential short-term and long-term human health and environmental threats. A permitted off-site disposal facility will provide isolation of the contaminated soil and prevent exposure to humans or the environment.

13.3.1.1 Compliance with ARARs. This selected remedy will be designed to comply with all the action-specific and location-specific federal and state ARARs listed in Table 13-1. The selected remedial design will achieve the FRG of 400 mg/kg of lead in soil remaining on site. Excavated soil with lead concentrations exceeding 5 mg/L TCLP will be stabilized with cement prior to disposal. All applicable emission control standards will be met during the excavation and disposal of the soil (DOE-ID 1999a). Therefore, the selected remedy will comply with all ARARs.

13.3.2 Cost-Effectiveness

Cost-effectiveness is a determination of whether the costs of a remedy are proportional to the overall effectiveness of the remedy. The long-term effectiveness is rated as high because lead-contaminated soil will be permanently removed and disposed to an approved, permitted off-INEEL facility. The short-term effectiveness is moderate in that some workers potentially will be exposed to contaminated soil during excavation. The selected remedy is slightly more expensive than the on-INEEL disposal alternative ($1.4 million vs. 1.3 million, respectively). However, off-INEEL disposal can be implemented sooner because the ICDF will not be operational until 2004. Therefore, the selected remedy is the most cost-effective alternative.

13.3.3 Use of Permanent Solutions and Alternative Treatment Technologies.

This selected remedy uses a permanent solution to the maximum extent practicable. Treatment through stabilization with cement, of CFA-10 soil with TCLP concentrations greater than 5mg/kg, will reduce the mobility of lead. Lead-contaminated soil exceeding the FRG will be permanently removed from the CFA- 10 Transformer Yard and disposed of at an approved off-INEEL facility, thereby

eliminating human and environmental exposure. This alternative will prove to be very effective in the long-term and provides the best balance between long-term effectiveness and permanence.

13.3.4 Preference for Treatment as a Principal Element

The statutory preference for treatment through reduction in toxicity, mobility, or volume is met to the maximum extent practicable with the selected remedy. Soil exceeding the lead FRG of 400 mg/kg and the lead TCLP limit of 5 mg/L will be excavated, stabilized with cement to reduce mobility, and disposed of in an off-INEEL facility. No treatment technologies exist to reduce the toxicity or volume of lead-contaminated soil. Therefore, the statutory preference for treatment is achieved to the maximum extent practicable.

13.3.5 Five-Year Reviews

Because this remedy will remove hazardous substances and contaminants above levels that allow for unlimited use and unrestricted exposure, five-year statutory reviews will not be required.

14. DOCUMENTATION OF SIGNIFICANT CHANGES

14.1 Modification of the Preferred Alternative for CFA-08

Alternatives 3a and 3b for the CFA-08 Sewage Plant Drainfield use SGS as the treatment option in the Proposed Plan. The SGS was proposed to reduce the volume of contaminated soil disposed to on- or off-INEEL locations by ex situ separation. A treatability study on SGS was performed by WAG 5 in 1999 (DOE-ID 1999b). The results of the study indicate that cesium-137 contaminated soil at WAG 5 cannot be successfully sorted to satisfy the 2.3 pCi/g FRG for cesium-137 with any volume reduction. As a result, Alternatives 3a and 3b are shown without treatment and the preferred remedy is Alternative 4.

14.2 CFA-04 Information

Table 3 on page 11 and Table 7 on page 1 of the Proposed Plan indicate that the human health hazard index for mercury is 62 at CFA-04. The calculated HQ is 80 as shown in Appendix D, Table D-46 of the RI/FS (DOE-ID 1999a). The values in the Proposed Plan were taken from Section 7 of the RI/FS, which was not updated to reflect the calculated risk values prior to finalization.

Table 3 also shows the FRG for mercury at CFA-04 is 0.74 mg/kg, when it is reported in this ROD as 0.5 mg/kg. The 0.5 mg/kg number represents the average background concentration for composited samples, whereas 0.74 mg/kg is the average background for discrete samples. Because the samples will be composited for analysis during remediation of the pond, 0.5 mg/kg is the appropriate FRG.

The cost estimate for the selected remedy at CFA-04 was $6.9 million NPV in the RI/FS and the Proposed Plan, whereas the estimated cost in this ROD is shown in Table 12-3 as $4.8 million NPV. The cost estimate in this ROD is lower because costs have been recalculated and ICDF disposal costs that will be borne by WAG 3 have been eliminated from the CFA-04 cost estimate. (These modifications are documented in DOE-ID 2000d.)

The Proposed Plan states that Alternative 3b, off-INEEL disposal would be the contingent remedy if the ICDF is not operational. By rernediating CFA-04 last (CY-03), it is believed that the ICDF will be operational for disposal of the contaminated and stabilized soil.

14.3 OU 4-13A Interim Action Proposed Plan

The Proposed Plan for this ROD was titled the OU 4-13A Interim Action Proposed Plan. The following paragraphs explain the naming differences between the OU 4-13 RI/FS, the OU 4-13A Interim Action Proposed Plan, and this OU 4-13 Comprehensive ROD. These changes are a logical outgrowth of the Proposed Plan and other documents in the AR.

Although no unacceptable risks were identified in the OU 4-13 RI/FS via groundwater use at WAG 4, a subsequent report for the OU 4-12 Post-ROD monitoring program identified that nitrate in two wells at WAG 4 was above a federal drinking water MCL of 10 mg/L. On this basis, the Agencies initially decided to separate OU 4-13 into two investigations: OU 4-13A was designated as an Interim Action ROD, and OU 4-13B, which was planned as the groundwater RI/FS. Therefore, the Proposed Plan for the OU 4-13 investigation was retitled the OU 4-13A Interim Action Proposed Plan when it was issued in August 1999.

Subsequent to this decision, information was gathered regarding the likely source and extent of nitrate in the wells. Additionally, a higher allowable level for nitrate was identified in the Federal Regulations that apply when the water is not available to infants under 6 months of age. The average nitrate concentration in one of the subject wells is equal to the MCL; nitrate concentrations in the other

well are less than the allowable MCL and show a downward trend. On that basis, the Agencies decided to eliminate the OU 4-13B RI/FS and maintain the original name, which is the OU 4-13 Comprehensive ROD. Groundwater will continue to be evaluated under the OU 4-12 Post-ROD monitoring program.

14.4 Ecologicai Sites and Risks

On page 8 of the proposed plan, sites that were retained for cumulative site-wide investigation are listed as CFA-01, CFA-02, CFA-05, CFA-13, CFA-17, CFA-21, CFA-26, CFA-41, CFA-43, and CFA-47. The sites retained for further evaluation are CFA-01, CFA-02, CFA-05, CFA-13, CFA-41, and CFA-43, based on further screening of contaminants with HQ less than 10.

On page 7 of the proposed plan, the maximum acceptable level of copper and lead for CFA-10 was listed as 320 and 400 respectively. The maximum acceptable level, or 10 times background values, listed in the RI/FS are 220 and 170 respectively.

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40 CFR 143, *Standards for Protection of the Environment,* "National Secondary Drinking Water Regulations," Code of Federal Regulations.

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40 CFR 264.310, *Code of Federal Regulations*, Title 40, Protection of the Environment, Part 262, "Standards for Owners and Operators of Hazardous Waste Treatment Storage, and Disposal Facilities," Subpart 310, "Closure and Post-Closure Care."

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Part III—Responsiveness Summary

1. INTRODUCTION

The purpose of this Responsiveness Summary is to provide a clear and concise measure of: (1) which aspects or elements of the alternatives for WAG 4 the community supports, opposes, or has reservations about, and (2) general concerns about the sites and the CERCLA process at those sites. This Responsiveness Summary identifies and responds to more than 40 statements of preferences, concerns, comments, and questions received both as formal statements at three public meetings, held on August 17, 18, and 19, 1999, and as written comments in more than 10 pages of materials from at least 12 individuals and interested groups. All comments on the August 1999 Proposed Plan were considered in preparation of the ROD and this Responsiveness Summary and are included verbatim in the Administrative Record for WAG 4. The comments cover a wide range of issues, including:

1. The WAG 4 cleanup in general, specific CFA sites, and the proposed INEEL CERCLA Disposal Facility (ICDF)

2. Past disposal practices

3. Goals for public participation and education

4. The criteria used to compare alternative remedies, identify feasible cleanup methods evaluate technologies, and ensure long-term protection to human health and the environment

5. Uncertainties associated with the CERCLA process and WAG 4 contamination, specifically.

Written comments received and formal statements made at the public meetings showed that community acceptance of the preferred alternatives, as presented in the Proposed Plan, ranges from support, to support with reservations. As documented in this Responsiveness Summary:

1. The preferred alternative of Excavation, Treatment by Stabilization, and On-Site Disposal for the Pond (CFA-04) was generally supported. Commenters asked for more details on aspects of cost and technical implementation of the preferred alternative, and clarification of why phytoremediation could not be considered for this site. This information has been provided in Section 3.3.1 of this Responsiveness Summary.

2. The preferred alternative of Containment for the Sewage Treatment Plant Drainfield (CFA-08) was not opposed in any comments received. At the request of several commenters, additional information describing the contaminant of concern has been provided in this Responsiveness Summary.

3. The preferred alternative of Excavation, Treatment by Stabilization, and Off-INEEL Disposal for the Transformer Yard (CFA-10) was supported by public comment. Additional information on the timing of the remedial action was requested and has been provided in Section 3.3.2 of this Responsiveness Summary.

During the WAG 4 public comment period, additional questions were submitted on several subjects not related to the WAG 4 remediation, such as questions about the Advanced Mixed Waste

Treatment Facility. While these queries were not relevant to this Responsiveness Summary, additional information on these subjects is available by writing or calling:

Ann Riedesel
Public Communications Coordinator
BNFL Inc.
(208) 524-8484
www.amwtp.com or ariedesel@bnflinc.com

Information about the Advanced Mixed Waste Treatment Project is available on the internet at http://environment.inel.gov/wm/amwtp.cfm

Copies of all documents referenced in this Responsiveness Summary can be obtained by writing or calling the INEEL Community Relations Office at the address provided above. Many of the documents also are available on the internet at http://environment.inel.gov/.

2. BACKGROUND ON COMMUNITY INVOLVEMENT

The Proposed Plan for WAG 4 was released in August 1999. During the 30-day public comment period, three public meetings were held, in Idaho Falls, Boise, and Moscow. The comment period was extended an additional 30 days in response to requests from members of the public. All written comments received before the close of the comment periods, and oral comments made during the formal comment session of each public meeting, are responded to by the Agencies in this Responsiveness Summary.

Each public meeting included an informal question and answer session as well as the formal public comment session. The meeting format was described in published announcements and meeting attendees were reminded of the format at the beginning of each meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal question-and-answer periods during the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during that part of the public meeting. However, written transcripts of the meetings capture the presentations and informal questions and answers for members of the public that were unable to attend the meeting. The transcripts are included in the Administrative Record for WAG 4 and can be found at:

INEEL Technical Library
DOE Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83415
(208) 529-1185

Albertsons Library
Boise State University
1910 University Drive
Boise, ID 83725
(208) 385-1621

University of Idaho Library
University of Idaho Campus
434 2nd Street
Moscow, ID 83843
(208) 885-6344

An electronic copy of the Administrative Record is available on the internet at http://ar.inel.gov.

3. SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

The public comment period for WAG 4 Proposed Plan (DOE-ID 1999c) began on August 5, 1999 ended October 4, 1999. Public meetings on the WAG 4 Proposed Plan were conducted in Idaho Falls on August 17, Boise on August 18, and Moscow on August 19, 1999. Written comments and the meeting transcripts are available in the three INEEL information repositories listed in Section 2 as part of the Administrative Record for the WAG 4 Comprehensive RI/FS.

Five members of the public provided oral comments on the Proposed Plan during the August public meetings. Eight groups or members of the public provided written comments. The thirteen comments and questions received during the public comment period have been summarized into succinct statements to capture the significant issue discussed or information requested and assigned individual numbers The summaries were then grouped by topics and responses were prepared.

Table 1 identifies the members of the public who provided comments and their affiliation, if any. It also shows the alphanumeric designation given to their comments. Written comments are numbered W1 through W7 corresponding with the seven individual commenters or commenting groups who submitted them. Oral comments transcribed during the formal comment sessions of the public meetings are numbered according to the location of the meetings and the commenter (IF1 and 1F2 from the Idaho Falls meeting; B1 and B2 from the Boise public meeting; and M1 from the Moscow public meeting).

Comments were further subdivided by identifying a numbering individual issues contained in the thirteen oral or written comments. Appendix A contains the original comments in their entirety, either as scanned written submissions or as public meeting formal comment period transcripts. It also contains a table showing the numbering system for the individual issues and the respective response number.

The Responsiveness Summary begins with a group of questions and comments on INEEL environmental remediation goals, the community relations process, and the budget and planning process for CFA remediation. The second group of questions and comments concerns the comprehensive remedial investigation and feasibility study (RI/FS) and the activities carried out during this process. The third group of questions and comments focuses on the individual sites retained for remedial action under this ROD, their descriptions, and the alternatives developed and evaluated for them. The final group covers tangential but significant concerns that some commenters felt were related to CFA remediation. Within the first three groups of questions and comments, issues are presented in an order parallel to the development of topics in the Proposed Plan. A total of 36 issues or topics are identified in this summary.

3.1 WAG 4 Cleanup and Public Participation

3.1.1 General Comments on WAG 4 Cleanup

1. A commenting group expressed support for the use of disposal and remediation actions that are technically appropriate and cost-effective. [W6-3] Another commenter expressed a low opinion of DOE's scientific and technical standards, and asked why better and more efficient cleanup technologies aren't used. [IF2-1]

   Response: The remedial alternatives described in the Proposed Plan were selected from the range of technologies demonstrated to be effective for sites with similar contaminants and media. Preference was given to technologies that have been demonstrated at the

Table 3-1. Oral and written comments for the WAG 4 Proposed Plan.

Commenter Name	Affiliation or Organization (If provided)	City and State	Document Number Assigned	Number of Comments Identified
Paul Randolph		Sun Valley, ID	W1	1
Charles M. Rice	INEEL Citizen Advisory Board	Idaho Falls, ID	W2	1
George Marriott		Rigby, ID	W3	3
Jared Newman	ONYX Environmental Services	Garden City, ID	W4	3
Warren Adler		Jackson Hole, WY	W5	1
John C. Commander	Coalition 21	Idaho Falls, ID	W6	3
Charles M. Rice	INEEL Citizen Advisory Board	Idaho Falls, ID	W7	4
Beatrice Brailsford	Snake River Alliance		W8	11
Beatrice Brailsford	Snake River Alliance	Idaho Falls, ID public meeting	IF1	5
Vaughn Nebeker		Idaho Falls, ID public meeting	IF2	1
Steve Hopkins		Boise, ID public meeting	B1	4
Pam Allister		Boise, ID public meeting	B2	8
Chuck Broscious		Moscow, ID public meeting	M1	1

INEEL. Innovative and emerging technologies that have been demonstrated at a pilot-scale or greater also were considered.

Each category of possible remedial actions (e.g., containment; removal and disposal; removal, treatment, and disposal) includes many potential technologies. The WAG 4 feasibility study considered only those technologies that met or exceeded the criteria of effectiveness, implementability, and cost. Also considered for each potential technology are: potential impacts to human health and the environment during implementation; whether the technology has proven its reliability; whether the required permits can be obtained; whether treatment, storage, and disposal services are fully available; and the range of equipment and personnel that are required.

Cleanup activities conducted under CERCLA must be cost-effective. Cost-effectiveness is determined by evaluating three of the five balancing criteria that determine overall effectiveness: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. A remedy is considered to be cost-effective if its costs are proportional to its overall effectiveness.

2. A commenting group expressed approval that the technical feasibility of the Proposed Plan alternatives seems straightforward. [W8-1]

   Response: Thank you. The feasibility of an alternative is determined by the application of three criteria: effectiveness (short-term and long-term), implementability, and cost. The preferred alternatives meet these criteria and this information was communicated in the Proposed Plan.

3. A commenting group noted that the term “interim action” is defined under CERCLA as “any action that will not result in full remediation.” However, the group emphasized that proposed remedial actions should constitute final remedies for the contamination sources they are designed to address. The group wrote that it has repeatedly expressed frustration at cleanup efforts that must be repeated, at great cost to taxpayers, because prior efforts were incomplete. All remedial actions taken at WAG 4 should completely and finally address the contamination present to avoid a need for follow-on remediation. [W7-1]

   Response: As explained in Parts I and II, this ROD is now called the Comprehensive ROD. The selected remedies described in the Proposed Plan constitute final remedies or the three sites with surface contamination as well as no action sites that require institutional controls.

4. A commenter noted that it seems irrational that DOE dumped powdered waste containing mercury on the surface but buried less hazardous construction materials. The general DOE rationale for past disposal practices was questioned. [IF1-5]

   Response: Although DOE’s past waste treatment, storage, and disposal practices were considered acceptable at the time, some practices led to the release of contaminants to the environment. As a result, DOE developed its environmental restoration program in 1989 to identify and, where necessary, clean up releases from past activities. In addition, a waste management program was developed to safely treat, store, and dispose of DOE waste generated by current and planned activities in an environmentally and economically sound manner.

3.1.2 Public Participation and Community Relations

5. A resident of Jackson Hole, Wyoming, commented on concerns in his region about the INEEL's general safety record and, specifically, whether there were real dangers to human health. He asked for information about the INEEL's recent environmental safety record and about cancer rates around the INEEL in comparison to other areas. He expressed concern about public ignorance of scientific issues which he feels lead to unwarranted distrust of the government. The commenter would like to learn more himself as well as to be able to better discuss issues with neighbors. [W5-1]

   Response: The INEEL Health Effects Subcommittee is comprised of approximately 12 members from the public, the State of Idaho, the Shoshone-Bannock tribe, and other interest lay persons. They are tracking an INEEL Dose Reconstruction project that is being conducted by the National Center for Environmental Health of the Centers for Disease Control and Prevention. The purpose of this project is to assess human health effects from potential exposure to chemicals from the INEEL. The due date for the project report has not been established, but it is anticipated to be complete in the 1 to 2 year time-frame. Additionally, your comment was forwarded to the Community Relations Office to provide you with more information. The phone number is (208) 526-7400.

6. A commenter charged that DOE's public documents, in a pattern too consistent to be other than intentional, omit facts about the true extent of problems, which can then only be found through research into the Administrative Record. The commenter expressed disappointment that the regulatory agencies do not use their review of these documents to require that more extensive data be presented. [M1-1]

   Response: Data that are salient to the remedial alternative evaluation and selection process are never intentionally omitted. The Proposed Plan is a summary of those sites at CFA where remedial action is required to protect human health and the environment from risks posed by past releases of contamination. It is based on the comprehensive RI/FS for WAG 4. The Proposed Plan is intended to be a high level document that summarizes the most important data that lead to a selected remedy; it is not intended to repeat all the data provided in the baseline documents. The Agencies believe that the Proposed Plan issued in August 1999 adequately summarizes the information in the comprehensive RI/FS.

7. A commenting group and an individual commenter appreciated the willingness of the INEEL to extend the original 30-day comment period. [W2-1, B2-7]

   Response: The Agencies appreciate the public's interest and participation in the public comment period and were pleased to extend the comment period to allow the public ample time to prepare their comments.

8. Several commenters took issue with the Proposed Plan's statement that the INEEL contamination resulted from research activities. One commenter stated that this is a euphemism for what was really nuclear weapons work. [B1-1] The majority of contamination, certainly the most perilous, wrote a commenting group, came from weapons production activities. [W8-2, B2-8]

Response: The Agencies thank you for your input and will consider whether to discuss past and present defense-related activities as a source of contamination at the INEEL in future documents.

While the INEEL will most likely continue to support national defense initiatives, its present mission is to develop and transfer advanced engineering technology and systems to private industry to improve the competitiveness and security of the nation.

9. A commenting group urged public involvement in setting the waste acceptance criteria for the INEEL CERCLA Disposal Facility (ICDF). [W8-10] A commenter concerned about the waste acceptance criteria for disposal on the INEEL urged that there be public involvement in establishing the ICDF waste acceptance criteria. [B2-5]

Response: The Agencies signed a ROD for the Idaho Nuclear Technology and Engineering Center (INTEC; formerly the Idaho Chemical Processing Plant) on October 11, 1999. A major component of the ROD is the construction of the ICDF. The facility will be used to consolidate radioactively contaminated soil and debris from the INTEC and other areas on the INEEL. As described in Part II, Section 12.1.1 and 12.1.3, of this ROD, some materials from CFA are anticipated to be disposed of at the ICDF.

The development of the ICDF itself is part of the remedial design/remedial actions at WAG 3 at the INTEC. DOE has committed to hold at least one public meeting during the WAG 3 remedial design process to solicit input on the ICDF waste acceptance criteria. Questions about the ICDF can be directed to the INEEL Community Relations Office at (208) 526-4700 or (800) 708-2680.

10. A commenting group asked that the INEEL continue to hold briefings or meetings on all cleanup activities, progress, and problems. The group recommended quarterly briefings. [W8-11)

Response: The Agencies encourage citizen involvement in decision-making at the INEEL. Public meetings held in connection with Proposed Plans for cleanup are one of many avenues for public involvement. Other avenues include briefings and tours. Postal addresses, telephone numbers, e-mail addresses, and internet site addresses are provided in all informational materials published by the INEEL. Citizens can contact INEEL representatives through these means to get additional information, briefings, or tours from Agency and project representatives. The range of activities that the public can participate in is described in the *INEEL Community Relations Plan* (May 1995) available from the INEEL Community Relations Office (208) 526-4700 or (800) 708-2680.

3.1.3 Content and Organization of the Proposed Plan

11. A commenter thought that including cancer-causing elements, toxic chemicals, and risks from lead in Table 1 was confusing. Given the different kinds of uptake criteria, the commenter said, these risks could not easily be evaluated individually when the data were combined. An expanded table, or the addition of separate multiple tables, was recommended. [B2-1]

Response: The comment is noted and appreciated and will be relayed to future Proposed Plan writers. The table design was an effort to present the three types of data together.

3.1.4 WAG 4 Remediation Planning and Costs

12. A commenter referring to the $18 million estimated cost to clean up the CFA, called it exorbitant, and wrote that this money should instead be spent at the INTEC. The commenter noted that these public tax dollars should be spent wisely. [W3-1]

    Response: The federal government has an obligation to clean up all contamination resulting from its past activities that pose a significant risk to human health or the environment. One of the purposes of doing risk assessment is to determine which sites create risk as defined by CERCLA. The three sites to be remediated at CFA have been determined to pose an unacceptable risk to human health.

    Cost estimates for the alternatives analyzed during the WAG 4 feasibility study were developed for comparison purposes only. The estimates were developed on the basis of a preliminary conceptual design. Many specific details of the alternatives are not well defined at this time and cannot be included in the estimates. Instead, these details are accounted for as a contingency cost element in each estimate. The cost estimates most likely do not reflect the actual cost of implementing an alternative. Actual project expenditures will likely be less than the cost estimates in the Proposed Plan. As the project design is finalized, the cost estimates will be refined.

    More information about DOE's strategies to improve efficiency and cost saving can be found in Accelerating Cleanup: Paths to Closure (June 1998) (available from the INEEL Community Relations Office, (208) 526-4700 or (800) 708-2680, or on the internet at http://www.em.doe.gov/closure/final/index.html).

13. Several commenters suggested that the assumption of a one-time disposal fee is optimistic and probably has more to do with INEEL's budget than with taxpayer costs. Does this cost estimate assumption hide additional costs for use of the ICDF? [IF1-3, W8-9]

    Response: Typically, disposal facilities charge a one-time fee. The off-INEEL disposal costs were determined by the existing contract between the INEEL and a representative off-INEEL disposal facility. The tippage fee is calculated through determining what the landfill will cost to build and maintain over its life span and then dividing that dollar amount by the amount of material that can be disposed of in the landfill. The fee paid to dump each truckload of waste is a portion of the landfill's lifetime cost.

    As with the individual using the local landfill, the INEEL must pay to dispose of wastes at off-INEEL facilities. However, no fee is paid for facilities on the INEEL. This is because facilities on the INEEL are funded under a separate line item within the budget.

    The Agencies realize that it is difficult to compare two alternatives when one includes a tippage fee and the other does not. If WAG 3 were to charge other INEEL users for the ICDF, the tippage fee would be approximately $104 per cubic yard. The tippage fee for off-INEEL disposal is approximately $300 per cubic yard. The off-INEEL disposal fee is based existing contract between the INEEL and a representative off-INEEL disposal facility.

14. One commenter stated that the Proposed Plan has a lot of fat in it. The commenter recommended that a panel of experts evaluate this project. [W3-3]

Response: The cost estimates provided in the Proposed Plan are rough estimates given for the purpose of comparing the remedial alternatives. As the project continues, the known factors increase, the unknowns and uncertainties decrease, and the cost estimate becomes more specific to the project. During the design phase, as schedules and specifications are developed, the cost estimates will become more precise.

The cost estimates are prepared by professional cost estimators with education and experience comparable to that of professionals in the private sector. Cost estimates for DOE sites must include worker health and safety concerns related to radiologic concerns that are not required in the private sector. (The INEEL's Cost Estimating Guide contains more information about DOE's cost estimating process. It is available at www.inel.gov/capabilies/cost-estimating/eindex.html on the Internet.)

15. Several comments dealt with the relationship between RCRA and CERCLA. One commenter questioned whether the distinction between a RCRA landfill and a CERCLA (Superfund) cleanup site is related to the number of years, or other concerns. [F1-1] A commenting group asked for clarification about how the various waste classification types are disposed of. Are the classifications made in terms of physical, chemical, legal, or political characteristics? Why is decontamination waste accepted for placement in the Radioactive Waste Management Complex (RWMC), but not environmental restoration waste? How do waste types accepted for the RWMC or proposed for the INEEL CERCLA Disposal Facility (ICDF) differ from those going to the Waste Experimental Reduction Facility (WERF)? [W8-3]

Response: Both RCRA and CERCLA establish comprehensive regulatory frameworks to protect human health and the environment from environmental contamination. However, CERCLA is the more comprehensive statute. The principal distinction between the two programs is that RCRA authorizes the safe and protective *current* and *future* management of wastes, while CERCLA authorizes cleanup responses whenever there has been a past release of wastes. The literature on RCRA and CERCLA is extensive, and this response can only address the points raised by the WAG 4 public comments. (More information about RCRA is available at http://www.epa.gov/epaoswer/general/orientat/ on the Internet. Information about CERCLA is available at http://www.epa.gov/superfund/whatissf/cercla.htm on the Internet.)

The term hazardous waste is defined under RCRA regulations as a waste with physical and/or chemical properties that make it dangerous to, or capable of having a harmful effect on, human health or the environment. Classification of waste types is a complicated process and has resulted in a large number of defined categories of waste, some of which are present at the INEEL (more information about the waste types can be found at http://environment.inel.gov/tsd.cfm on the Internet. The amount, status, and handling of the waste types are summarized in the INEEL Annual Reports available on the Internet at http://www.inel.gov/environment/annual_reports/index.html .

Hazardous substances covered under CERCLA include all RCRA hazardous wastes as well as toxic pollutants addressed by other regulations. In general, contamination that contains radionuclides is covered by CERCLA but not RCR-A, and petroleum/natural gas

products are covered by RCRA but not CERCLA. CERCLA requires that on-INEEL remedies meet any legally applicable or relevant and appropriate requirements (ARARs), including RCRA, unless site-specific waivers are obtained. When hazardous wastes are transported off a CERCLA site, they are subject to full RCRA regulation: all transportation and treatment, storage, and disposal requirements under RCRA must be followed. This ensures that wastes resulting from a CERCLA activity are sent to environmentally sound waste management facilities.

Low-level waste is defined as radioactive waste that is not high-level waste, transuranic waste, spent nuclear fuel, or by-product material. Mixed low-level waste contains both hazardous materials and low-level radioactive components.

The RWMC can not accept mixed waste. The ICDF, which is part of the remedial design/remedial actions at WAG 3 at the INTEC, is planned to be a facility that can consolidate low-level waste from several areas on the INEEL, including the CFA. It will also be able to receive low-level mixed waste. A description of the proposed ICDF is contained in the ROD for WAG 3 (available from the INEEL Community Relations Office (208) 526-4700 or (800) 708-2680 or at http://environment.inel.gov/er/erplans.htm on the Internet.) As planned, the soil repository will be an engineered facility meeting state and federal design and construction requirements, including the RCRA requirements.

16. A commenter would like more information on disposal costs for facilities off the INEEL and the factors that lead to variability in those costs. [B2-6]

Response: Cost estimates are based on an existing contract with a representative off-INEEL disposal facility. The cost estimates for disposal of waste at facilities include:

a. How a material has to be handled to prepare it for shipment (whether it must be in barrels, bags, or other containers)

b. The waste media involved (e.g., liquid, solid, sludge)

c. Characterization before the waste is shipped

d. Distance from the INEEL, and whether a special route must be followed

e. Tippage fees charged by the disposal facility

f. Characterization required to be conducted by the receiving facility

g. Transportation of any residuals (such as ash) back to the INEEL (including containers in which it is shipped, the waste media, special transportation routes, and characterization upon its return)

h. Legal, procurement, and subcontracting documentation.

3.2 The CERCLA Process at WAG 4

3.2.1 Risk Assessment

17. A commenter expressed concern about worker health and safety, and asked why the current occupational scenario was not included in the Proposed Plan. [B2-2] A commenting group wrote that it was not clear why only future occupational health risks were considered in Table 1. Do future occupational risks pose current occupational risks as well? [W8-41

    Response: The current occupational scenario was included in the baseline risk assessment conducted as part of the comprehensive RI/FS. Risk assessment results for the current occupational scenario were not provided as a separate column in Table 1 of the Proposed Plan because risks that exceed threshold levels are managed to ensure worker health and safety (see footnote (b) in Table 1). Worker safety is a high priority at the INEEL for all operations. Safeguards used at the INEEL to ensure worker health and safety include engineered barriers, robotics, and personal protective equipment.

18. A commenting group believed the risk assessments were very inaccurate. The group stated that the risk assessments are based on the linear non-threshold theory, which has no scientific basis. [W6-1]

    Response: Risk assessments at CERCLA sites are conducted following EPA guidance which directs use of the linear non-threshold theory. While some deviation from the guidelines is allowed based on the type of site and what contaminants are present, the baseline risk assessments typically follow these guidelines closely. Generally, the EPA guidelines produce a risk assessment that is very conservative: that is, the risk assessment tends to overestimate the risks and hazards at a site. This provides an extra level of protection for the health and safety of humans and the environment.

19. A commenting group would like information on when the future occupational scenario begins. [W8-5]

    Response: For purposes of the risk assessment, the future occupational scenario period begins in 100 years (the year 2095) and lasts for 25 years (through the year 2120).

20. A commenting group did not understand why cumulative excess cancer risk for uranium 238 and arsenic was collapsed into one cell in Table 1. [W8-6]

    Response: Table 1 in the Proposed Plan is a summary the results of the human health risk assessment. The information follows the guidelines set by EPA for Superfund sites. At each site, the exposure routes for each contaminant of concern are calculated and summed, and then the sums of all the contaminants are added together to find the total risk or hazard at the site. The results are presented in Table 1 of the Proposed Plan. This method not only provides the most conservative estimate of risk, but also permits comparisons between sites in each WAG and between WAGs.

3.2.2 Evaluation Criteria and Process

21. A commenter expressed approval that DOE is using the best currently available technology, rather than using experimental techniques. [B1-2]

    Response: Thank you. The types of contaminants at the three sites requiring remediation are readily addressed by available technology, therefore no experimentation is required.

22. A commenting group disagreed with the general approach to remediation that leaves in place contaminants that are deeper than 10 feet below the surface. The group concluded this merely gives the contaminants a head start toward the Snake River Plain Aquifer. [W8-7, IF1-4]

    Response: The depth of 10 feet below ground surface is used to evaluate contamination for a residential scenario in which a basement might be constructed. Contaminants at depths greater than 10 feet are inaccessible to residential receptors. Unless there is a groundwater risk from subsurface contamination, mitigative measures are not considered.

23. Several commenters disagreed with the use of the word "containment" for alternatives involving covers, since the covers are open at the bottom, the side nearest the aquifer. They contended that, although this technology prevents contamination from migrating upward, it fails to prevent migration of contaminants downward. [W8-8] One commenter also noted, however, that the containment cover described is better designed than those recommended for other INEEL remediation activities. [B1-4, B2-3]

    Response: The comprehensive RI/FS determined that contamination at the three WAG 4 sites does not threaten the aquifer. As used by CERCLA, the term containment refers to the ability of a constructed barrier to prevent migration of contaminants along a pathway that results in exposure to human or environmental receptors. For example, if a contaminant poses a human health risk when it is inhaled, the barrier must prevent it from reaching the air.

    The INEEL uses several types of containment barriers, each designed to meet the specific requirements of a contamination site. Containment with an engineered barrier is the preferred alternative only for the drainfield because it will break the exposure pathways of external radiation exposure, thus protecting human health and the environment. Groundwater simulation conducted as part of the RI/FS predicted that Cs-137, the COC at CFA-08, would not impact the Snake River Plain Aquifer above risk-based concentrations. Therefore, the cap effectively "contains" Cs-137 from the only viable exposure route, external exposure. Additionally, an evapotranspiration cover will minimize infiltration at the drainfield. (More information about engineered barrier designs evaluated in the WAG 4 feasibility study can be found in "Evaluation of Engineered Barriers for Closure Cover of the RWMC SDA" [J. F. Keck et al. January 1992] available in the Administrative Record.)

24. A commenting group supported the concept of a single, on-INEEL low-level waste disposal facility to be located at the Idaho Nuclear Technology and Engineering Center (INTEC; formerly the Idaho Chemical Processing Plant). [W6-2]

Response: The Agencies welcome public support of the concept of an On-INEEL disposal facility to be located at INTEC. As described in Part II Sections 12.1.1 and 12.1.3 of this ROD some materials from CFA are anticipated to be disposed at the ICDF. The development of the ICDF is itself part of the remedial design/remedial actions at WAG 3 at the INTEC.

A description of the proposed ICDF is contained in the ROD for WAG 3 (available from the INEEL Community Relations Office (208) 526-4700 or (800) 708-2680 or at http://environment.inel.gov/er/erplans.htm on the internet). It will be used to consiolidate radioactively contaminated soil and debris from INTEC and other areas on the INEEL. Containment in an engineered facility with a liner to prevent leaching and a cap to keep out moisture will significantly reduce the threat to the Snake River Plain Aquifer, protect human health and the environment, and improve DOE's ability to effectively manage the contamination. As planned, the soil repository will meet state and federal design and construction requirements, including the RCRA hazardous waste management requirements.

The decision to locate a repository at the INEEL was driven by cost and benefits. The cost for sending the large volume of waste to a commercial off-INEEL disposal facility, including costs to transport, treat, and dispose of contaminated soil, would be extremely large, compared to the benefits to be gained. DOE estimates that locating a repository on-INEEL will save taxpayers $377 million over the cost of shipping the contaminated soil to an off-INEEL disposal facility.

25. A commenter urged that remediation be selected when it is cheaper than monitoring. [B1-3]

Response: Environmental remedial options are not based solely on cost. A cleanup treatment must satisfy the two threshold criteria used in CERCLA based evaluations of remedial alternatives—overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements (ARARS)— before being ranked according to the five major balancing criteria, one of which is cost.

Monitoring without remedial action, though cheaper than the other alternatives, was determined not to be protective of human health or the environment.

3.3 Release Sites/Groups at WAG 4

3.3.1 Pond (CFA-04)

6. A commenter asked for more detail about the cost estimates for Alternatives 3a and 3b. Specifically, why was there such a disparity in costs between Alternatives 3a and 3b? Was the entire scope of work considered in both cost estimates? Could the off-INEEL option have been overestimated? Is it possible to send just the soils containing RCRA-listed waste off-INEEL, and dispose of the remaining waste on-INEEL? [W4-1]

Response: The estimated cost differences between Alternatives 3a and 3b primarily arise from the costs of both transporting soils to and disposing of the soils at an EPA-approved off-INEEL disposal facility. The estimates were based on cost information from such a

facility. As the project design is developed and the design parameters are finalized, the alternatives may be modified. Modifications may include alternate disposal sites.

Many of the operational aspects of the selected alternatives are not finalized, but will be defined more specifically during the design phase of the project. Stabilization of waste at the pond would meet all ARARs listed in Part II, Section 13 of this ROD, including state of Idaho requirements for fugitive dust emissions.

27. A commenter stated that his professional experience leads him to question the preference of Alternative 3a, given that it has operational and cost disadvantages compared to other alternatives. [W4-1] The commenter listed, the following items for specific discussion:

    a. The requirement of substantial mixing and material setup time to allow for proper treatment.

    b. The requirement of more personnel and equipment for a much longer period of time.

    c. The requirement for more preparations and logistics.

    The esthetic problem associated with high-volume unloading and mixing of Portland cement. The small particle size of the cement could lead to a continuous, large white cloud.

    Controlling this could be expensive and/or difficult due to the INEEL's typically windy conditions.

    Response: As presented in the Proposed Plan, alternative 3a is the least expensive of the three action alternatives considered for the Pond. Treatment of the excavated soils must be conducted in accordance with all applicable or relevant and appropriate requirements (ARARs), including those applying to fugitive dust emissions. (A complete list of ARARs that must be met for this project is contained in Part II, Section 13, of this ROD.) All treatment will be conducted in a manner to ensure the health and safety of workers and the environment.

28. A commenter felt that an easier and less expensive alternative for the pond contamination would be to dig it up and ship it off-INEEL. The commenter argued that the large volume of material would lead to price reductions. [W4-3]

    Response: Cost estimates for off-INEEL disposal of waste excavated from the pond show that the additional shipping and transportation expenses would drive the cost of Alternative 3b to an estimated $12.8 million—nearly double the $6.7 million estimated for Alternative 3a.

29. A commenting group stated that the cost estimate for Alternative 4 seemed very high. The group suggested that phytoremediation could be a less costly alternative, and asked why it was ruled out as an alternative technology. [W7-2]

    Response: Phytoremediarion uses plants to extract contaminants from the soil. Contaminants generally are incorporated into the biomass (the plant). At the end of the

growing season, the aboveground portion of the plant is collected and incinerated. The residual waste (ash) is stabilized and disposed of in a suitable landfill.

The cost-effectiveness and technical implementability of phytoremediation are very site specific. Factors that affect whether phytoremediation is the best overall choice for a site include type of contaminants, concentration level, depth to which they are present, types of plants that will uptake the contaminants, and the need for additional management of plants. For instance, it is best used for contaminants that are within the upper 3 feet of soil, within the root zones of the plants used. Plants may require additional irrigation and soil amendments for optimal uptake. Treatability studies must be conducted to select the best plant species, determine contaminant extraction rates and costs, measure increased contaminant leaching due to irrigation, and other concerns.

Phytoremediation has been identified for use at the following INEEL sites:

- The Mercury Spill Area (TSF-08) in WAG 1. A phytoremediation treatability study will be conducted at the Mercury Spill Area to evaluate plant uptake factors and rates. That area is contaminated with mercury concentrations at 73.7 mg(kg to at least 2.5 feet below ground surface. (More information can be found in the Proposed Plan for WAG 1, available from the INEEL Community Relations Office, (208) 526-4700 or (800) 708-2680.)

- Five sites at Argonne National Laboratory – West (ANL-W; WAG 9) Mercury contamination at the ANL-W sites ranges from 2.62 to 8.83 mg/kg, and is limited to 2 feet below ground surface. The remediation goal for mercury at the ANL-W sites is 0.74 mg/kg. (More information is available in the WAG 9 ROD, available from the INEEL Community Relations Office.)

Mercury contamination exists in the pond bottom at areas with uneven soil thickness, which would make successful growth of the plants difficult. Also, mercury was detected at a maximum concentration of 439 mg/kg at the pond compared to 73.7 mg/kg at the WAG 1 Mercury Spill Area (TSF-08) and a maximum of 8.83 mg/kg at the WAG 9 ANL-W site. To reach the final remediation goal of 0.5 mg/kg would potentially require much more time for the CFA-04 Pond soil. Therefore, implementability of phytoremediation for the pond was determined to be low to uncertain, and the technology was screened from further consideration during the feasibility study.

3.3.2 Sewage Treatment Plant Drainfield (CFA-08)

30. A commenter who worked at the CFA for many years questioned how the residue from the low-level contaminants in the hot laundry wastewater could have resulted in such a large cleanup cost. [W3-21]

Response: The commenter is correct in believing that very low concentrations of radionuclides were disposed of in large volumes over a long period of time at the drainfield. However, the contamination was spread out over a very large area (approximately 200 by 1,000 feet). The residues remain in the approximately 40,000 linear feet of gravel-filled trenches. The cost to cleanup the drainfield is in direct proportion to the size of the contaminated area - approximately 74,000 cubic yards.

31. A commenting group noted that, in approximately 189 years, the risks from cesium-137 contamination at the site would decrease to a level below the human health risk threshold. However, according to Title 5, cesium- 137 has a half-life of 30 years, which leads to a conclusion that the cesium-137 would decay to acceptable levels in 90 years rather than 189 years. The commenting group asked why it would take 189 years to achieve acceptable risk-based levels. [W7-3]

Response: A preliminary remediation goal, or PRG, is a quantitative cleanup level. PRGs are used in planning remedial actions and assessing the effectiveness of remedial alternatives. The maximum concentration of Cs-137 detected at the drainfield was 180 pCi/g. It is this concentration that would require 189 years to decay to the acceptable value of 2.3 pCI/g for residential use.

3.3.3 Transformer Yard (CFA-10)

32. The addition of items for information purposes throughout the text (marked with an "info" icon) was praised, with one exception. A commenting group felt that the text located under the info icon on page 20 raised unnecessary public concerns related to polychlorinated biphenyls (PCBs), particularly given the very low level of PCBs detected at WAG 4. The group stated that this info icon, in particular, was alarmist and served no purpose. [W7-4]

Response: A Proposed Plan is a "brief summary . . . of the RI/FS" (OSWER Directive 9355.3-02, Section 1.2.6). The Transformer Yard (CFA-10) is a fenced yard with a concrete pad that was used infrequently from 1985 to 1990 to store transformers. The area was originally named the "Transformer Yard Oil Spills" because PCB contamination from the transformers was suspected to be present. Although PCB levels were determined to be well within the threshold for industrial sites, the name was retained (with the deletion of "Oil Spills" for consistency). The sidebar discussion was appropriate to include in the Proposed Plan to acknowledge the original suspicions and inform stakeholders of the minor change in name.

33. While approving of off-INEEL disposal and the INEEL's rapid progress toward cleanup, a commenter questioned whether the selection of off-INEEL disposal was the result of expedience or strictly environmental considerations. [B2-4]

Response: The Agencies believe that that the selected alternative, Excavation, Treatment, and Off-INEEL Disposal, remains the most appropriate remedial action for the CFA-10 Transformer Yard soil. As stated in the Proposed Plan, it was selected because the site could be remediated within 15 months after signing this ROD. It provides the best balance of trade-offs among alternatives in terms of the five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness; implementability; and cost). It is cost-effective, because its costs are proportional to its overall effectiveness. Furthermore, it provides the balance of trade-offs among alternative because it emphasizes long-tem effectiveness and reduction of toxicity, mobility, or volume through treatment. Finally, selection of this alternative meets DOE's mission of completing cleanup acrivities as quickly as possible.

3.4 Other Issues

3.4.1 The Snake River Plain Aquifer/Groundwater

34. A commenting group disagreed with the general approach to remediation that leaves in place contaminants that are deeper than 10 feet below the surface. [W8-7, IF1-4]

Response: The depth of 10 feet below ground surface is used to evaluate contamination for a residential scenario in which a basement might be constructed. Under this scenario, residents could potentially be exposed to excavated soil. Contamination is only left in place below 10 feet in situations where groundwater modeling indicates that that the contaminants and/or the concentrations will not impact the aquifer above risk-based concentrations or maximum contaminant levels.

35. A commenter reiterated that his chief concern is that contamination be removed from over the aquifer before it is too late -assuming it is not. [W1-1]

Response: Groundwater modeling conducted as part of the Comprehensive RI/FS indicated that the WAG 4 release sites and tank sites do not constitute an unacceptable risk to the Snake River Plain Aquifer, approximately 500 feet below the ground surface. As part of the remedy for the OU 4-12 Landfills, groundwater monitoring has been conducted for 4 years and will be conducted for 26 more years to detect potential impacts to the aquifer.

3.4.2 INEEL CERCLA Disposal Facility

36. A commenting group contended that this Proposed Plan, like those from other waste area groups, selected remedial actions that require on-INEEL disposal at the proposed ICDF, and that this commitment to a facility that has not yet received public review and community acceptance is in violation of the CERCLA process. The Agencies have created a de facto approval process for an over-the-aquifer facility that the public would not accept. [F1-2, W8-10]

Response: The Agencies have followed all CERCLA requirements in regard to the ICDF. The ICDF was identified in the Proposed Plan for WAG 3 (the INTEC; formerly the Idaho Chemical Processing Plant), and all relevant documentation on the ICDF has been made a part of the Administrative Record. A description of the proposed ICDFs included in the recently signed ROD for the (INTEC). (Available from the Community Relations Office (208) 526-4700 or (800) 708-2680or at http://environnment.inel.gov/er/erplans.htm on the internet.)

4. REFERENCES

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U.S. Environmental Protection Agency, *RCRA Orientation Manual* (available on-line at http://www.epa.gov/epaoswer/general/orientat/

Appendix A

Oral and Written Public Comments

Appendix A

Table A-1. Cross-reference for individual comments and their responses.

Comment or Name and Affiliation or Organization (If provided)	Document and Comment No.	Response No(s)
Written Comments		
Paul Randolph	W1-1	35
Charles M. Rice INEEL Citizens Advisory Board	W2-1	7
George Marriott	W3-1	12
	W3-2	30
	W3-3	14
Jared Newman ONYX Environmental Services	W4-1	26
	W4-2	27
	W4-3	28
Warren Adler	W5-1	5
John C. Commander, Coalition 21	W6-1	18
	W6-2	24
	W6-3	1
Charles M. Rice INEEL Citizens Advisory Board	W7-1	3
	W7-2	29
	W7-3	31
	W7-4	32
Beatrice Brailsford, Snake River Alliance	W8-1	2
	W8-2	8
	W8-3	15
	W8-4	17
	W8-5	19
	W8-6	20
	W8-7	22, 34
	W8-8	23
	W8-9	13
	W8-10	9, 36
	W8-11	10

Table A-1. (continued).

Comment or Name and Affiliation or Organization (if provided)	Document and Comment No.	Response No(s)
	IF1-1	15
	IF1-2	36
Beatrice Brailsford Snake River Alliance	IF1-3	13
	IF1-4	22, 34
	IF1-5	4
Vaughn Nebeker	IF2-1	1
	B1-1	8
	B1-2	21
Steve Hopkins	B1-3	25
	B1-4	23
	B2-1	11
	B2-2	17
	B2-3	23
	B2-4	33
Pam Allister	B2-5	24
	B2-6	16
	B2-7	7
	B2-8	8
Chuck Broscious	M1-1	6

Central Facilities Area, Waste Area Group 4

Idaho National Engineering and
Environmental Laboratory Public Meeting

Central Facilities Area Comprehensive Remedial
Investigation/Feasibility Study Proposed Plan

August 17,1999
Idaho Falls, Idaho
7:00 p.m.

Public Comment

Ms. Brallsford: My name is Beatrice Brailsford. I'm with the Snake River Alliance. We will submit written comments

I think I do finally–and I do understand that CERCLA and RCRA address different concerns. I do think that the difference between a RCRA landfill and a CERCLA Superfund cleanup site is a number of years. It could be 30 years or 100 years or 1,000 years. So, in the real world, there are some similarities. IF 1-1

IF 1 I think I finally, honestly, just now figured out the chronology for the soil dump. We signed a ROD, decide to build a soil dump, and then start working on the criteria, beyond that it's CERCLA waste. We start looking at what really is appropriate to put above the aquifer or leave above the aquifer, to move above the aquifer. The way we figure out what is appropriate to put above the aquifer is we go back through all the cleanup plans and see what we've already decided to put there. And then we figure out what is in that waste, and that is the waste that we allow in the soil dump. IF 1-2

I think that you might have some problems with that. I'm not sure that that is the appropriate way to go about making that decision of both, whether to have one, and hat to put in it.

I think given the fact that at some point a RCRA dump becomes a Superfund site, whenever we're looking at these cost estimates and we look at the one-time disposal fee, I think that is being overly optimistic. IF 1-3

I am becoming more nervous about this 10-foot basement scenario, that it's okay to leave pollution if it's deeper than 10 feet. As far as I can see, all it means is that you're leaving the waste that is 10 feet closer to the aquifer, and you're not ruining its head start. IF 1-4

And that's it. I guess just one more thing. I hope I never understand DOE's version of tidy, but to read that we take powdered mercury and left it on the surface and we buried roofing material is just irrational. Thank you. IF 1-5

Mr. Simpson: Thank you. Anyone else? Vaughn, any comments?

Mr. Nebeker: My name is Vaughn Nebeker, N-e-b-e-k-e-r. I'm the original author and inventor of the technologies which put out Chenobyl, hydrogen bleed-off system at Three-Mile Island, Charilabalnck, and also did the cap that let out LR-1 in Iraq. In putting out the eight atomic nuclear reactors, I'm still batting at 110-percent average. And I always design my own equipment technologies. And sometimes I wonder why sometimes they have so low standards m the DOE. Whereas as a private contractor, I've always tried to have higher and more-efficient standards. Thank you. IF 2-1

Mr. Simpson: Anyone else?

Mr. Freund: I'm George Freund, F-r-e-u-n-d., Coalition 21, and we will submit our comments in writing.

Mr. Simpson: With that, I would like to remind people that the comment period for this project remains open until September 4, 1999. The next time we'll be having public cleanup meetings will be in the fall of 2001 to discuss the Operable Unit 10-04 options. Operable Unit 10-04—I'm going to try to get most of these sites—includes EBR-1 and BORAX sites, the Organic Moderated Reactor Experiment, the site training facilities, the ordinance areas, and various other Waste Area Groups, 6 and 10 site.

Once again, that will be in the fall of 2001. And that is very close to the time frame that the nitrate investigation will be, and we will have a proposed plan for the Central Facilities Area.

With that, thank you for coming. Good night.

(Meeting concluded at 8:40 p.m.)

Central Facilities Area, Waste Area Group 4

Idaho National Engineering and
Environmental Laboratory Public Meeting

Central Facilities Area Comprehensive Remedial
Investigation/Feasibility Study Proposed Plan

August 18, 1999
Boise, Idaho
7:00 p.m.

Public Comment

Steve Hopkins: I just have a few short comments. First of all, I have been concerned when it comes to writing these cleanup path plans. In some of the articles I've seen involving DOE officials commenting on past INEEL activities that is in a substantial amount of revision of history going on. And it may seem to be a minor point, but I think you have to be honest about what has gone on at INEEL in the past, referring to previous research activities as resulting in contamination is definitely a euphemism. B1-1

Basically you're talking about nuclear weapons work. This was a site that was very key in reprocessing bomb-grade uranium used to produce tritium and plutonium at Savannah River. So, I think you should be a little more honest about exactly where the contamination stemmed from.

Some other comments, in terms of good points, I like the fact that—with this particular plan, as opposed to the other plans, there is not as much, for lack of a better word, dinking with the waste like with the soil searcher with WAG that didn't pan out. At least in this case, you're looking at experimenting for the sake of experimenting. It appears that you're going forth with the best available technology even though there may not be any truly real good solutions. It appears that you've selected the best ones. B1-2

Also, I would like you to consider—and a WAG 5 is sort of the model for this, that you look further at sites that you can potentially remediate for less of a cost than monitoring or perhaps not as a significant cost in addition to monitoring. As you stated, with the WAG 5 clean-up plan, some sites were cheaper to remediate than monitor. B1-3

Approximately, half of the remediated activities so far in terms of Records of Decisions that have been signed involving WAGs have been essentially just a cap, very crude cap, at that, just made of soil. Whereas, with this cap, it looks like there is actually some thought into designing it for it to last for more than a few years. B1-4

Although, of course, when you say containment, you're only talking about containment on the top and not the bottom, but at least it appears to be a better design than the previous caps.

And that is all I have at this time. Thank you.

Mr. Simpson: Thank you.

Audience Member: My name is Pam Allister, and I'm the executive director of the Snake River Alliance...Thank you very much for your attention and courtesy this evening. I have a list of comments in no particular priority or flow. I'd like to comment that I found that Table 1 was confusing. And that there with you a sense for me—and I consider myself a lay reader, as a mixing of apples and oranges with a final case of lemons for the risk. It was too quick a table for looking at the risks, because we were looking at cancer-causing elements and also toxics, and lead, which is has its own particular kind of uptake criteria. So, I suggest an expansion some how of Table 1, or Table 1 like graphs in the future. B2-1

I also felt uncomfortable with not including the current occupational scenario in this review. I am hopefully optimistic that there is careful attention being given to the workers at the Central Facilities Area, given the large number of them of 800. And that it is flagged carefully for workers' safety that the nitrates and tritium that is in the groundwater, as that investigation continues at the Central Facilities, is given careful attention, particularly in light of the recent federal revelations. We cannot be too careful with observing and protecting our workers from risk in Idaho. B2-2

I also thank you very much for you acknowledgement that capping is not containment. It takes care of the top but not the bottom. I'm not opposed—I will speak for myself as one member of the alliance. In this case, I'm not opposed to off-site disposal and the moving forward with this particular clean-up, project as fast as possible. However, I am uncomfortable with the decision-making process that was seemingly based on expedience rather than what might be best for the environment. I pose that as a question. I don't have the answer for if it's better stored north or south 300 miles. B2-3 B2-4

Also, I'm beginning to wonder about the waste acceptance criteria for the on-site disposal. I talked with my colleagues who were at last night's meeting, and we do continue to ask that there be good public involvement with setting up the criteria for that facility, especially in a closely affected area of the state. B2-5

In reference to the cost analysis, this hasn't come up for quite the same way as it did this evening, but looking at the variability and the off-site disposal, I'm wondering about the cost-I need to do my homework, I guess and look at this other document, but what is driving this variability and cost for off-site disposal, I'm assuming its market driven, however, I think that we need to bring in the factor of environmental risk and the long-term lifetime cost of disposal and bring to our own awareness the values issue of the lifetime cost of past and current DOE activities. B2-6

I also thank Erik for his informal okay for us to get some of our written comments after Labor Day because Friday I'm going on vacation. I want to forget about this for a couple weeks. B2-7

Lastly, I would like to reiterate what my colleague Steve Hopkins mentioned. I find the first sentence or two of this introduction euphemistic. The 1300 dues-paying members of the Snake River Alliance are very concerned about nuclear weapons production activity, whether they are past, current, or in the future. And it feels very much like a glossing over to say research activities when we know that these activities were B2-8

actually related to tools and instruments, great destruction to the human health and the environment both now and in their intent as weapons. Thank you. B2-8 cont.

Mr. Simpson: Thank you. Any other comments? Well then, with that, I would just like to say that the comment period for this project remains open until September 4th. The next time we will be holding clean-up meetings will be about two years from now. In fact it will be kind of a horse race between this 413b investigation dealing with the nitrates in the groundwater, the Central Facilities Area, or the Operable Unit 10-04 investigation. And that investigation deals with the organic moderated reactor experiment and the site training facilities ordinance area, the Experimental Breeder Reactor 1 and Boiling Water Reactor Experiment Facilities and other site within WAGs 6 and 10. With that, thank you for coming and good night.

(Meeting concluded at 8:45 p.m.)

Central Facilities Area, Waste Area Group 4
Idaho National Engineering and
Environmental Laboratory Public Meeting

Central Facilities Area Comprehensive Remedial
Investigation/Feasibility Study Proposed Plan

August 19,1999
Moscow, Idaho
7:00 p.m.

Public Comment

Audience Member: Chuck Broscious, executive director of environmental Defense Institute, Troy, Idaho. As I've said many times over the years, all the agencies, not only the Department of Energy but also the regulatory agencies have an obligation that when they convey information to the public that it be accurate and that it tell the whole truth and not be anything less than that.

Since DOE is the polluter, the public might even expect that they might not always tell everything there is to know that the public may need to know about what is happening in the process. But what is not acceptable, from our point of view, from the public's point of view, is that when we have regulatory agencies whose mandate is to track these things and force the law, and when they have their logo on these documents that go out to the public, we have an expectation that they do accurately reflect the whole truth and not a selected part of the truth.

M1-1

Over the years, I can't say I have ever seen one of those plans go to the public that I could say accurately reflected the truth, the whole truth. That when I go and do my own research into the administrative record and look at the sampling data and find radically different numbers than is the document that goes out to the public, and I see this consistently year after year after year, it becomes a kind of problem that can't be attributed to a single oversight or a single mistake by somebody that missed something because it's too consistent. And the only thing that we're left with is that there is a deliberate effort on part of all the agencies not to be fully honest about what the extent of the problems are.

If what we found, if there were inaccuracies in the there that covered that were too low or too high, we could say, well, there is not a consistent pattern here. But there is a pattern. And the numbers are always way too low, consistently. There is a problem here.

And if you wonder about how the public responds to you and if you wonder about whether you have any credibility, you can look at this and find out why you have no credibility, why the public doesn't have any faith in this process, and why this is an empty room. I'm here because it's in my job description. That is what I do. I don't get paid for it. I'm unpaid staff. But as a member of that organization, that is what my

board of directors has asked me to come and represent our organization so that, at least, you get some feedback from somebody telling you it's not working and we don't believe you and we don't have any faith in you, and that we don't think that you're going to do the right thing. And you can ask Ruel, a number of years ago—ask him the next time you see him. There was a meeting in Idaho Falls when Grumbly was still undersecretary, he was there. I think it was an EMAC meeting or something like that. And I went up to Tom, I said, "The only thing you guys bloody understand is a court order. You know, this is just spinning our wheels. We never get anywhere with you unless we go to court and a judge tells you that this is what you're going to need to do." And even then they ignored it. Penna almost went to jail. He was cited in contempt by the court because he never followed through on the PE EIS. And, finally, they settled it, but even then—I mean, how many years did that take, probably near a decade.

But that is the only thing you understand is a court order. I will tell you under no uncertain circumstances that that is where I'm putting my work right now. That's where I'm going to spend my time. I'm going home. Have a safe trip.

(Meeting concluded at 8:40 p.m.)

Please return this form by September 4, 1999

What's Your Opinion?

The Agencies want to hear from you to decide what actions to take at the Central Facilities Area.*

WAG 4 Comments: Dear Kathleen —

My comments remain consistent over the years & * get the crap off the top of the aquifer before it has left — assuming it can't. This thing isn't going to go away — but it must be of more profit stop the water table. Don't you think?

W1-1

* Please Bird Regards — [illegible]

W2-1

* If you want a copy of the Record of Decision and Responsiveness Summary, make sure your mailing label is correct.

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Citizens Advisory Board

Idaho National Engineering and Environmental Laboratory

CAB-99-081

August 27, 1999

Kathleen E. Heine, Director
Environmental Restoration Program
U.S. Department of Energy
850 Energy Drive
Idaho Falls, ID 83401

Dear Ms. Haine:

Thank you for the opportunity to review the WAG 4 proposed plan. While we realize that the public comment period is presently scheduled to end on for August 31, we request an extension until September 14 to allow the full board to reach consensus on its recommendation regarding the same at the Board meeting scheduled on that date. W3-1

Thank you for your consideration of this matter. I am in hopes that this request can be accommodated for a thorough review and response.

Sincerely,

Chuck Rice
Chair, INEEL CAB

AUG 27 1999

W3-2

W3-3

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Waste Area Group 4 Proposed Plan

AUG 24

— Comment Form —

This postage-paid return mail comment form is provided for your convenience in submitting written comments to DOE, EPA and the state of Idaho concerning the Central Facilities Area proposed cleanup plan. Please provide your name and mailing address if you would like to receive a copy of the Record of Decision and Responsiveness Summary that addresses public comments received on this project.

Name: George Marriott

Address: P. O. Box 302 **City:** Rigby **State:** Idaho **Zip:** 83442

Reference Monday August 16, 1999 article in the Post Register "18 Million cleanup proposed for INEEL's Central Facility Area". I also understand this figure could be plus or minus 50%. It is not my intent to eliminate employment or to stop reasonable cleanup. However I believe the 18 Million is exorbitant for the CFA project. Would be more reasonable to spend this money at CPP. I have heard the money comes from the "Superfund". Regardless of the source, it comes from tax dollars and should be spent wisely. W4-1

I am familiar with the CFA complex, having worked at the site from 1983-89. The CFA laundry as I remember handled low level radioactive contaminated anti-c's. Many of the isotopes had short half lives i.e. ^{60}Co 5.3 years, some long half lives i.e. ^{137}Cs, 30 years. I can't imagine the residue from the laundry waste water being that large a project. I do not claim to be an expert on the subject of cleanup but common sense tells me this proposal has a lot of fat in it. I recommend a panel of experts evaluate this project. 18 million dollars is not a large amount of money as far government projects go but it is a large amount of money for city, county, and even state governments are concerned. W4-2 W4-3

George Marriott 8/18/99

(continued reverse)

AUG 31 '99 08:26AM ENERGY & ENVIRONMENTAL RESTORATION P.1

WAG 4 COMMENTS

Jared Newman
Project Manager
ONYX Environmental Services, L.L.C.
(formerly known as Waste Management Industrial Services) or Advanced Environmental Technical Services (AETS)

I work for a division of our company that does environmental cleanup at customer locations. Having done this for the past 16 years, I have managed various stabilization projects with the use of kiln material. I have done both "On-Site" and "Off-Site" stabilization projects. I also manage the distribution/disposal of the drum quantities of non-radioactive hazardous waste for the INEEL.

After reading the proposed plan for the CFA Disposal Pond cleanup I was surprised there is such a difference in cost of Alternative 3a and 3b. What would make such a difference? I wonder if the entire scope of work was considered for both alternatives. Could the off-site option have been overestimated? Has there been talk of having just the "RCRA 796 cubic yards" sent for off-site disposal, and the remaining "untreated" soil disposed of on-site?

Here are some operational and cost items I would submit for consideration:

ON-SITE Stabilization disadvantages:

- Requires substantial mixing and material setup time to allow for proper treatment.
- Requires more personnel and equipment for a much longer period of time.
- Requires more preparations and logistics.
- High volume unloading and mixing of kiln or "Portland cement" can be a real esthetic problem because of the small particle size (a continuous large white cloud). Controls can be used, which could be expensive and/or difficult to use due to the typical INEEL windy conditions.

W5-1

I have found that, in many cases it is much easier and in some cases, less expensive (all things considered) to dig it up and ship it off. With a large volume of material, prices can be reduced considerably.

Most of my work is in talking with INEEL personnel, so if anyone would care to talk to me about this or other non-radioactive remediation projects, feel free to pass my name along. I would be interested in a copy of the Record of Decision and Responsiveness Summary.

Thank You,
ONYX Environmental Services, L.L.C.

Jared Newman
5111 W. Alworth, Unit G
Garden City, ID 83714
Phone (800) 735-0966, E-mail jared_newman@AETS

adlamovel@aol.com on 09/07/99 09:33:39 AM

To: Steven K Baker/SKB/UMITCC/NEEL/US@INEL
cc:

Subject: Comments on CFA Proposed Plan

W6-1

W6-2

W6-3

Message Content From Comments.htm

Sender Name
Warren Adler

Project Name
CFA

Comments
I am a resident of Jackson Hole, Wyoming. There is a hysteria building here on the question of incineration of nuclear waste from your facility. Money has been raised for a concerted push against your present plan. My own view is that there is more hysteria than science here. What I would like is some arguments to counter this hysteria. Are their real dangers in the incineration process? Is the area around INEEL safe? Has ther been more cases of cancer in the area of INEEL than elsewhere? There seems to be a great deal of ignorance about the science of this technology. There is also a great deal of distrust of anything the government suggests which, frankly, offends me. Could you enlighten me so that I might enlighten my neighbors. Thanks Warren Adler

To: Peter Beeler 6-9373
From: Carol Hathaway

Please return this form by September 4, 1999

What's Your Opinion?

The Agencies want to hear from you to decide what actions to take at the Central Facilities Area.*

9/2/99

WG 4 Comments: The risk assessments for WAG 3 are based upon The Linear Nathreshold Theory which has no scientific basis. Therefore decisions based upon The derived risks are very inaccurate. Radiation safety levels proposed by The Health Physics Society to provide a comparison of risks and costs associated with the proposed actions.

We support The concept of a single on-site low disposal facility take located at the INTEC.

We support the general principal of getting on with The disposal and remediation actions that are technically appropriate and are cost effective approach.

The comments reflect the opinions of Coalition 21

{No comments this page}

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Citizens Advisory Board

Idaho National Engineering and Environmental Laboratory

99-CAB-100

September 28, 1999

Kathleen E. Hain
Environmental Restoration Program
U.S. Department of Energy, Idaho Operations Office, MS 3911
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Idaho Falls, ID 83401

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Lori DeLuca

Dear Ms. Hain

Note: The Site-Specific Advisory Board (SSAB) for the Idaho National Engineering and Environmental Laboratory (INEEL), also known as the INEEL Citizens Advisory Board (CAB), is a local advisory committee chartered under the Department of Energy's (DOE) Environmental Management SSAB Federal Advisory Committee Act Charter.

The INEEL CAB reviewed the Proposed Plan for Operable Unit 4-13A Interim Action, Waste Area Group 4 (WAG 4), Central Facilities Area at the Idaho National Engineering and Environmental Laboratory. Enclosed is a copy of the INEEL CAB's recommendation #62, addressing the Proposed Plan. The recommendation was approved through consensus by the full CAB at our September 1999 meeting. I might add that we appreciated your willingness to extend the public comment period to allow our participation. W7-1

We await DOE-ID's response to this recommendation.

Sincerely,

Charles M. Rice
Chair, INEEL CAB

cc: Dave Rydalch, INEEL CAB Environmental Restoration Committee Chair
Beverly Cook, DOE-ID
Jerry Lyle, DOE-ID
Carol Hathaway, DOE-ID
Martha Crosland, DOE-HQ
Fred Butterfield, DOE-HQ
Larry Craig, U.S. Senate
Mike Crapo, U.S. Senate
Mike Simpson, U.S. House of Representatives
Helen Chenoweth, U.S. House of Representatives
Laird Noh, Chair, Idaho Senate Resources and Environment Committee
Golden C. Linford, Chair, Idaho House of Representatives Resources and Conservation Committee
Jack Barraclough, Chair, Idaho House of Representatives Environmental Affairs Committee
Gerald Bowman, DOE-ID
Kathleen Trever, State of Idaho INEEL Oversight
Wayne Pierre, U.S. Environmental Protection Agency Region X

W7-2

W7-3

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Citizens Advisory Board
Idaho National Engineering and Environmental Laboratory

W7-3 (cont.)

Proposed Plan for Operable Unit 4-13A Interim Action, Waste Area Group 4 (WAG 4), Central Facilities Area, Idaho National Engineering and Environmental Laboratory

W7-4

The INEEL CAB reviewed the Proposed Plan for Operable Unit 4-13A Interim Action, Waste Area Group 4 (WAG 4), Central Facilities Area at the Idaho National Engineering and Environmental Laboratory. The document was well formatted and easy to understand. We particularly appreciated the "Consumer Reports"-type tables. We have four recommendations to make on the document.

We understand that the term "interim action" is defined under the Comprehensive Environmental Remediation, Compensation, and Liability Act as any action that will not result in full remediation. We understand that some contamination sources at WAG 4 are not addressed by this Proposed Plan, hence the title of the document refers to it as an "interim action." We sincerely hope, however, that the proposed remedial actions described in the Proposed Plan will constitute final remedies for the contamination sources they are designed to address. The CAB has repeatedly expressed frustration at cleanup efforts that must be repeated, at great cost to taxpayers, because prior efforts were incomplete. **The INEEL CAB recommends that all remedial actions taken at WAG 4 completely and finally address the contamination present to avoid a need for follow-on remediation.**

We understand that the contaminant of concern in the Disposal Pond is mercury. We also understand that analysis (based on the Toxicity Characteristic Leachate Procedure) of sediment from three of the 88 sampling locations in the pond bottom supports a conclusion that the sediment meets the definition for hazardous waste under the Resource Conservation and Recovery Act. We question, however, why phytoremediation was ruled out as an alternative technology that could be less costly than the preferred alternative. In addition, the $9.9 million estimate for operating and monitoring costs under Alternative 4 seems very high. **The INEEL CAB recommends further evaluation of alternative technologies to reduce the costs associated with cleanup on the disposal pond.**

Text describing the preferred alternative for the Sewage Treatment Plant Drainfield states that "in approximately 189 years the risks from the Cesium-137 contamination at the site would decrease to a level below the human health risk threshold." Table 5 states that Cesium-137 has a half-life of 30 years. The table leads us to a conclusion that the Cesium-137 would decay to acceptable levels in 90 years rather than 189 years. A presentation to the CAB explained the concept of a "preliminary remediation goal" which was, unfortunately, not well explained in the Proposed Plan. The document simply does not provide an adequate explanation for why it would take 189 years to achieve acceptable risk based levels. **The INEEL CAB recommends clarification of these apparent discrepancies and/or inadequate explanations.** We cannot support the

selection of Alternative 4 as the preferred alternative without a better understanding of how long it will take the Cesium-137 to decay to acceptable levels.

We appreciated the addition of items for informational purposes throughout the text (marked with an "info" icon), with one exception. The INEEL CAB feels that the text located under the info icon on page 20 raises a flag related to polychlorinated biphenyls (PCBs). There was no obvious need to raise unnecessary public concerns, particularly given the very low level of PCBs detected at WAG 4. **The INEEL CAB recommends against the inclusion of alarmist information that serves no purpose in the document.**

W8-1

W8-2

W8-3

Snake River Alliance

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Comments on the Proposed Plan for
Operable Unit 4-13A Interim Action
Waste Area Group 4—Central Facilities Area
Idaho National Engineering and Environmental Laboratory

Snake River Alliance

October 5, 1999

The following comments and questions are submitted on behalf of the 1,300 members of the Snake River Alliance, an Idaho-based grassroots group that has monitored activities at the Idaho National Engineering and Environmental Laboratory since 1979.

The current plan doesn't seem to have any particular tricks in it (eg, soil sorter, moon shot). That's probably a good thing.

The first page of the plan says that "research activities" at INEEL left behind contaminants. The majority of contamination, certainly the most perilous, came from weapons production activities.

At the Idaho Falls public meeting on this plan, the discussion of what waste goes where highlighted an area of confusion: The waste "classifications" used for INEEL cleanup are not always physical or chemical; they are sometimes legal(istic) or even political. For example, it has never been explained satisfactorily why it's okay to put waste from decontamination in the Radioactive Waste Management Complex even though it's not okay to put environmental restoration waste there. Further, when Site officials were asked to compare the waste currently going to RWMC or proposed for the soil dump with that currently being burned at the Waste Experimental Reduction Facility, the response was that WERF is treating off-site waste. That is a political definition that does not address treatment impacts. Later clarification that WERF does not burn soils was a more helpful distinction.

Unfortunately, that brought up another source of confusion that is outside the scope of this plan but well within the scope of INEEL cleanup. BNFL officials have said on more than one occasion that the Advanced Mixed Waste Treatment Project could burn the soil from Pit 9. RWMC personnel don't necessarily seem to agree.

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It's not clear why only future occupational health risks are considered (Table 1), particularly given the loose mercury-contaminated calcine. Do these not pose a current occupational health risk as well? When does the future begin for the occupational scenario?

It is still not clear why the cumulative excess cancer risk for uranium-238 and arsenic were collapsed in Table 1.

Some INEEL cleanup plans are based on the premise that it's okay to leave pollution where it is if it's already deeper than 10 feet. All that seems to do is maintain the headstart towards the Snake River Aquifer that particular contamination already has.

Please note that, even when caps seem adequate, which the one for the disposal pond does, they are not containment. Contamination is covered but left open at the bottom, the side nearest the aquifer.

Given the general acknowledgement that the only difference between a RCRA disposal facility and a CERCLA cleanup site is some number of years, the assumption of a one-time disposal fee probably has more to do with INEEL's budget than with taxpayer costs.

At the Idaho Falls meeting on this plan, I became confident that INEEL recognizes the need for some sort of public involvement in setting the soil dump waste acceptance criteria. Please pursue this matter

Imagine the consternation caused by contemplating a two-year gap between cleanup meetings! What will we do with our time? I suggest INEEL offer quarterly briefings/meetings on all cleanup activities—progress and problems. It would be best if the Department of Energy, regulators, and contractors were all regularly available.

Respectfully submitted,

Beatrice Brailsford
Program director