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Superfund Record of Decision:

US DOE Idaho National Engineering Laboratory (Operable Unit 18), ID

50272-101

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16. Abstract (Limit: 200 words)

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 above-ground pad. The TSA was

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - USDOE Idaho National Engineering Laboratory (Operable Unit 18), ID
Eighth Remedial Action
Contaminated Media: soil, debris
Key Contaminants: VOCs (PCE, TCE), other organics (PCBs), metals (lead), radioactive materials

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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	None	

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

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 ground water 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.

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 double-contained 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; sodium cyanide 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.

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 9 Interim 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 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 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.

AUGUSTINE A. PITROLO
Manager
U.S. Department of Energy Idaho Operations Office

9/23/93
Date

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.

GERALD A. EMISON
Acting Regional Administrator, Region 10
U.S. Environmental Protection Agency

9-24-93
Date

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.

Jerry L. Harris

JERRY L. HARRIS
Director
Idaho Department of Health and Welfare

10/1/93
Date

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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	Comprehensive Environmental Response, Compensation, and Liability Act
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 × 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].

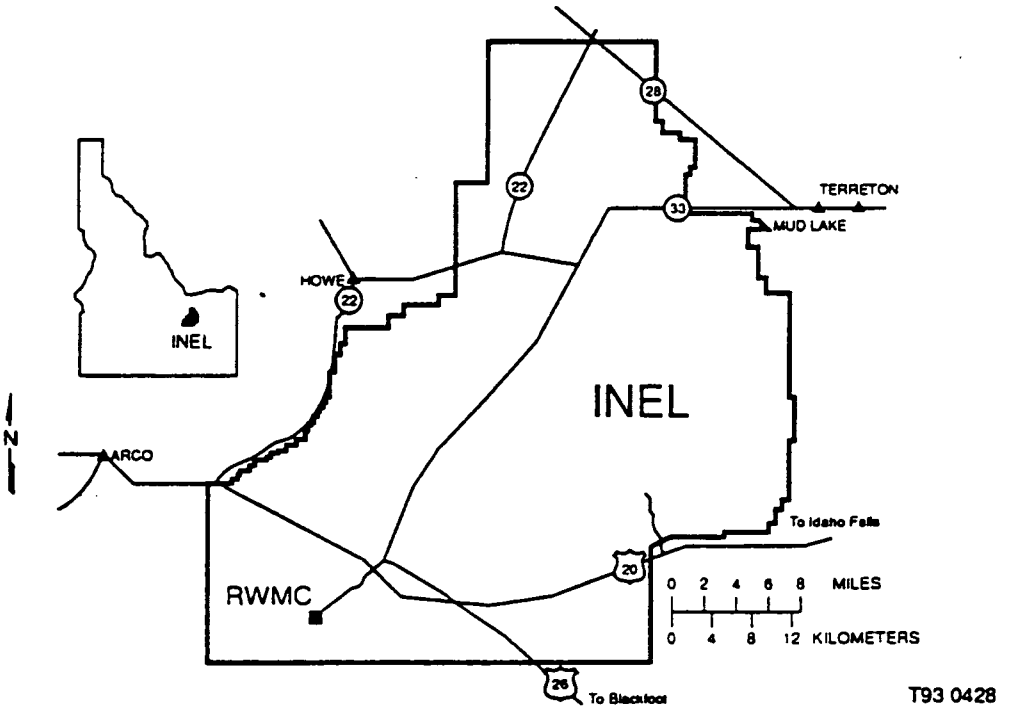

Figure 1. The RWMC at the INEL.

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).

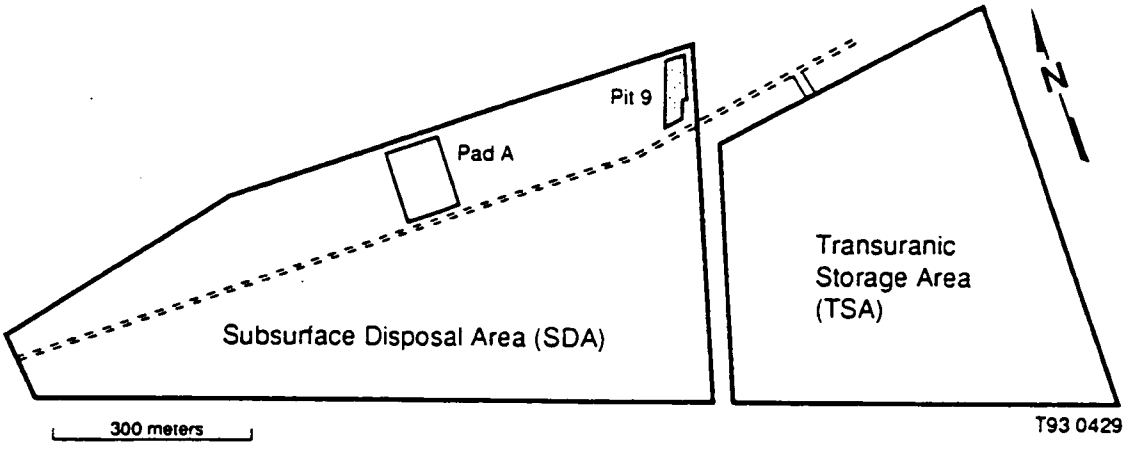

Figure 2. Pit 9 located within the SDA at the RWMC.

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 $\leq$ 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 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 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 informational meetings, 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 remedial alternative, 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 newspapers carried 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 (25-lb) 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

Table 1. Pit 9 Radiological Inventory in 1991 and 1992.[a]

Isotope	1991 Radioactivity (Ci)	1991 Mass (g)	1992 Radioactivity (Ci)	1992 Mass (g)
U-234	8.23E-02	1.32E+01	8.23E-02	1.32E+01
U-235	3.75E-03	1.73E+03	3.75E-03	1.73E+03
U-238	3.97E+00	1.18E+07	3.97E+00	1.18E+07
Th-234	3.97E+00	1.72E-04	3.97E+00	1.72E-04
Pu-238	2.57E+01	1.50E+00	2.55E+01	1.49E+00
Pu-239	1.16E+03	1.87E+04	1.16E+03	1.87E+04
Pu-240	2.65E+02	1.17E+03	2.65E+02	1.17E+03
Pu-241	3.07E+03	2.97E+01	2.93E+03	2.84E+01
Pu-242	1.26E-02	3.20E+00	1.26E-02	3.20E+00
Am-241	2.26E+03	6.59E+02	2.26E+03	6.59E+02
Co-60	1.46E-02	1.29E-05	1.28E-02	1.13E-05
Co-60 (MAP)[b]	5.83E-04	5.16E-07	5.11E-04	4.52E-07
Cs-137 (MFP)[c]	2.63E+00	3.04E-02	2.57E+00	2.97E-02
Ba-137 (MFP)	2.49E+00	4.63E-09	2.43E+00	4.52E-09
Sr-90 (MFP)	2.38E+00	1.71E-02	2.33E+00	1.68E-02
Y-90 (MFP)	2.38E+00	4.38E-06	2.33E+00	4.29E-06

a. EG&G Idaho Engineering Design File ERP-BWP-64, 1991.
b. Mixed Activation Products.
c. Mixed Fission Products.

Table 2. Estimate of Organic Content of Sludge Drums Buried in Pit 9.[a]

Waste Stream	Volume (gal)
Total Organics in 743 Sludge	29,100
Texaco Regal oil	8,200
Carbon tetrachloride	5,500
Trichloroethane	2,900
Miscellaneous Organics	12,500
Trichloroethylene	
Tetrachloroethylene	
Hydraulic oil	
Gearbox oil	
Spindle oil	
Freon	
Varsol	
Polychlorinated biphenyls	Trace amounts
Organic phosphates	Trace amounts
Nitrobenzene	Trace amounts
Total organics in 744 Sludge	2,200
Alcohols	
Organic acids	
Versenes (EDTA)	

a. EG&G Idaho Engineering Design File ERP-BWP-65, Rev. 2, 1991.

Table 3. Estimate of Inorganic Compounds in Sludge Buried in Pit 9.[a]

Material	Mass (kg)	Volume (gal)
Total inorganics in 741 sludge		10,200
Hydrated iron oxides		
Hydrated magnesium oxides		
Hydrated aluminum oxides		
Hydrated silicon oxides		
Hydrated plutonium oxides		
Hydrated americium oxides		
Beryllium (500 ppm)	20	
Portland cement	4,700	
Total inorganics in 742 sludge		14,800
Hydrated iron oxides		
Hydrated magnesium oxides		
Hydrated aluminum oxides		
Hydrated silicon oxides		
Hydrated plutonium oxides		
Hydrated americium oxides		
Mercury (containerized)	100	
Lithium (batteries)	10	
Portland cement	6,900	
Total inorganics in 743 sludge		
Calcium silicate	44,000	
Oil absorbent	6,600	
Beryllium (ppm)		
Total inorganics in 744 sludge		
Portland cement	7,600	
Magnesia cement	1,900	
Total inorganics in 745 sludge		
Sodium nitrate		14,400
Potassium nitrate		7,200

a. Liekhus, K. J., 1992, *Nonradionuclide Inventory in Pit 9 at the RWMC*, EGG-WM-10079.

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 are 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 potential for 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 post-remediated 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 $1.3 \times 10^{-5} \pm 0.3 \times 10^{-5}$ to $9.08 \times 10^{-4} \pm 0.07 \times 10^{-4}$ nCi/g.

- The concentrations of cobalt-60 observed ranged from $5.2 \times 10^{-5} \pm 1.7 \times 10^{-5}$ to $2.8 \times 10^{-4} \pm 0.2 \times 10^{-4}$ nCi/g.

- The concentration of plutonium-238 observed ranged from $1.18 \times 10^{-6} \pm 0.17 \times 10^{-6}$ to $1.7 \times 10^{-5} \pm 0.2 \times 10^{-5}$ nCi/g.

- The concentrations of plutonium-239, -240 observed ranged from $1.0 \times 10^{-5} \pm 0.0$ to $7.4 \times 10^{-4} \pm 0.4 \times 10^{-4}$ 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-trichloroethane, and trichloroethylene were found in several RWMC wells. The 1987 analysis indicated carbon tetrachloride was present at a concentration of 6 μg/L (ppb). Carbon tetrachloride

was the only volatile organic contaminant found above the maximum concentration level (MCL) [5 μg/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 $\leq$ 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 $\leq$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 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.

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.

Table 4. Delisting Levels for Pit 9 Listed Wastes.

Listed Hazardous Waste	Delisting Levels[a] MAL (mg/L)	Total (mg/kg)	Toxicity Characteristics Level (mg/L)
Carbon Tetrachloride (F001 and F002)	0.18	18	0.5
Tetrachloroethylene (F001 and F002)	0.18	45	0.7
Trichloroethylene (F001 and F002)	0.18	15	0.5
1,1,1-trichloroethane (F001 and F002)	7.2	2,910	NA
Sodium Cyanide (P016)	7.2[b]	122[b]	NA
Potassium Cyanide (P098)	7.2[b]	119[b]	NA

a. Calculated using EPACML model assuming a waste volume of 10,000 cubic yards with a Dilution/Attenuation Factor (DAF) of 36. "MAL" is the maximum allowable leachate concentration; "Total" is the maximum allowable total concentration.
b. Calculated using the health-based level (HBL) for pure cyanide (0.2 mg/L), which is conservative.

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 TRU-Contaminated 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.

Table 5. Treatment Standards for Concentrated Treatment Residuals.

LDR Prohibited Waste	LDR Standard[a]	Comments[b]
Carbon Tetrachloride (F001 to F005)	5.6 mg/kg	The LDR concentration level is based on a BDAT of incineration (40 CFR §268.433 Table CCW).
Tetrachloroethylene (F001 to F005)	5.6 mg/kg	The LDR concentration level is based on a BDAT of incineration (40 CFR §268.43 Table CCW).
Trichloroethylene (F001 to F005)	5.6 mg/kg	The LDR concentration level is based on a BDAT of incineration (40 CFR §268.43 Table CCW).
1,1,1-trichloroethane (F001 to F005)	5.6 mg/kg	The LDR concentration level is based on a BDAT of incineration (40 CFR §268.43 Table CCW).
Sodium cyanide (P106)	Amenable—9.1 mg/kg Total—110 mg/kg	The LDR concentration level is based on a BDAT of electrolytic oxidation followed by alkaline chlorination (cyanides); chemical precipitation, settling, filtration (metals)(40 CFR §268.43 Table CCW).
Potassium cyanide (P098)	Amenable—9.1 mg/kg Total—110 mg/kg	The LDR concentration level is based on a BDAT of electrolytic oxidation followed by alkaline chlorination (cyanides); chemical precipitation, settling, filtration (metals) (40 CFR §268.43 Table CCW).
Sodium nitrate (D001—ignitable oxidizer)[c]	Deactivation	The LDR standard is to deactivate the characteristic (chemical reduction or incineration are the recommended methods) (40 CFR §268.42 Table 2).
Potassium nitrate (D001—ignitable oxidizer)[c]	Deactivation	The LDR standard is to deactivate the characteristic (chemical reduction or incineration are the recommended methods) (40 CFR §268.42 Table 2).
Mercury (D009 nonrad elemental mercury—less than 260 mg/kg total mercury)[c] Mercury (D009 radioactively contaminated elemental mercury)[c]	0.20 mg/L (TCLP)[d] Amalgamation	There are two LDR standards: one for elemental, nonradioactively contaminated mercury (based on a recommended BDAT of acid leaching followed by chemical precipitation, dewatering), and one for radioactively contaminated mercury. Mercury in amounts >260 mg/kg are not expected to be encountered (40 CFR §268.41 Table CCWE; §268.42 Table 3; and §268.43 Table CCW).
Lead (D008 nonrad elemental lead)[c] Radioactively contaminated lead (D008)[c]	5 mg/L (TCLP)[d] Macroencapsulation	The LDR standard for nonradioactive elemental lead is based on a recommended BDAT of stabilization. For radioactive lead, no concentration standard exists (40 CFR §268.41 Table CCW; §268.42 Table 3; and §268.43 Table CCW).

a. Alternative LDR standards are expressed as technologies for hazardous debris. Refer to 40 CFR §268.45. However, there is a 1-yr, nationwide case-by-case extension to the effective date for the debris treatment standards [58 FR 28506 (5-14-93)]. Therefore, the debris treatment standards will not become effective until May 8, 1994. These standards should provide flexibility with respect to treatment of materials qualifying as debris.

b. Information presented in *The RCRA Land Disposal Restrictions: A Guide to Compliance, 1992 Edition* (McCoy and Associates, Inc.), Ch. 6, Tables 6.1 and 6.2, was also consulted in preparing this table.

c. These are characteristic hazardous wastes; all others identified in this table are listed hazardous wastes.

d. Toxicity Characteristic Leachate Procedure (TCLP).

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 cost-effective 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 chemical or 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.

Table 6. Total Cost Comparison (in thousands of dollars).

Alternative	#2 In Situ Vitrification	#3 Ex Situ Vitrification	#4 Physical Separation/Chemical/ Extraction/Stabilization Process	#5 Complete Removal, Storage, and Offsite Disposal
Treatability				
Subtotal	unknown	$5,000	$16,000	$0
Interim Activity				
Operations and Maintenance	$6,563	$4,063	$29,102	$59,660
Capital	22,837	25,337	20,661	26,768
Subtotal	29,400	29,400	$49,763	$86,428
Long-term Storage and Offsite Disposal				
Subtotal	$0[a]	$130,815	$61,950	$261,623
TOTAL	$29,400[b]	$165,215	$127,713	$348,051

a. Long-term storage and offsite disposal costs may be applicable to Alternative 2 if the in situ vitrified waste is not acceptable for long-term storage.
b. Total for all activities with the exception of the treatability study.

Alternative 3 - Ex Situ Vitrification

Table 7. Summary of Applicable or Relevant and Appropriate Requirements.

Statute	Regulation	Alternative 2 In Situ Vitrification	Alternative 3 Ex Situ Vitrification	Alternative 4 Physical Separation/ Chemical Extraction/ Stabilization	Alternative 5 Complete Removal, Storage, and Offsite Disposal
HWMA	IDAPA §16.01.05008 [40 CFR §§264.341-343, .345, .347, .351 (Subpart O - Incinerators)]		b	b	
	IDAPA §16.01.05008 [40 CFR §§264.171-178 (Subpart I - Use and Management of Containers)]		a	a	a
	IDAPA §16.01.05008 [40 CFR §§264.192-.199 (Subpart J - Tank Systems)]			a	a
	IDAPA §16.01.05008 [40 CFR §264.601 (Subpart X - Miscellaneous Units)]		a	a	
	IDAPA §16.01.05008 [40 CFR §264.310 (Subpart N - Landfills - Closure/Post Closure Care)]	b	b	b	
	IDAPA §16.01.05008 [40 CFR §264.111 (Subpart G - Closure and Post-Closure) and §264.258 (Subpart L-Waste Piles)]				b
	IDAPA §16.01.05004 [40 CFR §§260.20, .22 (Subpart C - Rulemaking Petitions) (delisting)]			a	
	IDAPA §16.01.05005 [40 CFR §§261.20-.24 (Subpart C - Characteristics of Hazardous Waste)]		a	a	
	IDAPA §16.01.05011 [40 CFR 268 Subpart D - Treatment Standards (§268.41 (concentrations), .42 (specified technologies), .43 (waste concentrations)]		*	*	*
RCRA	Air Pollution emission standards, [40 CFR §264.1032-.1034 (Subpart AA)]			b	
	Air Pollution emission standards, [40 CFR §264.1052-.1063 (Subpart BB)]		b	b	
TSCA	PCB Storage Requirements (40 CFR §§761.40, .45, .65, .79[d])		b	b	b
	PCB Disposal/Incineration Requirements (40 CFR §§761.60, .70[d])		b	b	b
IDAPA	IDAPA §16.01.01101,05.a (Prevention of Significant Deterioration Increments)	b	b	b	
	IDAPA §16.01.01251 and §16.01.01252 (Rules for Control of Fugitive Dust)	a	a	a	a
	IDAPA §16.01.01502 (Emission Limits for particulate matter from incinerators)	b	b	b	

Table 7. Continued.

Statute	Regulation	Alternative 2 In Situ Vitrification	Alternative 3 Ex Situ Vitrification	Alternative 4 Physical Separation/ Chemical Extraction/ Stabilization	Alternative 5 Complete Removal, Storage, and Offsite Disposal
CAA	NESHAPS 40 CFR §61.32(a) (beryllium)	b	b	b	b
	NESHAPS 40 CFR §61.52(b) (mercury)	b	b	b	b
	NESHAPS 40 CFR §61.92, .93 (radionuclides other than radon from DOE facilities)	a	a	a	a
	NESHAPS 40 CFR §61.151(a) (asbestos)		b	b	b
TBCs	RCRA ARARs: Focus on Closure Requirements (OSWER 9234.2-04FS, October 1989)	c	c	c	c
	A Guide to Delisting of RCRA Wastes for Superfund Remedial Responses (OSWER 9347.3-09FS, September 1990)		c	c	
	Superfund LDR Guide #1, Overview of RCRA Land Disposal Restrictions (OSWER 9347.3-01FS, July 1989)		c	c	c
	DOE 5480.2A, Radioactive Waste Management	c	c	c	c
	DOE 5400.5, Radiation Protection of the Public and the Environment	c	c	c	c
	State of Idaho New Source Review Policy for Toxic Air Pollutants			c	
	CERCLA NCP Final Rule Preamble (55 *FR* 8743)	c	c	c	

a. Applicable.
b. Relevant and appropriate.
c. To be considered.
d. Toxic Substances Control Act (TSCA) requirements are relevant and appropriate where PCB concentrations are 50 ppm or greater.
* See detailed discussion in Section 9, "Selected Remedy," for concentrated waste residuals >10 nCi/g TRU to be stored awaiting final disposal. LDR BDAT levels are a goal for Alternatives 3, 4 and 5 regarding stored wastes, pending remedy selection in the TRU-Contaminated Pits and Trenches OU 7-13 RI/FS.

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 double-contained 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 risks associated 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 long-term 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

Table 8. Evaluation of Alternatives.

Criteria	Alternative 2 In Situ Vitrification	Alternative 3 Ex Situ Vitrification	Alternative 4 Physical Separation/ Chemical Extraction/ Stabilization	Alternative 5 Complete Removal, Storage, and Offsite Disposal
Long-Term Effectiveness	c	b	b	d
Reduction of Toxicity, Mobility, or Volume Through Treatment	b	b	a	d
Short-Term Effectiveness	b	b	b	d
Implementability	c	b	b	d
Cost	b	c	c	d

KEY:
a. Best.
b. Good.
c. Poor.
d. Worst.

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 impacts and 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 that impacts 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).

Table 9. Summary of Health Risks Associated with Routine Operations for Cleanup of Pit 9.

	Hazard Index[a]		Nonradionuclide Cancer Risk[b] (Per Person)		Radionuclide Cancer Risk[c] (Per Person)	
Scenario	Worker	Public MEI[d]	Worker	Public MEI	Worker	Public MEI
Excavation	0.000003	0.00001	1E-08[e]	2E-09	2.8E-08	3.3E-09
Incineration	0.0001	0.03	3E-10	2E-09	1.2E-07	6.5E-08
Total	0.0001	0.03	1E-08	4E-09	1.5E-07	6.8E-08

a. Hazard indices are indicators of health risks. A hazard index < 1 indicates that the concentration of hazardous substances in the air would result in no unacceptable noncarcinogenic health risk (EPA, 1989).

b. Based on a slope factor, which is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used to estimate an upper bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen (EPA, 1989).

c. Based on cancer risk factors of 4E-04 and 5E-04 fatal cancers/person-rem for workers and the public, respectively (NRC, 1991).

d. Maximum exposed individual (MEI).

e. To convert a number from scientific notation to its original form, multiply the base number times 10 raised to the given exponent. To convert 3E-06, multiply 3×10^{-6}, giving 0.000003.

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 one-hundredth 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 to the 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 4×10^{-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 the following availability factors 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 and operation 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 twenty-nine 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 characteristic);

- 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 scale remediation 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 the Administrative 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

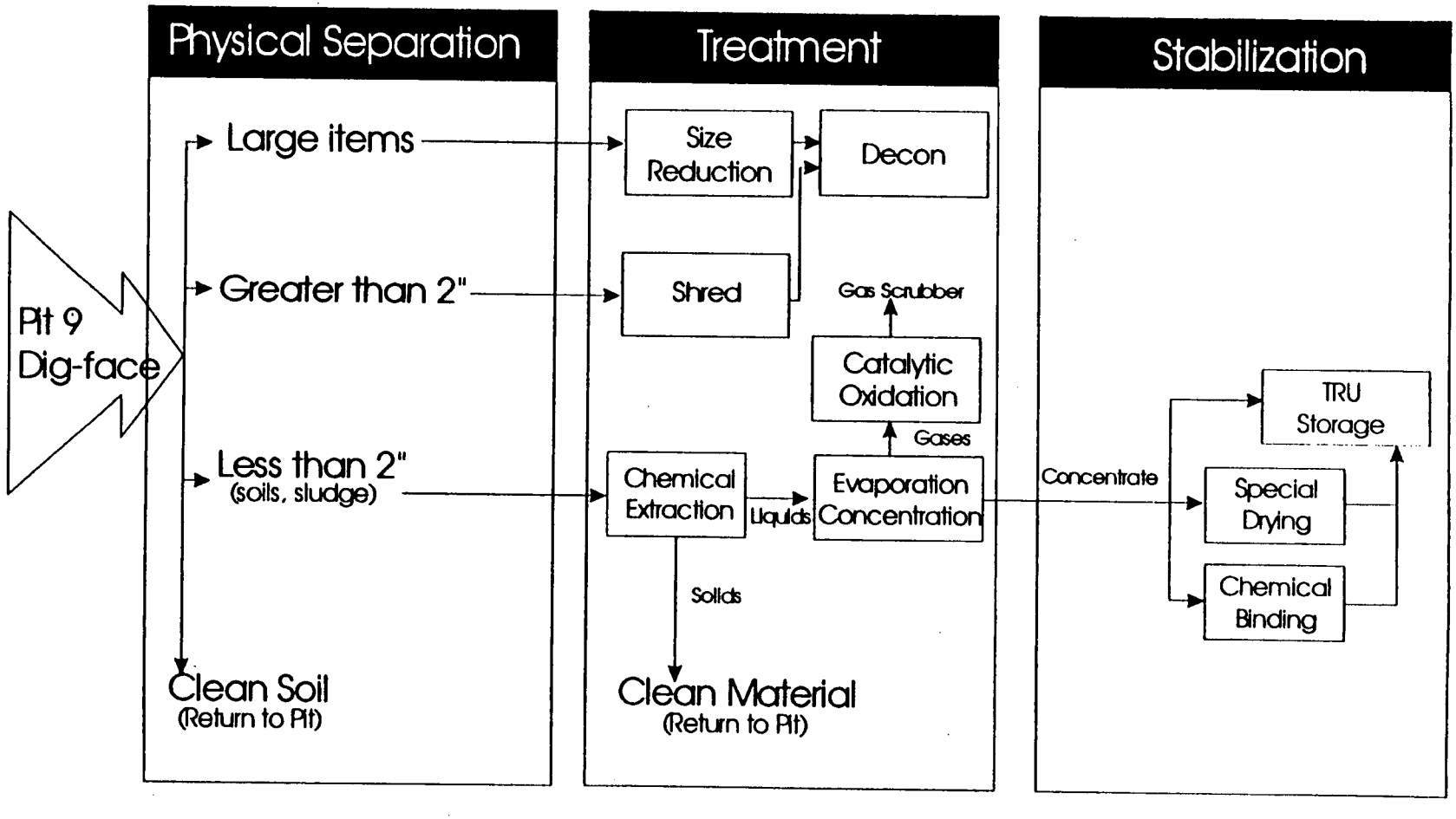

Figure 3. Subcontractor 1 Simplified Process Diagram.

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 ($\leq$ 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 long-term management including site and over maintenance and groundwater monitoring; and (c) institutional controls (e.g., land-use restrictions or deed notices) to restrict access.

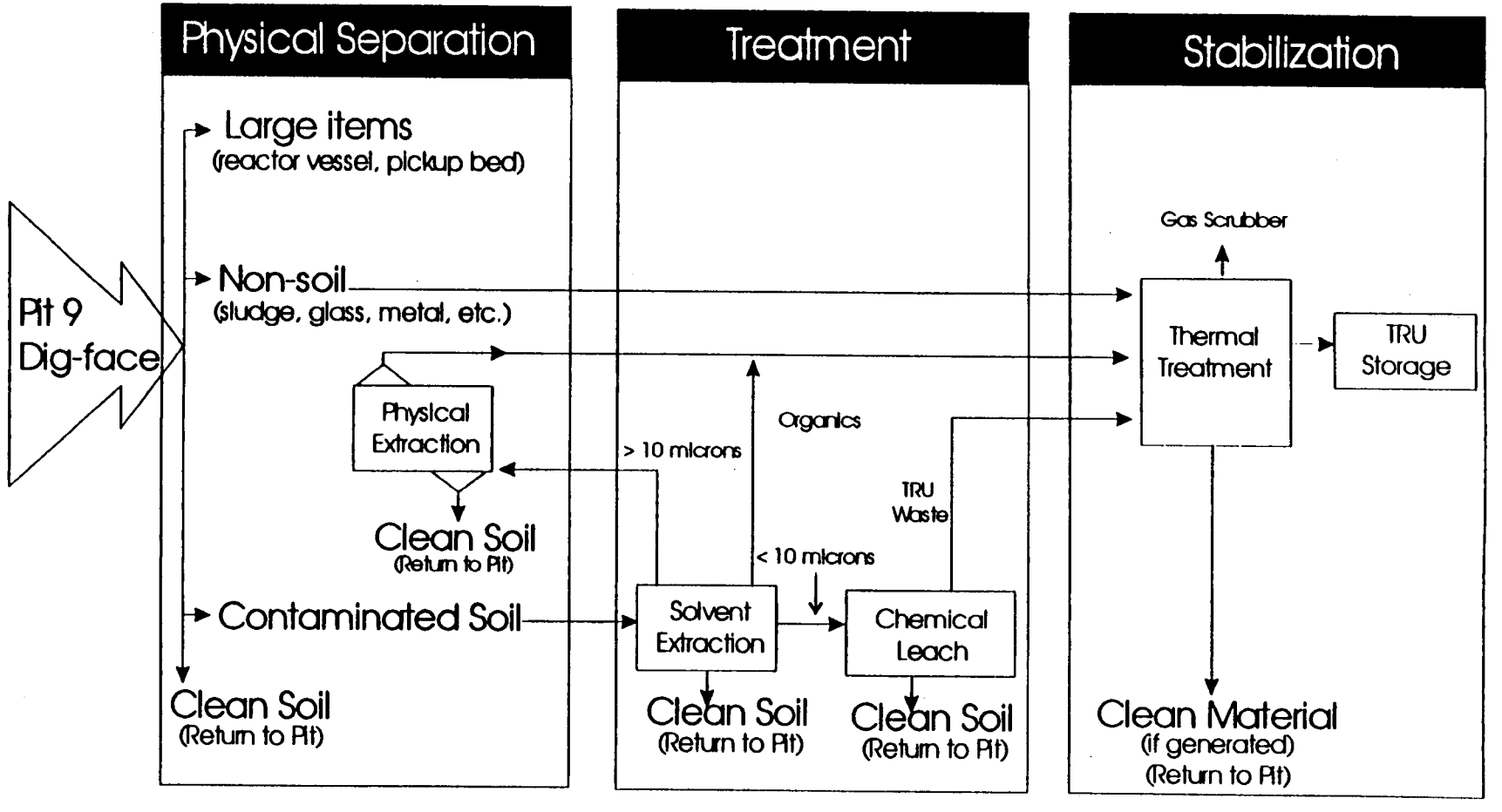

Figure 4. Subcontractor 2 Simplified Process Diagram.

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 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 TRU-Contaminate 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 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.

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 contaminated soils 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 including implementation 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 IDAPA §16.01.01101.05.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 $\mu g/m^3$, 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 hazardous waste, 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 unit-specific 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-term effectiveness 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 long-term 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 a principal 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.