9. Feasibility Study Introduction

9. INTRODUCTION

This section discusses the overall scope, format and content of the Waste Area Group (WAG) 1 Operable Unit (OU) 1-10 Feasibility Study (FS), including assumptions developed to facilitate preparation. Section 9.1 introduces the format of the comprehensive FS. Section 9.2 lists assumptions developed in scoping the OU 1-10 FS. Section 9.3 presents the development of remedial action objectives (RAOs); identifies contaminants of concern (COCs), media and exposure pathways of concern; and identifies potentially applicable or relevant and appropriate requirements (ARARs). Section 9.4 presents the development of general response actions (GRAs), the preliminary remediation goals (PRGs), and presents the estimated volume of contaminated material above the calculated PRGs and the associated assumptions.

9.1 Format of the Comprehensive Feasibility Study

Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare (IDHW) participated in several FS scoping discussions that resulted in the general format of this FS. Three significant decisions developed by these scoping discussions include:

1. The comprehensive OU 1-10 FS would rely heavily on previous remedial responses at the Idaho National Engineering and Environmental Laboratory (INEEL), and elsewhere, to formulate remedial responses for OU 1-10 sites of concern.

2. The analysis of alternatives for the OU 1-10 sites would closely follow the format used for the Test Reactor Area (TRA) (OU 2-13) soil contamination sites, to the extent that it is feasible and practical to do so. The OU 2-13 FS used a similar approach to reduce the number of remedial alternatives considered.

3. The U.S. Department of Energy, Idaho Operations Office (DOE-ID), IDHW, and EPA Region X determined that the Test Area North (TAN) Technical Support Facility (TSF)-06 contaminated soil area, the TSF-07 Disposal Pond, the TSF-26 soil contamination, and the TSF-09/18 V-tank soil contamination sites are sufficiently similar to OU 2-13 sites that RAOs, ARARs, GRAs and remedial alternatives for OU 2-13 should be adopted in the OU 1-10 FS, to the extent that it is feasible and practical to do so. Benefits of this approach include reduced time and cost required to prepare the OU 1-10 FS.

Similarities between OU 2-13 and the OU 1-10 sites, include:

1. Contaminants of concern—COCs for OU 2-13, and for OU 1-10 sites, are almost exclusively radioisotopes dispersed in surficial and near-surface soils. Many of the COCs for OU 1-10 are similar to the COCs identified for OU 2-13 sites, such as the shorter lived radioisotopes, principally Cs-137, Sr-90, and Co-60. Also, both OUs have toxic metals and organics that result in risks greater than allowable ranges at some of the sites.

2. Location—OU 2-13 and the OU 1-10 sites are located on the INEEL, associated with or adjacent to active facilities, in previously disturbed areas.

3. Exposure pathways—Primary exposure pathways of concern at 2-13 and the OU 1-10 sites are direct exposures to future residents at the sites. Infiltration of COCs to groundwater is not expected to produce residential exposure risks greater than the 1E-4 to 1E-6 risk range at

either WAG. Secondary exposure pathways of concern are soil ingestion and inhalation for workers and hypothetical future residents, and consumption of homegrown produce by hypothetical future residents.

Differences between the OU 1-10 and the OU 2-13 sites, include:

1. Types of contaminants of concern—COCs for OU 1-10 soil sites include long-lived uranium isotopes, namely Ra-226, while OU 2-13 COCs are almost exclusively short-lived radioisotopes, principally Cs-137, Sr-90, and Co-60. Differences in COCs affect ARARs, closure requirements, requirements for and effectiveness of treatment, design life of on-site containment alternatives and other considerations discussed further in Section 9 of this FS.

2. Treatment options and alternative development for tank waste contained in the PM-2A tanks at TSF-26 (described in Section 9.4.2.8) and the V-tanks at TSF-09/18 (described in Section 9.4.2.7) are considered in the OU 1-10 FS. OU 2-13 did not have to evaluate tank waste treatment options and alternative development.

3. Other, less significant differences between OU 1-10 and OU 2-13 include areas (i.e., lateral extent) and volumes of contamination, and locations on the INEEL.

Based on the similarities and differences listed above, the contents of the OU 2-13 FS are incorporated in this OU 1-10 FS as appropriate.

9.2 Feasibility Study Assumptions

The assumptions detailed in this section are critical to the development and preparation of this FS. Assumptions were developed in agency conference calls and scoping meetings during November and December, 1996. These assumptions include:

1. The OU 1-10 FS relies on previous remedial responses at the INEEL for the identification, screening and analysis of alternatives.

2. Groundwater contamination due to infiltration was demonstrated in the Remedial Investigation (RI) Report to be within allowable ranges, therefore controlling infiltration is not an RAO or design input.

3. A minimum of 100 years of institutional control would be implemented at all sites where contaminant concentrations exceeding allowable ranges are left in place. In order to remain consistent with the baseline risk assessment (BRA), the 100-year institutional control period is assumed to begin in 1998 and end in 2098. During the institutional control period, the need for continuing institutional controls would be evaluated and determined by the agencies during five-year reviews following site closure.

4. The OU 1-07B Record of Decision (ROD) will ensure that the ongoing remediation will reduce groundwater plume contamination to maximum contaminant levels (MCLs) within the next 100 years. OU 1-07B will not be considered further in this FS.

5. The soils and the contents of TSF-09/18 (V1, V2, V3, and V9) and TSF-26 (PM-2A, V-13, and V-14) will be delisted in the OU 1-10 ROD or a not contained in determination obtained as appropriate.

9.3 Remedial Action Objectives

RAOs for OU 1-10 are developed in accordance with National Oil and Hazardous Substances Contingency Plan and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) guidance (EPA 1988). The RAOs identified for OU 1-10 have been defined through discussions among IDHW, EPA, and DOE. RAOs provide the basis for developing GRAs that will satisfy the objectives of protecting human health and the environment. The RAOs were developed for each medium of concern by integrating the following:

- Pathways and exposure routes
- COCs
- Acceptable risk and/or acceptable contaminant levels based on ARARs
- Environmental protection.

The conclusions from the RI/BRA used for RAO development are discussed below.

- The BRA identified external radiation exposure and ingestion of homegrown produce as the risk-driving exposure routes for soils.
- Lead concentrations above the EPA interim residential PRG of 400 mg/kg have been detected.
- GWSCREEN model results showed that infiltration of COCs from the currently identified soil sites does not result in unacceptable risk levels in groundwater. As a result, the only groundwater risk associated with WAG 1 is the trichloroethylene plume which is undergoing remediation per the OU 1-07B ROD. Therefore, and RAO for the groundwater pathway is not necessary.
- Results of the BRA indicate risks associated with the air pathway are acceptable. Therefore, a RAO for the air pathway is not necessary.
- The V-tank and PM-2A-tank contents were excluded from the BRA analysis. Previous sample data from the tanks was summarized in the WAG 1 RI/FS Work Plan (Lewis et al 1996) and indicate that the contaminants present in the tank contents would result in a risk if they were released to the environment. On the basis of environmental protection, a RAO for the tank contents was developed.
- There are a number of facilities/structure that have been identified as having the potential to impact risk estimates at TAN. The facilities are identified as co-located and contaminant data can not be obtained. The RAO for these facilities/structures encompasses any uncharacterized release to the environment as a result of operations or decontamination and decommissioning (D&D).

The RAOs specified for protecting human health are expressed in terms of risk levels for specific COCs and exposure pathways because protection can be achieved through a reduction in contaminant concentrations, as well as through the reduction or elimination of exposure pathways. These COC-specific RAOs are based on the results of the BRA and ARARs. The overall intent of these RAOs is to maintain the contribution to cumulative risk from the soil pathway to at or below 10^{-4} for the future resident. The RAO specified for the V-tank and PM-2A tanks and tank contents are protective of the environment and are intended to prevent potential future effects to the environment. The RAOs specified for the co-located facilities are intended to encompass previously uncharacterized contamination to the environment, if identified or accessed, either as a result of releases from the facility and/or the D&D activities. The RAOs for co-located facilities are designed to maintain cumulative risk (i.e., risk from the sum of all complete pathways and exposure routes) at or below 2E–04 for the future resident. The RAOs developed for OU 1-10 sites are the following:

RAOs for the soil pathway are:

- Reduce risk from external radiation exposure from Cs-137 and Ra-226 in soil to a total excess cancer risk of less than 10^{-4} for the 100-year future resident.
- Prevent direct exposure to lead in soils at concentrations in excess of 400 mg/kg.
- Prevent uptake of mercury in soil that would result in a hazard quotient greater than 1 for the homegrown produce ingestion exposure route for the 100-year future resident.

The RAO for the V-tank and PM-2A tanks and tank contents is:

- Prevent any release of tank content(s) COCs to the environment.

RAOs for co-located facilities are:

- Maintain the current institutional control of the co-located facilities until D&D is complete.
- Prevent risk at the co-located facility sites from exceeding 2E–04 total excess cancer risk from all exposure routes if releases are discovered or known releases are accessed.
- Prevent noncarcinogenic hazards at the co-located facility sites from exceeding a hazard quotient (HQ) of 1 from all exposure routes if releases are discovered or known releases are accessed.

9.3.1 Potential Applicable or Relevant and Appropriate Requirements

Applicable Relevant and Appropriate Requirements (ARARs) are laws or regulations that could impact the remedial actions that will be performed at the WAG 1 release sites. In other words, if a potential remedial action might have to comply with a given law or regulation, the law or regulations is identified as an ARAR.

In general, ARARs can be divided into three categories; action specific ARARs, location specific ARARs, and chemical specific ARARs. Action specific ARARs are usually technology or activity based requirements for actions taken at a site. Action specific ARARs generally do not guide the development of

remedial action alternatives, but they do focus on requirements for implementation of the selected remedy. Chemical specific ARARs are usually health or risk based numerical substantive requirements that result in the establishment of numerical values. These values establish the acceptable amount, or concentration, of a given contaminant that may be found in, or discharge to, the environment. Finally, location specific ARARs are regulatory requirements or restrictions placed on activities in specific locations. These requirements or restrictions must be met by remedial activities at the location.

Table 9-1 lists the ARARs that have been identified for the WAG 1 release sites.

9.3.1.1.1 Location-Specific Regulatory Requirements Inappropriate to WAG 1—The WAG 1 area is not located in a 100-year flood plain. An extensive flood control system has been built at the INEEL that uses a diversion gate and a series of spreading areas to control high flows from the Big Lost River, which typically occur in the late spring and early summer.

Birch Creek originates from springs below Gilmore Summit in the Beaverhead Mountains and flows in a southeasterly direction onto the Snake River Plain (SRP). The water in the creek is diverted from the channel 6.4 km (4 mi) upstream of the INEEL northern boundary via a canal for irrigation and hydropower uses. Flows not used for irrigation during the off-season, usually the first of November through mid-April, are returned to the main Birch Creek channel within the INEEL boundary. The channel leads to a gravel pit near Playa 4, located 6.4 km (4 mi) north of the main facilities at TAN, where it infiltrates the gravel pit bottom. Water was observed flowing in this area of the Birch Creek channel during early April 1992. If the flow is continuous throughout the winter season, the water readily infiltrates the channel and gravel pit bottom. However, if the flow is interrupted, the channel and pit bottom may freeze, reducing infiltration rates. In this event, a second channel is used to divert the flows to a second gravel pit, located to the east away from the TAN facilities.

A hydrological characterization of the Birch Creek Basin indicated a low potential for flooding at TAN (Koslow and Haaften 1986). This study included a flood-frequency analysis, which demonstrated a low flood potential for Birch Creek. Birch Creek discharges are characteristic of a stable stream fed by groundwater, with low flows of 2.1 m^3/s (75 ft^3/s) and very consistent discharges. The predicted 100-year peak flow of 3.3 m^3/s (116 ft^3/s), at a station near Reno, 6.4 km (4 mi) upstream of the INEEL northern boundary, would not cause flooding at TAN. Presently, Birch Creek flows below Reno are diverted for hydropower and irrigation with no flow onto the INEEL during the irrigation season and minimal return flow onto the INEEL during the winter months.

The area surrounding TAN has been surveyed in the past and no sites of archaeological or historical value were found. All potential remedial areas within TAN are considered disturbed areas that do not contain material of archaeological or historical significance. Therefore, the regulatory requirements associated with the preservation of antiquities and archaeological materials/sites will not serve as ARARs for any activities at WAG 1.

WAG 1 is not known to be located within a critical habitat of an endangered or threatened species, including bald and golden eagles, nor are such species known to frequent the WAG 1 proximity. However, bald eagles, golden eagles, and American peregrine falcons have been observed at the INEEL. In addition, eight species of concern to the Idaho Department of Fish and Game and Bureau of Land Management (BLM) have been observed at the INEEL. Remedial activities at WAG 1 are not expected to affect any endangered species, because activities are anticipated to be conducted entirely in previously disturbed areas, and limited in both duration and affected area. However, before initiation of a remedial action potential impacts to endangered species may be further evaluated.

Table 9-1. Compliance applicable or relevant and appropriate requirements (ARARs) and to be considered controls (TBCs) for Waste Area Group 1 sites.

Regulation, Statute, or Order	Citation
ARAR	
Idaho Hazardous Waste Management Act	IDAPA 16.01.05.005 (40 CFR 261) IDAPA 16.01.05.006 (40 CFR 262.11) IDAPA 16.01.05.007 IDAPA 16.01.05.008 (40 CFR 264) IDAPA 16.01.05.009 IDAPA 16.01.05.010 IDAPA 16.01.05.011 (40 CFR 268)
Toxic Substances	IDAPA 16.01.01.161
National Pollutant Discharge Elimination System	40 CFR 122.26
Toxic Substances Control—PCBs	40 CFR 761
PCB Marking Requirements	40 CFR 761.40(a)(1), (a)(9), (a)(10), (e), (h)
Disposal of Rags, Debris after Remedial Action	40 CFR 761.60(a)(4)
Disposal of PCB Containers after Remedial Action	40 CFR 761.60(c)
PCB Spill Cleanup During Remedial Action	40 CFR 761.60(d)
Storage of PCB Waste	40 CFR 765.65(b) except (b)(v)
30 Day Storage of PCB Waste During Remedial Action	40 CFR 761.65(b)
PCB Waste Inspections	40 CFR 761.65(c)(5)
PCB Container Requirements	40 CFR 761.65(c)(6) and (c)(7)
Placing a Date on PCB Containers	40 CFR 761.65(c)(8)
PCB Landfill Technical Requirements	40 CFR 761.75(b)(3), (b)(4), (b)(5), (b)(6)(ii), (b)(6)(iii), and (b)(7)(i)
PCB Spill Cleanup During Remedial Action	40 CFR 761.125 and .130
Manifesting PCB Waste Offsite	40 CFR 761.207 and .208
Evaluate Federal Projects for Impact to Endangered or Threatened Species or Critical Habitats	50 CFR 402.12
Evaluate DOE Projects for Potential Floodplain and Wetland Impact	10 CFR 1022
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.650 and .651

Table 9-1. (continued).

Regulation, Statute, or Order	Citation
Hazardous Waste Determination	40 CFR 262.11
Accumulation of Hazardous Waste	40 CFR 262.34(a)(1), (2)(c)(1), and (4)
General Waste Analysis	40 CFR 264.13(a)(1),(a)(2)
Security	40 CFR 264.14
General Inspection	40 CFR 264.15
Personnel Training	40 CFR 264.16
Location Standards	40 CFR 264.18(a)
Preparedness and Prevention	40 CFR Subpart C
Emergency Planning	40 CFR 264 Subpart D except 264.56(j)
Operating Record	40 CFR 264.73, except 264.73(b)(8)
Miscellaneous Units	40 CFR Subpart X
Land Disposal Restrictions for Secondary Waste	40 CFR 268.7, 9, .40, .45, .48
Rules for Solid Waste Management	IDAPA 16.01.06.004
Flood Plains	40 CFR 257.3-1(a)
Groundwater	40 CFR 257.3-4(a)
Idaho Water Quality	IDAPA 16.01.02.299(5)(a) and (b)
Idaho Ground Water Quality Rule	IDAPA 16.01.11.200
Container Standards	40 CFR 264 Subpart I except .179
New Tanks Systems	40 CFR 264.192 (except certifications will not be submitted)
Containment and Detection of Releases	40 CFR 264.193
General Operating Requirements	40 CFR 264.194
Inspections	40 CFR 264.195
Response to Spills and Leaks	40 CFR 264.196
Closure	40 CFR 264.197(a) and (b)

Table 9-1. (continued).

Regulation, Statute, or Order	Citation
Incompatible Waste	40 CFR 264.199
Requirements for Portable Equipment	IDAPA 16.01.01.500.02
NESHAPS—Mercury	40 CFR 61.52(b)
Mercury Emissions Testing	40 CFR 61.53(d), .54
Mercury Emissions Monitoring	40 CFR 61.55
Ground Water Protection Standard	40 CFR 264.92
Hazardous Constituents	40 CFR 264.92
Point of Compliance	40 CFR 264.93
Ground Water Monitoring Requirements	40 CFR 264.97
Detection Monitoring Program	40 CFR 264.98(a), (b), (c), (d), (e), and (f)
Closure Performance Standards	40 CFR 264.111(a) and (b) and .114
Closure and Post Closure	40 CFR 264.310(a)(1), (2), (3), (4), (5); (b)(1) , (4), (5), (6)
Surveying and Record Keeping	40 CFR 264.309(a) and (b)
Assessment of Existing Tank Systems	40 CFR 264.191(a), (b), and (d)
Preconstruction Compliance with Toxic Standards	IDAPA 16.01.01.210
NESHAPS—Radionuclide Emissions from DOE facilities (other than Radon-222 and Radon-220 at DOE Facilities-Emission Standard)	40 CFR 61.92
Emission Monitoring	40 CFR 61.93
Emission Compliance	40 CFR 61.94
Rules for the Control of Air Pollution in Idaho (Air Toxins Rules) Toxic Air Emissions	IDAPA 16.01.01585 and 16.01.01586
Landmarks, Historical, and Archeological Sites	40 CFR 6.301
Migratory Bird Conservation	16 USC 715
Requirements for Land Disposal of Radioactive Waste	10 CFR 61
Location Standards	40 CFR 264.18(a)

Table 9-1. (continued).

Regulation, Statute, or Order	Citation
Preparedness and Prevention	40 CFR Subpart C
Emergency Planning	40 CFR 264 Subpart D, except 264.56(j)
Operating Record	40 CFR 264.73, except 264.73(b)(8)
National Historic Preservation Act	16 USC 470 et seq.
Storm Water Discharges	40 CFR 122.26
To be considered (TBC)	
Environmental Protection, Safety, and Health Protection Standards	DOE Order 5480.4
Radioactive Waste Management	DOE Order 5820.2A
Radiation Protection of the Public and Environment	DOE Order 5400.5
Hazardous and Mixed Waste Program	DOE Order 5400.3
Environmental Protection, Safety and Health Protection Standard	DOE Order 5480.4
Residual Radioactive Material in Soil	DOE Order 5400.5, Chapter IV
Low Level Radioactive Waste Management	DOE Order 5820.2A, Chapter III
General Design Criteria	DOE Order 6430.1A

a. ARAR waivers will be required for Waste Area Group 1 as indicated below.

No fish or wildlife addressed by the Threatened Fish and Wildlife Act are found at WAG 1, nor do the planned activities at WAG 1 involve the modification of a stream because no streams are located on the site and surface runoff is controlled.

Occasionally, migratory waterfowl are observed at the WAG 1 site. However, the area contains no critical habitat and remedial activity at this time does not appear to have a potential for adverse impacts to migratory waterfowl.

The seismic standards contained in the RCRA and Idaho regulations are only applicable to certain counties, as specified in the regulations themselves. WAG 1 is located in Butte County, which is listed neither in Appendix VI to 40 CFR 264 nor the Idaho regulations and is, therefore, exempt from demonstrating compliance with the seismic standard.

9.3.1.1.2 Location-Specific ARARs Appropriate to WAG 1—A review of the location-specific, regulatory requirements presented in the previous section suggests that the National Historic Places requirements and Storm Water Discharge requirements for construction activities may be the most likely ARARs for WAG 1.

At present, sites located within the WAG 1 area have not been deemed potentially eligible for the National Register of Historic Places by the Idaho State Historical Society. However, prior to initiation of activities that could potentially impact WAG 1 Idaho State Historical Preservation Office may want to photograph some of the WAG 1 sites and will be notified of the planned activities..

During implementation of remedial activities within WAG 1, storm water and associated discharges, if any, will be managed using construction best management practices in accordance with 40 CFR 122.26. Long-term storm water management, depending upon subsequent disposition of contaminated facility, will be managed in accordance with the storm water management plan approved for such a facility.

9.3.1.2 To-Be-Considered Criteria, Advisories, or Guidance. A to-be-considered (TBC) list identifies criteria, advisories, guidance, or policies which do not meet the definition of ARARs but which may assist in determining what is protective in the absence of an ARAR for a specific contaminant or circumstance. Preliminary TBCs for the WAG 1 site include:

- DOE Orders—Orders that may apply are listed in Table 9-1
- Federal and State rules pertaining to relevant subjects that are not promulgated criteria, limits or standards [by definition of Section 121(d) of CERCLA].
- EPA guidance documents.
- Remedial action decisions at similar Superfund sites.

DOE Order 5820.2A is the primary TBC affecting OU 1-10 sites of concern. This Order addresses management of low-level waste, and is typically applied to management of radionuclide-contaminated soils.

9.4 General Response Actions

GRAs identify broad categories of remedial actions that will satisfy RAOs for the environmental media associated with the OU 1-10 sites. In order to protect human health and the environment, the intent of GRAs is to eliminate source-to-receptor pathways by preventing external exposure from and direct contact with contaminants, and by reducing or eliminating contaminant migration to uncontaminated media. Radionuclide-contaminated soil, nonradionuclide-contaminated soil, tanks and the associated tank contents are the media of concern targeted for remediation at the OU 1-10 sites.

GRAs, individually or in combination with other GRAs, can satisfy RAOs in one of two ways. Contaminants can be destroyed or reduced in concentration to levels posing insignificant risks to human health and the environment, or contaminants can be isolated from potential exposure and migration pathways to decrease risks to human health and the environment. Contaminant destruction is the preferred method because it ensures that RAOs have been satisfied. However, radionuclide contamination within the OU 1-10 sites cannot be destroyed and must therefore be isolated from potential exposure and migration pathways.

A range of GRAs and combinations of GRAs that could achieve varying degrees of protectiveness of human health and the environment and compliance with RAOs were defined. Six GRAs and combinations of GRAs identified for contaminated soil and tank waste at OU 1-10 sites include:

- No action—does not involve active remedial actions with the exception of environmental monitoring. Monitoring is included to enable identification of potential contaminant migration or other changes in site conditions that may warrant future remedial actions.

- Institutional Controls—actions taken by the responsible authorities to minimize potential danger to human health and the environment. Institutional controls are ongoing actions that can be maintained only for as long as the responsible authority is in control of the site. At such time the site is no longer institutionally controlled, appropriate deed restrictions will be put into effect to limit access to the site. Based on the *Comprehensive Facility and Land Use Plan* (DOE-ID 1996) institutional controls will be maintained for a minimum of 100 years following closure. Institutional controls are assumed to be similar to those currently in place at the specific sites of concern. In order to remain consistent with the BRA, the 100-year institutional control period is assumed to begin in 1998.

- Containment—utilizes a combination of containment actions and institutional controls. Containment refers to remedial actions taken to isolate contamination from the accessible environment. Through isolation of contaminants, potential exposure pathways to human or environmental receptors are eliminated.

- In Situ Treatment—consists of implementing technologies capable of immobilizing or reducing the toxicity or volume of contaminants in situ. No method exists for destroying radionuclide contaminants or reducing their toxicity. However, volumes of contaminated media may be reduced, and some toxic metals may be rendered less toxic through treatment.

- Ex Situ Treatment—treating contaminated soil and tank contents after removal. As for in situ treatment, no method exists for destroying radionuclide contaminants or reducing their toxicity. However, volumes of contaminated media may be reduced, and some toxic metals may be rendered less toxic through treatment.

- Removal—complete removal of material contaminated at concentrations greater than PRGs from the sites.

- Disposal—disposal of contaminated materials or waste streams generated from treatment at an appropriate location.

9.4.1 Preliminary Remediation Goals

PRGs are quantitative cleanup levels, based primarily on ARARs and risk-specific doses (EPA 1988). PRGs are used in remedial action planning and assessment of effectiveness of remedial alternatives. Final remediation goals are based on the results of the BRA, and evaluation of expected exposures and risks for alternatives, and consider effects of multiple contaminants. The OU 1-10 ROD will present final remediation goals. The 1E-04 risk level is the basis for determining PRGs for OU 1-10. External exposure to radionuclides is the primary exposure pathway of concern for OU 1-10 COCs. Therefore, PRGs for individual COCs were defined by calculating soil concentrations that would result in excess

cancer risks greater than 1E–04 to hypothetical residents present at the end of the 100-year institutional control period by external exposure using a decayed value over the 30-year exposure duration (i.e., an average concentration for the exposure period). Current and future worker risk is controlled during the institutional control period. PRGs for OU 1-10 COCs are listed in Table 9-2.

9.4.2 Areas and Volumes of Interest

This section defines the areas and volumes of contaminated media at OU 1-10 sites of concern. The contaminated media at OU 1-10 consist of soil and tank waste. The site-specific areas, depth of contamination, and volumes as presented in the OU 1-10 RI/BRA are summarized in Table 9-3. Table 9-4 presents the assumed area, depth, and volume of contaminated soil on a site-by-site basis given the PRGs and an assumed maximum excavation depth of 3.05 m (10 ft). For soils, the PRGs presented in Table 9-2 were used to reduce the volume of contaminated material from that presented in the Table 9-3, where appropriate. The maximum excavation depth assumption was only applied to sites with zones of contamination that extended below 3.05 m (10 ft). The basis for the assumption stems from the BRA protocol for assessing residential exposure over a 0 to 3.05 m (0 to 10 ft) depth interval. As a result, a maximum removal of 3.05 m (10 ft) of soil from any site would meet the PRG by eliminating all potential routes of exposure. Table 9-5 presents the volume of tank content waste for TSF-09/-18 and TSF-26. The following sections discuss the FS area and volume assumptions on a site-specific basis.

9.4.2.1 TSF-06, Area B. TSF-06, Area B was subject to a removal during 1995; however, an area of known contamination was left in place because excavation and removal would require partial removal of Snake Ave., which borders the length of the site. The area of contamination is illustrated on Figure 9-1.

Table 9-2. Soil preliminary remediation goals by contaminants of concern and site.

Site	COC	PRG (mg/kg or pCi/g)[a]
TSF-06, Area B	Cs-137	2.33E+01
TSF-07	Cs-137	1.17E+01[b]
	Ra-226	2.71E–01
TSF-08	Mercury	1.9E+00
WRRTF-01	Lead	400[c]
TSF-03	Lead	400[c]
TSF-09/18	Cs-137	2.33E+01
TSF-26	Cs-137	2.33E+01
WRRTF-13	TPH[d]	1.00E+03

a. PRGs were estimated assuming a 100 year institutional control period followed by a 30 year residential scenario. Radionuclides were decayed over the residential exposure period and the concentrations represent the activity in soil which would result in 1E–04 risk.
b. Cs-137 PRG at TSF-07 is less than the other Cs-137 PRGs because TSF-07 has two contaminants with calculated risk in excess of 1E–04. In order to achieve a total risk for the site of 1E–04, each contaminant must be remediated to a 5E–05 risk-based concentration (RBC).
c. Lead PRG is based on ARARs.
d. TPH = total petroleum hydrocarbon.

Table 9-3. Site areas and volume from the OU 1-10 RI/BRA.

Site	Area m^2 (ft^2)	Depth m (ft)	Volume m^3 (ft^3)
TSF-06 Area B	3.832 (41,250)	0.76 (2.5)	2,920 (103,125)
TSF-07	9,049 (97,400)	3.35 (11)	30,339 (1,071,400)
TSF-08	61 (660)	3.05 (10)	187 (6,600)
WRRTF-01	2,520 (27,125)	6.10 (20)	15,362 (542,500)
TSF-03	155 (1,664)	5.33 (17.5)	825 (29,120)
TSF-09/18	372 (4,000)	14.48 (47.5)	5,380 (190,000)
TSF-26 (surface soil)	7,316 (78,750)	0.30 (1)	2,230 (78,750)
TSF-26 (soil in tank area)	650 (7,000)	14.48 (47.5)	8,453 (298,500)
WRRTF-13 —[a]	—[a]	—[a]	—[a]

a. WRRTF-13 was not quantitatively evaluated in the OU 1-10 RI/BRA.

9.4.2.2 TSF-07, TAN Disposal Pond. TSF-07 is an active disposal pond which, given past use of approximately 5 acres, has an assumed area of contamination of approximately 9,049 m^2 (97,400 ft^2). The active portion of the pond makes up about 1,487 m^2 (16,000 ft^2) of this area. While Cs-137 concentrations in the pond sediments do not exceed the OU 1-10 PRG of 1.17E+01 pCi/g for all samples in the pond, Ra-226 throughout the top 3.35 m (11 ft) of pond sediments are above the OU 1-10 PRG of 2.71E-01 pCi/g. For purposes of the FS, the resulting volume of contaminated material is based on a depth of 3.05 m (10 ft) in the inactive portion of the pond. As discussed in Section 9.4.2, the basis for this assumption is the removal depth that would be required to eliminate potential exposure under a residential scenario. Figure 9-2 illustrate the volume estimate for the site.

9.4.2.3 TSF-08, Area 13 B, TSF HTRE III Mercury Spill Area. The volume of residual contamination at TSF-08 was reduced from the volume estimated in the RI/BRA given the calculated OU 1-10 PRG for mercury of 1.9 mg/kg (which is based on estimating the concentration of mercury resulting in a HQ of 1 for the homegrown produce ingestion exposure route) and the occurrence of isolated PRG exceedances within the site. As summarized in the RI/BRA, TSF-08 was subject to a removal action in 1994 with a target removal level of mercury contamination in excess of 80 mg/kg (which was based on the soil ingestion exposure route). The site was successfully remediated to that level and covered with approximately 0.76 m (2.5 ft) of clean soil. Based on the five verification sample results from that action, two areas of the site are assumed to have contamination above the OU 1-10 PRG of 1.9 mg/kg. The depth of these samples varied over a 0.76 m to 1.52 m (2.5 to 5 ft) below ground surface (bgs) interval. The results from the other verification samples indicated either nondetectable concentrations or levels below the PRG.

Table 9-4. Areas and volume of contaminated soil based on the preliminary remediation goals and modified depth assumptions.

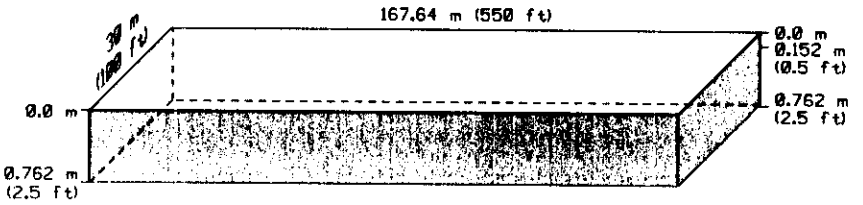
Site	Area m^2 (ft^2)	Depth of Cover m (ft)	Contaminated Interval m (ft)	Volume m^3 (ft^3)
TSF-06 Area B	511 (55,000)	0	0.76 (2.5)	2,920 (103,125)
TSF-07	9,048 (97,400)	0	3.05 (10)	23,050 (814,000)
TSF-08	3.72 (40)	0.76 (2.5)	2.29 (7.5)	8.50 (300)
WRRTF-01	1.21 (13)	1.22 (4)	1.83 (6)	2.21 (78)
	1.21 (13)	1 (3)	2.13 (7)	2.58 (91)
	1.21 (13)	0.15 (0.5)	2.90 (9.5)	3.51 (124)
	1.21 (13)	2.74 (9)	0.30 (1)	0.37 (13)
			WRRTF-01 (total)	11.50 (406)
TSF-03	155 (1,664)	0.61 (2)	3.05 (10)	471 (16,640)
TSF-09/18	372 (4,000)	0	3.05 (10)	1,133 (40,000)
TSF-26	—[a]	0	—[a]	3,891 (137,400)
WRRTF-13	171 (1,840)	1.5 (5)	1.5 (5)	260 (9,180)
	30 (324)	1.8 (8)	0.6 (2)	18 (648)
	9 (100)	1.6 (6)	1.2 (4)	12 (405)
			WRRTF-13 (total)	290 (10,233)

a. Area estimate based on differing areas of contamination identified during 10-06 removal during 1996. See Section 9.4.2.8 and Figure 9-7.

Table 9-5. Volume of tank waste liquid and sludge.

Site/Tank	Tank Capacity L (gal)	Liquid Volume L (gal)	Sludge Volume L (gal)
TSF-09/-18, V1	37, 854 (10,000)	4,543 (1,200)	2,006 (530)
TSF-09/-18, V2	37, 854 (10,000)	4,543 (1,200)	1,779 (470)
TSF-09/-18, V3	37, 854 (10,000)	23,091 (6,100)	2,574 (680)
TSF-09/-18, V9	1,514 (400)	416 (110)	95 (25)
TSF-26, PM-2A Tank V-13	189,271 (50,000)	189 (50)	7,192 (1,900)
TSF-26, PM-2A Tank V-14	189,271 (50,000)	189(50)	1,325 (350)

TSF-06, Area B



LEGEND

Zone of contamination for Cs-137.

ASSUMPTIONS:

- The volume of contaminated material is assumed to extend .76 m (2.5 ft) bgs and extends below Snake Ave.

Figure 9-1. TSF-06, Area B volume assumption.

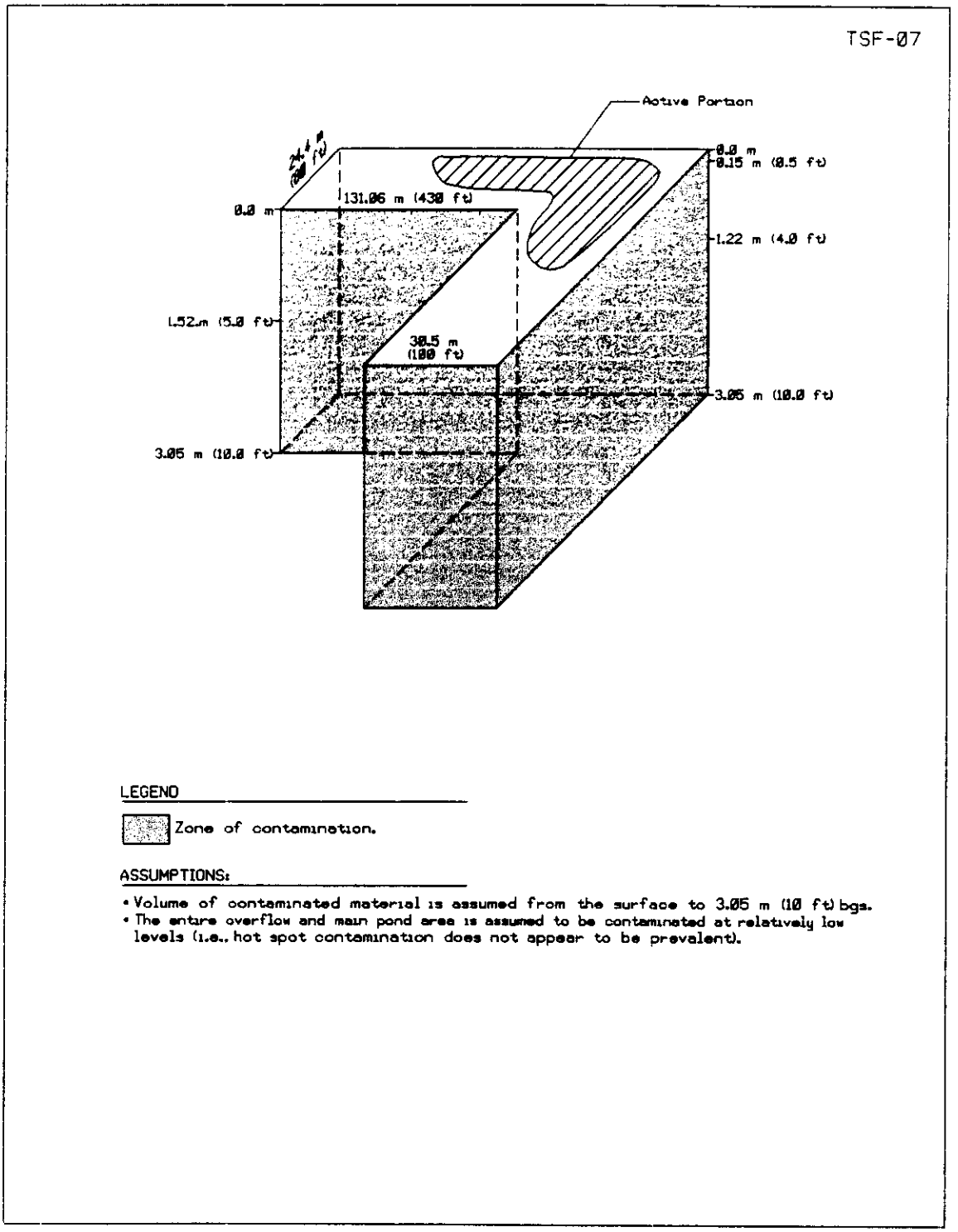


Figure 9-2. TSF-07 volume assumption.

Based on the limited mobility of mercury and the fact that previous removal actions have been implemented in the area, a 0.61 m (2 ft) radius about the sample locations where the exceedances were observed was assumed to encompass the lateral extent of contamination. Given that a minimum of 0.76 m (2.5 ft) of clean soil has been placed over the area, the contaminated interval is assumed to extend to a maximum of 3.05 m (10 ft) (i.e., from 0.76 to 3.05 m [2.5 to 10 ft] bgs). Figure 9-3 illustrates these assumptions. This distance between contaminated area results in an overall site area of 12.2 by 3.05 m (40 by 10 ft).

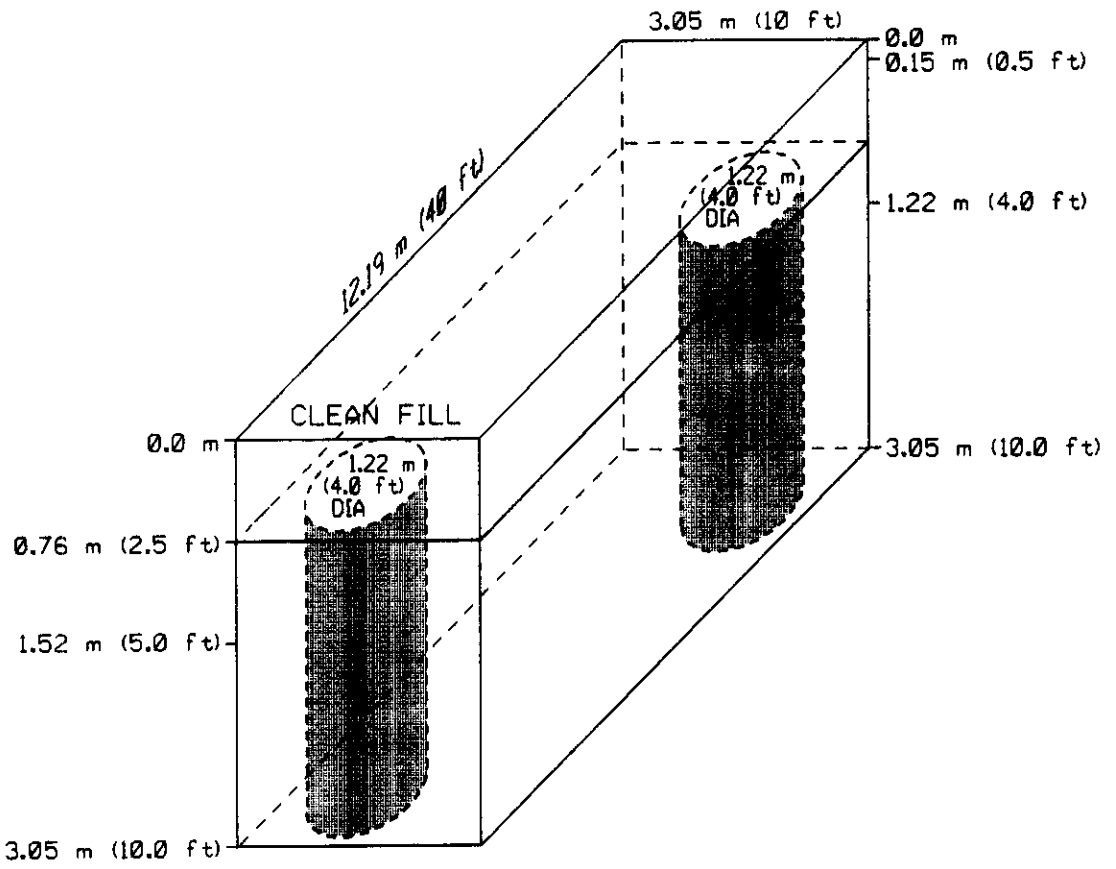
9.4.2.4 WRRTF-01 Burn Pits. Similar to TSF-08, lead concentrations throughout the WRRTF-01 Burn Pits are not homogeneous. Levels exceeding the PRG of 400 mg/kg are isolated in Pits I, II, and IV. Lead levels above the PRG were not observed in Pit III. As summarized in Section 8.4.5, clean soil cover over the burn pits ranges from 0.15 to 2.74 m (0.5 to 9 ft). The area encompassing all four pits, including the noncontaminated area between the pits, is 150 by 50 m (492 by 164 ft). Excluding Pit III, this area is reduced to approximately 122 by 50 m (400 by 164 ft).

The observed PRG exceedances are limited to one of four boreholes sampled in Pit I from the 1.22 to 2.44 m (4 to 8 ft) interval, one of four boreholes sampled in Pit 2 from the 1 to 2.74 m (3 to 9 ft) interval, and two of eight boreholes sampled in Pit IV collected over the 0.15 to 3.96 m (0.5 to 13 ft) and 2.74 to 3.66 m (9 to 12 ft) interval, respectively. All other samples were below the PRG of 400 mg/kg. Figure 9-4 illustrates the assumptions for the burn pits. If a similar assumption is applied to the mercury contamination at TSF-08 (i.e., a 0.61 m (2 ft) radius with a limiting depth of 3.05 m (10 ft)), the volume of lead-contaminated soils within the pits can be calculated. This volume is summarized in Table 9-5.

9.4.2.5 TSF-03 Burn Pits. Samples collected from four boreholes placed in the TSF-03 Burn Pit all have lead concentrations in excess of the 400 mg/kg PRG, thus for the purposes of the FS, the lateral extent of contamination is assumed to be that defined in the RI/BRA. The contamination is known to extend to 5.79 m (19 ft) at one sample location; however, for purposes of the FS the resulting volume of contaminated material to be considered is based on a depth of 3.05 m (10 ft). As discussed in Section 9.4.2, the basis for this assumption is the removal depth that would be required to eliminate potential exposure under a residential scenario. As summarized in Section 8.4.6, the clean soil cover over the burn pit ranges from 0.61 to 2.3 m (2 to 7.5 ft) in thickness. Accounting for the clean cover, the assumption is that contamination is present from 0.61 to 3.05 m (2 to 10 ft) bgs. Figure 9-5 illustrates the assumptions for TSF-03.

9.4.2.6 TSF-09/18, TSF Intermediate-Level (Radioactive) Waste Disposal Site/TSF Contaminated Tank Southeast of Tank V-3. V-tanks 1, 2, and 3 are 37,854 L (10,000 gal) stainless steel tanks used to manage low-level waste. V-tank 9 is a 1,514 L (400 gal) stainless steel tank. For purposes of the FS, the areal extent of contamination is assumed to be the area of the site as defined in the RI/BRA. The soils have been contaminated by surface spills during transfer of waste to and from the tanks and contamination has been observed throughout the 15.2 by 24.4 m (50 by 80 ft) area. As a result, the limiting assumption with respect to the volume of contaminated soil to be evaluated for the FS at TSF-09/18 is the depth of contamination to be targeted for potential remediation. Contamination has been observed to a depth of 6.10 m (20 ft) and, for purposes of the RI/BRA, was assumed to extend to 14.5 m (47.5 ft) bgs; however, remediating the top 3.05 m (10 ft) of soil at TSF-09/18 would meet the PRGs by eliminating the potential exposure to contaminated soil. A depth of 3.05 m (10 ft) was used in estimating the volume of soil considered in the FS. Figure 9-6 illustrates these assumptions. The estimated volume of sludge and liquid still present in the V-tanks at site TSF-09/18 was calculated from observations made during the tank content sampling conducted during the RI. These volumes are presented in Table 9-5. Based on observations made during tank content level monitoring, the tanks have not leaked.

TSF-08



LEGEND

Zone of contamination for Hg.

ASSUMPTIONS:

- The site was backfilled with .76 m (2.5 ft) of clean soil.
- The volume of contaminated material is assumed from .76 m (2.5 ft) bgs to 3.05 m (10 ft) bgs and is isolated.

Figure 9-3. TSF-08 volume assumption.

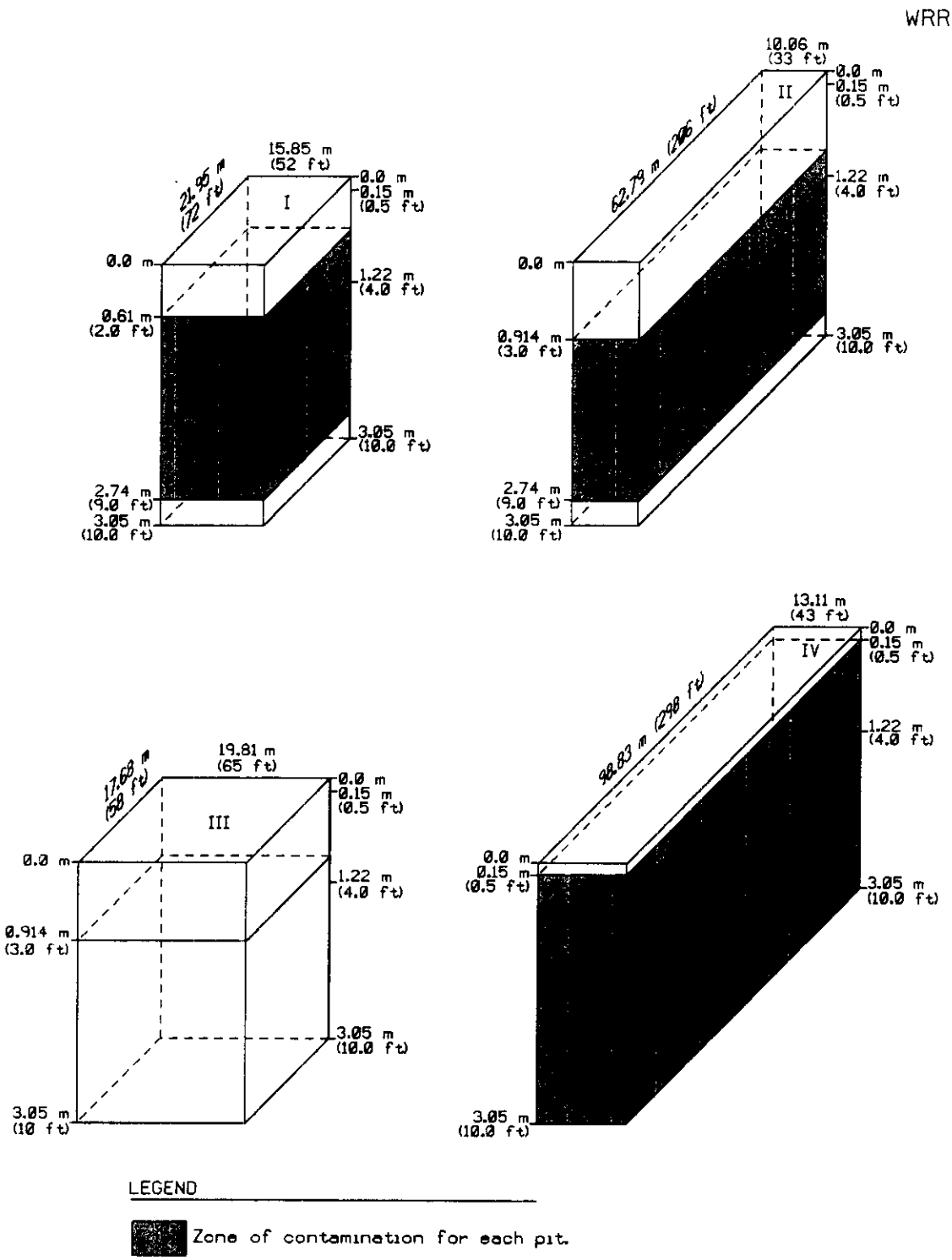
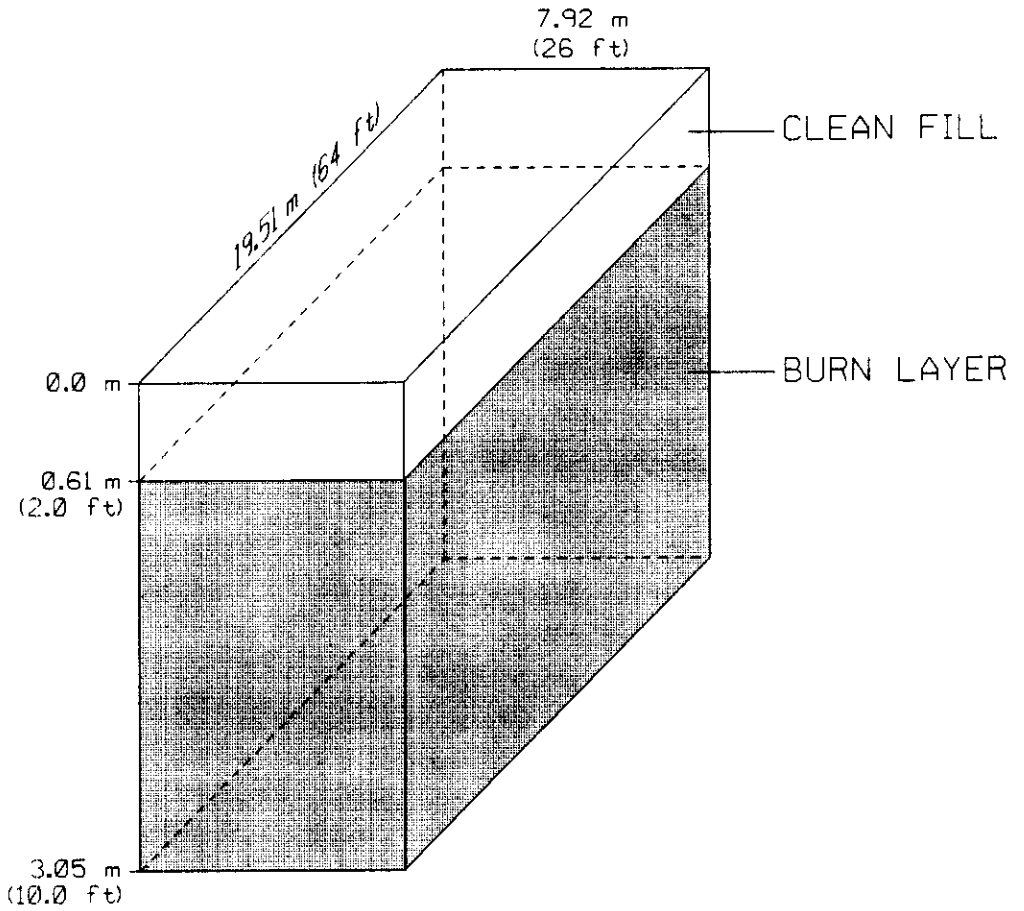


Figure 9-4. WRRTF-01 volume assumption.

TSF-03



LEGEND

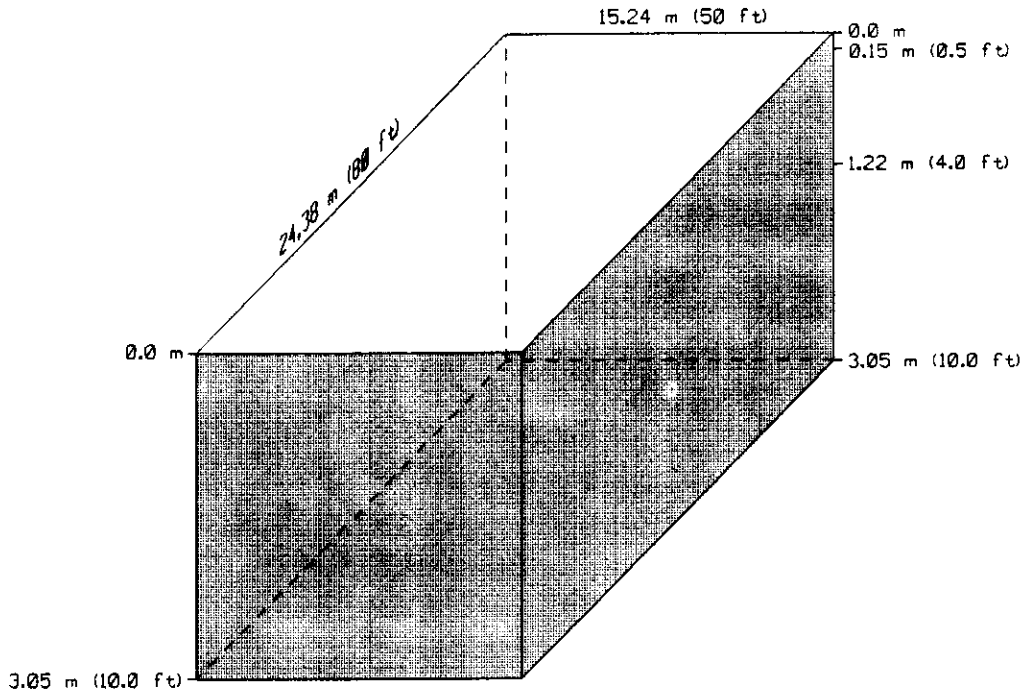
Zone of contamination.

ASSUMPTIONS:

- The volume of contaminated material is assumed from .61 m (2 ft) bgs (the minimum depth observed) to 3.05 m (10 ft) bgs (accounting for 2.44 m (8 ft) of maximum thickness observed).

Figure 9-5. TSF-03 volume assumption.

TSF-09/18



LEGEND

Zone of contamination.

ASSUMPTIONS:

- The volume of contaminated material is assumed from the surface to 3.05 m (10 ft) bgs.

Figure 9-6. TSF-09/18 volume assumption.

9.4.2.7 TSF-26 and the TSF PM-2A Tanks. The PM-2A tanks are two 189,271 L (50,000 gal) tanks used to manage low-level waste. Soil at TSF-26 underwent a partial removal action in 1996; however, during the removal activities contaminant levels not previously anticipated (i.e., gross activities in excess of transportation guidelines of 2,000 pCi/g) were encountered and the removal action was stopped. Several soil stockpiles were created and areas of shallow subsurface contamination (i.e., to 1 m (3 ft) bgs) were delineated. The volume estimate for the FS is based on the observation made during the removal action. The assumed area and depth of contamination is detailed on Figure 9-7.

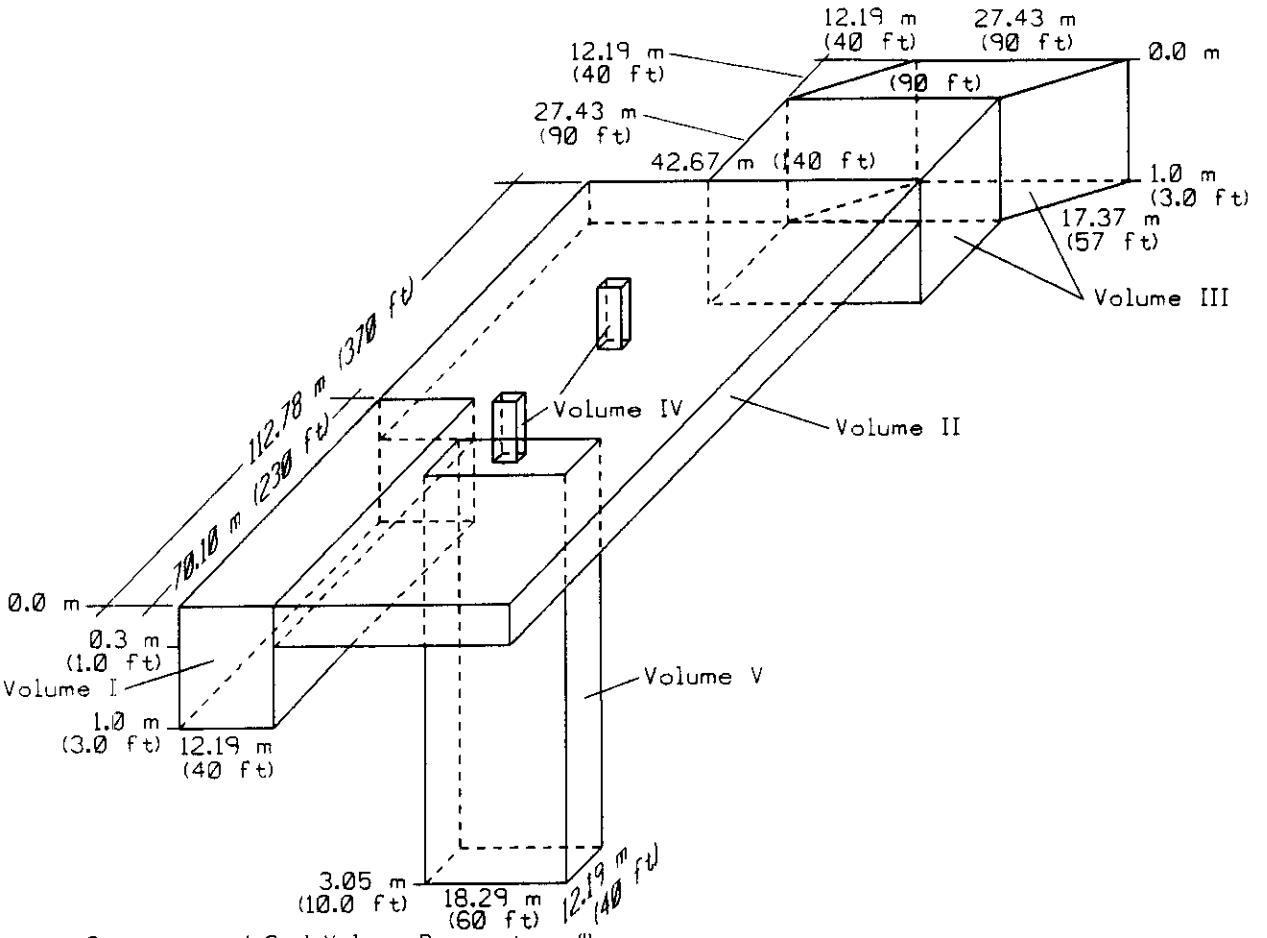
As for the V-tank contents, the estimated volume of contaminated sludge and liquid remaining in the PM-2A tanks at site TSF-26 was calculated from observations made during the tank content sampling conducted during the RI. However, unlike the TSF-09/-18 tanks, the majority of the tank contents were removed and the tanks were partially filled with diatomaceous earth. Because of this the evaluation of treatment options, development of alternatives, and detailed analysis of alternatives is more limited.

9.4.2.8 WRRTF-13. WRRTF-13 is an area between buildings TAN-641 and TAN-645 that has been contaminated by numerous diesel fuel spills and leaks. The site contains three principal areas of contamination that may need to be remediated. These areas are located from 1.5 to 3 m (5 to 10 ft) bgs at the former location of the TAN-738 to TAN-787 diesel transfer line, from 1.8 to 3 m (8 to 10 ft) bgs at the former location of tank TAN-738, and from 1.6 to 3 m (6 to 10 ft) bgs at the former location of tank TAN-739 (see Figure 4-40). The total volume of contaminated soil that may require remediation at the site is 290 m^3 (380 yd^3). None of the site's contaminants have available toxicity data, so the site was not quantitatively evaluated in the OU 1-10 BRA (see Section 6), but some measured total petroleum hydrocarbon (TPH) concentrations at the site exceed the action level of 1,000 mg/kg[a]. The assumed area and depth of contamination is detailed on Figure 9-8.

---

a. G. C. Bowman, Environmental Protection Division, letter to Dr. W. C. Poole, IDHW Division of Environmental Quality, summary of meeting held November 6, 1989.

TSF-26



Contaminated Soil Volume Descriptions[1]

Vol. I: 1 m (3 ft) deep contamination in NW corner of site.
Vol. II: 0.3 m (1 ft) deep contamination over most of the fenced area.
Vol. III: 1 m (3 ft) deep contamination outside of east fence.
Vol. IV: Stockpiled soil.[2]
Vol. V: 3 m (10 ft) deep contamination around tanks.[3]

Volume Estimates:

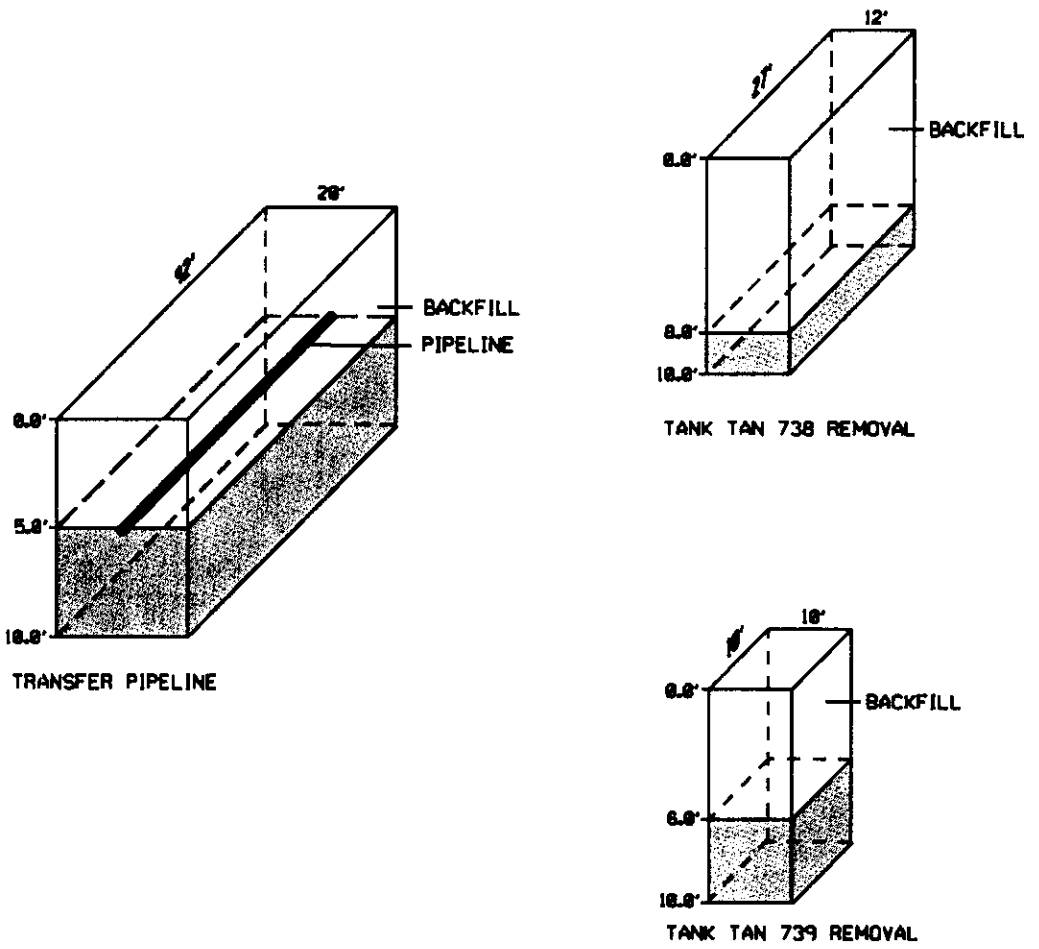
Vol. I: (230 ft)(40 ft)(3 ft) = 27,600 ft^3.
Vol. II: ((370 ft)(140 ft) - (230 ft)(40 ft))(1 ft) = 42,600 ft^3.
Vol. III: ((90 ft)(90 ft) + (90 ft)(40 ft))(3 ft) = 35,100 ft^3.
Vol. IV: (assumed): (300 yd^3)(27 ft^3/ yd^3) = 8,100 ft^3.
Vol. V: (60 ft)(40 ft)(10 ft) = 24,000 ft^3.

Total = 137,400 ft^3

Notes:

(1) The volumes of contaminated soil shown in the figure are based on field observations taken during the OU10-06 nontime critical removal action.
(2) Volume IV consists of a total of 229 m^3 (300 yd^3) of contaminated soil in two stockpiles.
(3) Contamination around the tanks extends deeper than 3 m (10 ft), but remediation of the top 3 m of soil will prevent exposures to workers and potential future residents at the site.

Figure 9-7. TSF-26 volume assumption.



LEGEND

Zone of contamination

ASSUMPTIONS:

- The zone of contamination beneath the transfer pipeline extends to 3 m (10 ft) on either side of the pipeline, and from 1.5 m (5 ft) to 3 m (10 ft) bgs.
- The zone of contamination beneath the former location of tank TAN 738 extends from 2.4 m (8.8 ft) to 3 m (10 ft) bgs.
- The zone of contamination beneath the former location of tank TAN-1709 extends for 1.8 m (6 ft) to 3 m (10 ft) bgs.
- All contamination beneath the former location of tank TAN-787 is greater than 3 m (10 ft) bgs.
- Only contamination that is shallower than 3m (10 ft) bgs has to be removed.

Figure 9-8. WRRTF-13 volume assumption.

9.5 References

DOE-ID, 1996, *Comprehensive Facility and Land Use Plan,* DOE/ID-10514, March.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,* EPA/540/G-89/004, Interim Final, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, October.

Koslow, K. N., and D. H. Van Haaftern, 1986, *Flood Routing Analysis for Failure of MacKay Dam,* EG&G-EP-7184.

Lewis et al., 1996, *Work Plan for Waste Area Group 1 Operable Unit 1-10 Comprehensive RI/FS,* DOE/ID-10527, March.