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100-DR-1 Operable Unit Focused Feasibility Study Report

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EXECUTIVE SUMMARY

The standard Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Feasibility Study (FS) includes development and screening of alternatives (phases 1 and 2) and the detailed analysis of alternatives (phase 3). This focused feasibility study (FFS) constitutes the phase 3 portion of the FS process for the remedial alternatives initially developed and screened in the *100 Area Feasibility Study Phases 1 and 2* (DOE-RL 1993a).

The FFS process is conducted in two stages, a Process Document (DOE-RL 1994) and an operable unit-specific FFS document, such as this one. The FFS process is performed by implementing a "plug-in" style approach as defined in great detail in the Process Document. The Process Document is a companion to this document.

The objective of this operable unit-specific FFS is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures (IRM) for sites associated with the 100-DR-1 Operable Unit. The IRM candidate waste sites are determined in the limited field investigation (DOE-RL 1993b). Site profiles are developed for each of these waste sites. The site profiles are used in the application of the plug-in approach. The waste site either plugs into the analysis of the alternatives for the group, or deviations from the developed group alternatives are described and documented. A summary of the FFS results for the 100-DR-1 IRM candidate waste sites is as follows:

- None of the waste sites require additional alternative development.
- All of the waste sites directly plug into the waste site group alternatives, except for the effluent pipelines. The site-specific detailed analysis is conducted, referencing the waste site group analysis as appropriate. A waste site detailed analysis summary is presented in Table ES-1.
- A comparative analysis of remedial alternatives is presented for each waste site. A summary of the comparative analysis is presented in Table ES-2.

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Table ES-1 Waste Site Remedial Alternatives and Technologies

Alternatives		Technologies Included	Waste Site										
			116-D-7	116-DR-9	116-DR-1 116-DR-2	107-D/DR Sludge Trenches	116-D-1A	116-D-18	116-D-2A	116-D-9	Pipelines	118-D-4A 118-D-4B 118-D-18	132-D-1 132-D-2 132-D-3
No Action	SS-1 SW-1	None											P
Institutional Controls	SS-2 SW-2	Deed Restrictions								P			
		Groundwater Monitoring								P			
Containment	SS-3 SW-3	Surface Water Controls									P	P	
		Modified RCRA Barrier									P	P	
		Deed Restrictions									P	P	
		Groundwater Monitoring									P	P	
Removal, Disposal	SS-4 SW-4	Removal	P	P	P	P	P	P	P		P	P	
		Disposal	P	P	P	P	P	P	P		P	P	
In Situ Treatment	SS-8A	Surface Water Controls			P	P			P				
		In Situ Vitrification			P	P			P				
		Groundwater monitoring			P	P			P				
		Deed restrictions			P	P			P				
	SS-8B	Void Grouting									P		
		Modified RCRA Barrier									P		
		Surface Water Controls									P		
		Deed Restrictions									P		
		Groundwater Monitoring									P		
	SW-7	Dynamic Compaction										P	
		Modified RCRA Barrier										P	
		Surface Water Controls										P	
		Groundwater Monitoring										P	
		Deed Restrictions										P	
Removal, Treatment, Disposal	SS-10	Removal	P	P	P	P	P	P	P				
		Thermal Desorption											
		Soil Washing	P	P	P	P	P	P	P				
		Disposal	P	P	P	P	P	P	P				
	SW-9	Removal									P		
		Thermal Desorption									P		
		Compaction									P		
		ERDF Disposal									P		

Note: blank - Technology does not apply to this waste site
RCRA - Resource Conservation and Recovery Act
P - indicates detailed analysis in Process Document
ERDF - Environmental Restoration Disposal Facility

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Table ES-2 Comparative Analysis Summary[a] (page 1 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Retention Basins 116-D-7 (Table 6-1)		Retention Basins 116-DR-9 (Table 6-1)		Process Effluent Trenches 116-DR-1, 2 (Table 6-2)			Sludge Trenches 107-D/DR (1) (Table 6-3)			Sludge Trenches 107-D/DR (2) (Table 6-3)			Sludge Trenches 107-D/DR (3) (Table 6-3)			Sludge Trenches 107-D/DR (4) (Table 6-3)			Sludge Trenches 107-D/DR (5) (Table 6-3)			Fuel Storage Basin Trenches 116-D-1A (Table 6-4)		Fuel Storage Basin Trenches 116-D-1B (Table 6-4)	
	Alternatives[b]	SS-4	SS-10	SS-4	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-10	SS-4	SS-10
Overall Protection of Human Health and Environment																											
Compliance with ARAR																											
Long-Term Effectiveness and Permanence																											
Reduction of Toxicity, Mobility, and Volume																											
Short-Term Effectiveness																											
Implementability																											
Present Worth[c] ($ millions)		76.8	87.7	96.0	114.0	13.3	48.8	16.3	1.61	5.49	2.24	1.67	5.63	2.23	1.64	5.57	2.28	1.22	4.0	1.79	1.25	4.42	1.84	4.47	5.57	1.86	2.58

Key:

- Best
- Better
- Good
- Fair
- Poor

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Table ES-2 Comparative Analysis Summary[a] (page 2 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Pluto Crib 116-D-2A (Table 6-5)			Pipelines 100-D/DR (Table 6-6)			Burial Grounds 118-D-4A (Table 6-7)				Burial Grounds 118-D-4B (Table 6-7)				Burial Grounds 18 (Table 6-7)			
	Alternatives[b]	SS-4	SS-8A	SS-10	SS-3	SS-4	SS-8B	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9
Overall Protection of Human Health and Environment																			
Compliance with ARAR																			
Long-Term Effectiveness and Permanence																			
Reduction of Toxicity, Mobility, and Volume																			
Short-Term Effectiveness																			
Implementability																			
Present Worth[c] ($ millions)		0.267	0.661	0.692	38.1	8.61	3.51	1.45	2.38	1.69	2.53	0.832	0.415	0.962	0.907	0.866	0.547	1.0	1.02

Notes:

ARAR = applicable or relevant and appropriate requirement.

[a] Comparative Analysis Summary is based on Tables 6-1 through 6-7. Comparisons are made between relevant alternatives for each individual waste site group only.

[b] Alternatives are summarized from Table 5-1.
- SS-3/SW-3 Containment
- SS-4/SW-4 Removal and disposal
- SW-7 In situ treatment of solid waste
- SS-8A In situ treatment of soils (except pielines)
- SS-8B In situ treatment of soils (pipelines)
- SW-9 Removal, treatment and disposal of solid waste
- SS-10 Removal, treatment and disposal of soil

[c] Cost is present worth at 5% discount rate.

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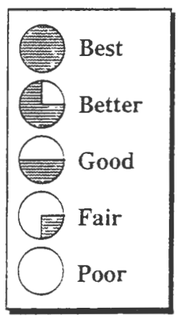

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Table ES-1 Waste Site Remedial Alternatives and Technologies

Alternatives		Technologies Included	Waste Site										
			116-D-7	116-DR-9	116-DR-1 116-DR-2	107-D/DR Sludge Trenches	116-D-1A	116-D-18	116-D-2A	116-D-9	Pipelines	118-D-4A 118-D-4B 118-D-18	132-D-1 132-D-2 132-D-3
No Action	SS-1 SW-1	None											P
Institutional Controls	SS-2 SW-2	Deed Restrictions								P			
		Groundwater Monitoring								P			
Containment	SS-3 SW-3	Surface Water Controls									P	P	
		Modified RCRA Barrier									P	P	
		Deed Restrictions									P	P	
		Groundwater Monitoring									P	P	
Removal, Disposal	SS-4 SW-4	Removal	P	P	P	P	P	P	P		P	P	
		Disposal	P	P	P	P	P	P	P		P	P	
In Situ Treatment	SS-8A	Surface Water Controls			P	P			P				
		In Situ Vitrification			P	P			P				
		Groundwater monitoring			P	P			P				
		Deed restrictions			P	P			P				
	SS-8B	Void Grouting									P		
		Modified RCRA Barrier									P		
		Surface Water Controls									P		
		Deed Restrictions									P		
		Groundwater Monitoring									P		
	SW-7	Dynamic Compaction										P	
		Modified RCRA Barrier										P	
		Surface Water Controls										P	
		Groundwater Monitoring										P	
		Deed Restrictions										P	
Removal, Treatment, Disposal	SS-10	Removal	P	P	P	P	P	P	P				
		Thermal Desorption											
		Soil Washing	P	P	P	P	P	P	P				
		Disposal	P	P	P	P	P	P	P				
	SW-9	Removal									P		
		Thermal Desorption									P		
		Compaction									P		
		ERDF Disposal									P		

Note: blank - Technology does not apply to this waste site
RCRA - Resource Conservation and Recovery Act
P - indicates detailed analysis in Process Document
ERDF - Environmental Restoration Disposal Facility

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Table ES-2 Comparative Analysis Summary[a] (page 1 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Retention Basins 116-D-7 (Table 6-1)		Retention Basins 116-DR-9 (Table 6-1)		Process Effluent Trenches 116-DR-1, 2 (Table 6-2)			Sludge Trenches 107-D/DR (1) (Table 6-3)			Sludge Trenches 107-D/DR (2) (Table 6-3)			Sludge Trenches 107-D/DR (3) (Table 6-3)			Sludge Trenches 107-D/DR (4) (Table 6-3)			Sludge Trenches 107-D/DR (5) (Table 6-3)			Fuel Storage Basin Trenches 116-D-1A (Table 6-4)		Fuel Storage Basin Trenches 116-D-1B (Table 6-4)	
	Alternatives[b]	SS-4	SS-10	SS-4	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-10	SS-4	SS-10
Overall Protection of Human Health and Environment																											
Compliance with ARAR																											
Long-Term Effectiveness and Permanence																											
Reduction of Toxicity, Mobility, and Volume																											
Short-Term Effectiveness																											
Implementability																											
Present Worth[c] ($ millions)		76.8	87.7	96.0	114.0	13.3	48.8	16.3	1.61	5.49	2.24	1.67	5.63	2.23	1.64	5.57	2.28	1.22	4.0	1.79	1.25	4.42	1.84	4.47	5.57	1.86	2.58

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Table ES-2 Comparative Analysis Summary[a] (page 2 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Pluto Crib 116-D-2A (Table 6-5)			Pipelines 100-D/DR (Table 6-6)			Burial Grounds 118-D-4A (Table 6-7)				Burial Grounds 118-D-4B (Table 6-7)				Burial Grounds 18 (Table 6-7)			
	Alternatives[b]	SS-4	SS-8A	SS-10	SS-3	SS-4	SS-8B	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9
Overall Protection of Human Health and Environment		Good	Fair	Better	Fair	Better	Good	Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best
Compliance with ARAR		Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Long-Term Effectiveness and Permanence		Better	Good	Better	Fair	Better	Good	Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better
Reduction of Toxicity, Mobility, and Volume		Fair	Better	Good	Fair	Good	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better
Short-Term Effectiveness		Good	Better	Fair	Better	Fair	Good	Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair
Implementability		Better	Fair	Good	Better	Good	Fair	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good
Present Worth[c] ($ millions)		0.267	0.661	0.692	38.1	8.61	3.51	1.45	2.38	1.69	2.53	0.832	0.415	0.962	0.907	0.866	0.547	1.0	1.02

Notes:

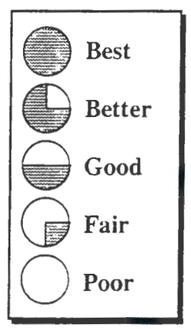
ARAR = applicable or relevant and appropriate requirement.

[a] Comparative Analysis Summary is based on Tables 6-1 through 6-7. Comparisons are made between relevant alternatives for each individual waste site group only.

[b] Alternatives are summarized from Table 5-1.
- SS-3/SW-3 Containment
- SS-4/SW-4 Removal and disposal
- SW-7 In situ treatment of solid waste
- SS-8A In situ treatment of soils (except pielines)
- SS-8B In situ treatment of soils (pipelines)
- SW-9 Removal, treatment and disposal of solid waste
- SS-10 Removal, treatment and disposal of soil

[c] Cost is present worth at 5% discount rate.

Key:



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ACRONYMS

ARAR	applicable or relevant and appropriate requirements
ARCL	Allowable residual contamination level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CMS	Corrective Measures Study
COPC	contaminants of potential concern
D&D	decontamination and decommissioning
EPA	U.S. Environmental Protection Agency
FFS	focused feasibility study
FS	feasibility study
HPPS	Hanford Past-Practice Strategy
ICR	incremental cancer risk
IRM	interim remedial measures
LFI	limited field investigation
O&M	operation and maintenance
PRG	preliminary remediation goals
QRA	qualitative risk assessment
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation

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1.0 INTRODUCTION

This 100-DR-1 Operable Unit-specific focused feasibility study (FFS) is prepared in support of a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI)/corrective measures study (CMS) for the 100-DR-1 Operable Unit. The *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE-RL 1994a), otherwise referred to as the Process Document, is a required reference document to this operable unit-specific focused feasibility study, which together provide a complete detailed analysis of remedial alternatives.

The approach for the RFI/CMS activities for the 100 Area has been defined in the *Hanford Past-Practice Strategy* (HPPS) (DOE-RL 1991). The HPPS emphasizes integration of the results of ongoing site characterization activities into the decision making process at the earliest point practicable (observational approach) and expedites the remedial action process by emphasizing the use of interim actions (DOE-RL 1991).

In accordance with the HPPS, FFS are performed for those operable unit waste site which have been identified as candidates for interim remedial measures (IRM) based on information contained in applicable work plans and limited field investigations (LFI). This FFS constitutes the Phase 3 (detailed analysis) portion of the feasibility study (FS) process for the remedial alternatives initially developed and screened in the *100 Area Feasibility Study Phases 1 and 2* (DOE-RL 1993a).

Figure 1-1 depicts the interrelationships and sequencing of steps and activities associated with the HPPS which must be integrated to bring an operable unit from field investigation through the record of decision. This figure provides a graphical description of the entire process of characterization activities, risk assessments, treatability studies, and FS for the high and low priority sites within an operable unit and for the operable unit as a whole.

1.1 FOCUSED FEASIBILITY STUDY APPROACH

As shown in Figure 1-2, the FFS process is conducted in two stages, a Process Document (DOE-RL 1994a) and operable unit-specific FFS documents, such as this one. The FFS process is performed by implementing a "plug-in" style approach similar to that defined by the U.S. Environmental Protection Agency (EPA) Region IX in the *Operable Unit Feasibility Study, VOCs in Vadose Zone, Indian Bend Wash Superfund Site, South Area, Tempe, Arizona* (EPA 1993). To implement this approach, the waste sites in the 100 Area source operable units were first separated into waste site groups, then the detailed analysis phase was implemented for the remedial alternatives (previously developed in the FS Phase 1 and 2 [DOE-RL 1993a]) based on the characteristics of individual waste site groups. The definition of waste site groups, identification of remedial action objectives (RAO), development of remedial alternatives, and the group specific detailed and comparative analyses are documented in the Process Document. The results of the group-specific FFS

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(Process Document) serve as the baseline for the site-specific analyses presented in this document.

The following methodology has been developed for the implementation of the plug-in approach (as shown in Figure 1-2):

1) Assemble Site Groups and Associated Group Profiles

Assemble sites with similar characteristics (e.g., physical structure, function, and impacted media) into waste site groups as shown on Figure 1-3. These groups are based on the "analogous site" approach to site characterization discussed in the HPPS. Specifically, the following site groups have been identified as potential sources in the 100 Area and are evaluated in the Process Document:

- retention basins
- pipelines
- process effluent trenches
- sludge trenches
- fuel storage basin trenches
- decontamination cribs/french drains
- pluto cribs
- seal pit cribs
- burial grounds
- decontamination and decommissioning (D&D) facilities.

Develop a description, or profile, which is representative of the waste sites within each waste site group. Such a description is called the *group profile.* Data used to generate the group profiles for each of the waste site groups were compiled from 100 Area operable unit LFI (i.e., 100-DR-1, 100-BC-1, and 100-HR-1 [DOE-RL 1993b, DOE-RL 1993c, and DOE-RL 1993d]) which are considered representative of the source areas in the 100 Area. Detailed discussion of the site groups and development of the associated group profiles are documented in Section 3.0 of the Process Document.

2) Develop Remedial Alternatives

Develop remedial alternatives based on the group profiles. Identify additional alternative components or *enhancements* which may be incorporated into the alternatives on a case-by-case basis in order to maximize the number of sites within each group for which the alternatives will be applicable. For each alternative, identify site characteristics or *applicability criteria* that must be met in order to ascertain the applicability of the subject alternative. For example, the institutional controls alternative may be applicable to a site if concentrations of all contaminants of potential concern (COPC) are less than corresponding preliminary remediation goals (PRG). Detailed description of

the IRM alternatives and specification of associated applicability criteria are presented in Section 4.0 of the Process Document.

3) Perform Detailed and Comparative Analyses

Perform detailed and comparative analyses of the IRM alternatives. The detailed and comparative analyses are presented in Sections 5.0 and 6.0 (respectively) of the Process Document.

4) Develop Individual Site Profiles

Develop a site profile which includes the extent of contamination, contaminated media/material, refined COPC/maximum concentrations, and a review against the reduced infiltration concentrations for each site within an operable unit. Development of individual site profiles are documented in Section 2.0 of the operable unit-specific FFS.

5) Identify Representative Group

Compare the individual site profile to the group profiles presented in the Process Document to determine the waste site group to which the subject site belongs. Compare the site characteristics to the applicability criteria for the alternatives developed for the waste site group noting any deviations which may result in a requirement for alternative enhancement or site-specific re-evaluation. Identification of the appropriate site group, and comparison to the associated alternative applicability criteria for each site are documented in Section 3.0 of the operable unit-specific FFS.

6) "Plug-In" or Perform Site-Specific Analysis

a. If applicability criteria are met based on the comparison conducted in step 5, the waste site plugs into the analysis of the alternative for the group. Site-specific volume and cost estimates are documented in Section 2.0 and 5.0, respectively, of the operable unit-specific reports.

b. If applicability criteria are not met, the site does not plug into the analysis of the alternative for the group. Deviations from the developed group alternative will be documented in Section 4.0 of the operable unit-specific FFS. A re-evaluation of the alternative based on site-specific conditions is then performed and documented in Sections 5.0 and 6.0 of the operable unit-specific FFS.

Steps 1 through 3 are documented in Sections 3.0 through 6.0 of the Process Document (DOE-RL 1994a). Site-specific evaluation of the alternatives for the 100-DR-1 Operable Unit sites, in accordance with steps 4 through 6, documented in this report.

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1.2 PURPOSE AND SCOPE

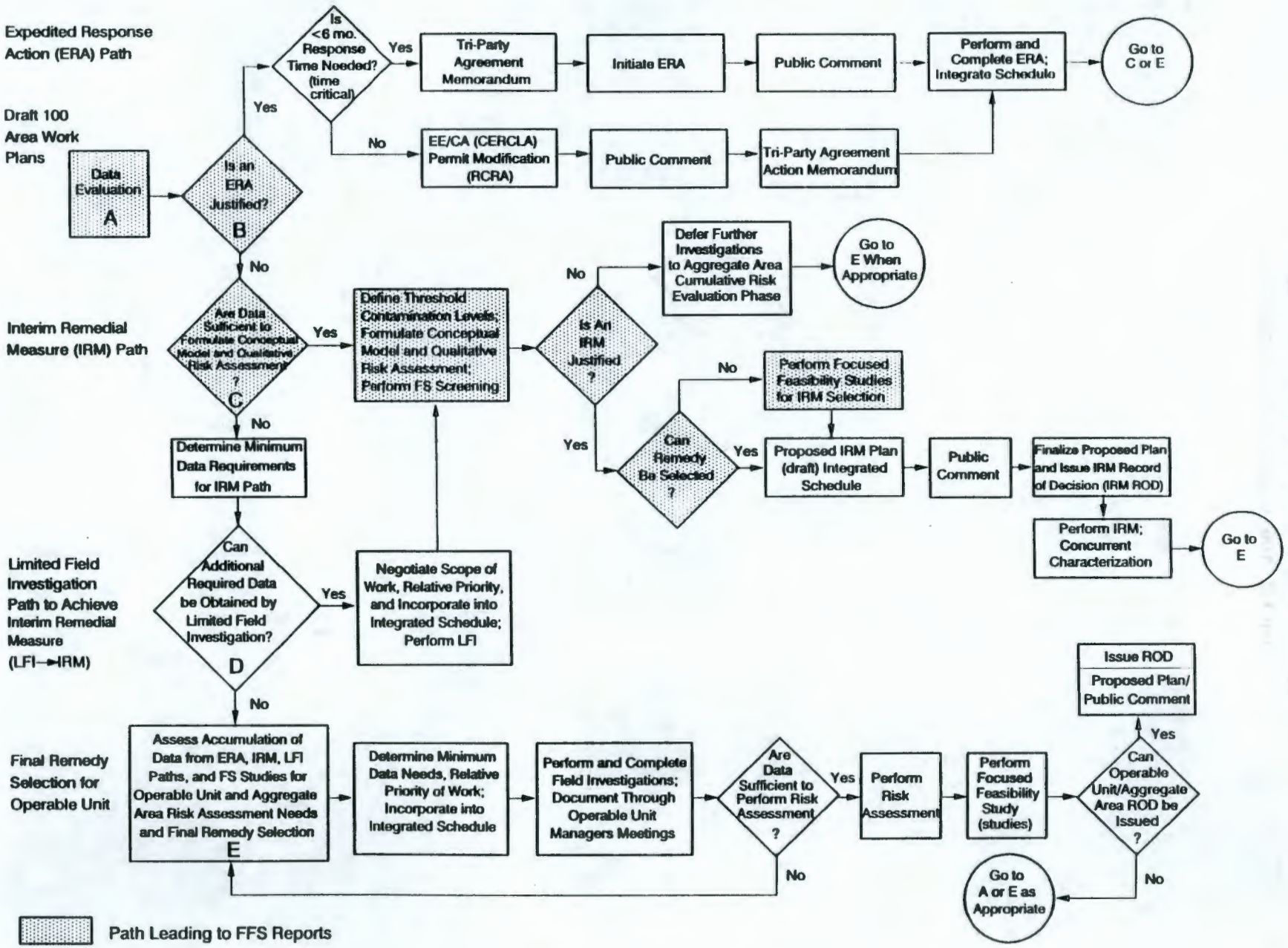
In accordance with steps 4, 5, and 6 listed above, this report presents:

- the 100-DR-1 Operable Unit individual waste site information (Section 2.0)
- the development of individual waste site profiles (Section 2.0)
- the identification of representative groups for individual waste sites and a comparison against the applicability criteria and identification of appropriate enhancements for the alternatives (Section 3.0)
- a discussion of the deviations and/or enhancements of an alternative and additional alternative development, as needed (Section 4.0).
- the detailed analyses for sites which deviate from the representative group alternatives (Section 5.0)
- the comparative analysis for all individual waste sites.

Note that the scope of this document is limited to 100-DR-1 Operable Unit IRM candidate sites as determined in the LFI report. Impacted groundwater beneath the 100 Area is being addressed in separate FFS documents. In addition, low priority sites and potentially impacted river sediments proximate to the 100 Area are not considered candidates for IRM, accordingly, they are being addressed under the RFI/CMS pathway of the HPPS. The decisions to limit the scope of the FFS are documented and justified in the applicable work plans, LFI, qualitative risk assessments (QRA), and the 100 Area FS Phase 1 and 2.

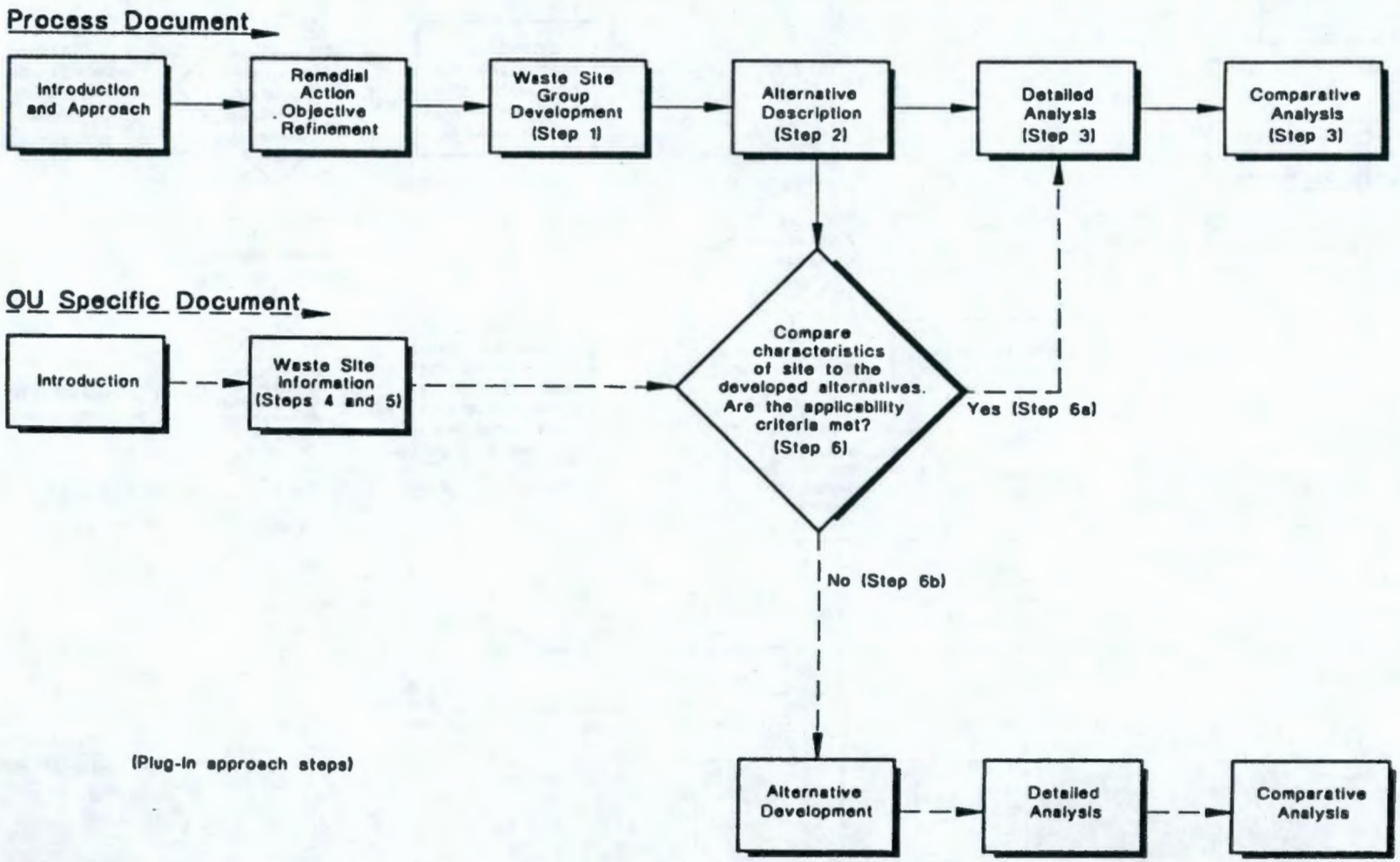
The objective of this operable unit-specific FFS is to provide decision makers with sufficient information to allow appropriate and timely selection of IRM for sites associated with the 100-DR-1 Operable Unit.

Figure 1-1 Hanford Past-Practice Strategy



Hanford Site Past Practice Strategy Decision

Figure 1-2 100 Area Source Operable Unit FFS Process



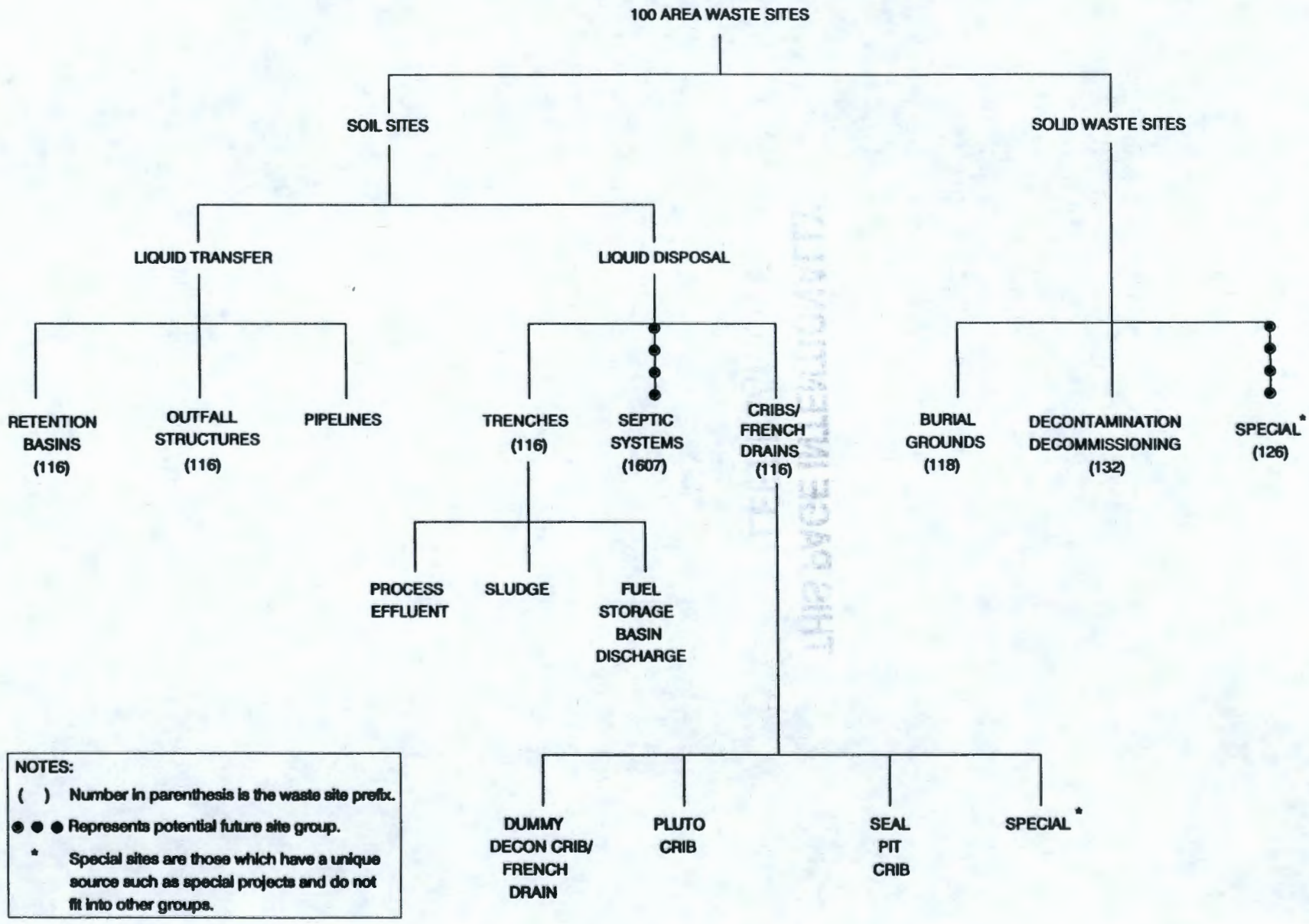


Figure 1-3 Analogous Waste Sites

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2.0 WASTE SITE INFORMATION

2.1 OPERABLE UNIT BACKGROUND

The 100-DR-1 Operable Unit is located immediately adjacent to the Columbia River shoreline. The 100-DR-1 Operable Unit encompasses approximately 1.5 km^2 (0.59 mi^2). It lies predominantly within the southeast quadrant of Section 15 and the southwest quadrant of Section 14 of Township 14N, Range 26E, and is located within latitude 46°41'30" and 46°42'30" and longitude 119°31'45" and 119°33'00" (Figure 2-1).

The 100-DR-1 Operable Unit is one of three operable units associated with the 100 D/DR Area at the Hanford Site. Two of the 100 D/DR Area operable units are source units and one is a groundwater unit. The 100-DR-1 Operable Unit includes the D Reactor and its associated facilities. It also includes the liquid and sludge disposal sites, and solid waste burial grounds generally associated with operation of the D Reactor. The 100-DR-2 Operable Unit includes the DR Reactor and its associated facilities, liquid disposal sites, solid waste burial grounds, decommissioned ponds, burn pits, and septic tank systems. The 100-HR-3 Groundwater Operable Unit includes the groundwater below the source operable units as well as the adjacent groundwater, surface water, sediments, and aquatic biota impacted by the 100 D/DR Area operations.

Since the preparation of the *100 Area Feasibility Study Phases 1 and 2* (DOE-RL 1993a), additional data has been collected that is relevant to the 100 Area in general and to the 100-DR-1 Operable Unit specifically. A LFI and QRA were performed for the 100-DR-1 Operable Unit. In addition, aggregate area studies were performed to evaluate cultural resources and area ecology.

2.2 100 AREA AGGREGATE STUDIES

The 100 Area aggregate studies and Hanford Site studies, such as the Hanford Site background studies, provide integrated analyses of selected issues on a scale larger than the operable unit. The 100 Area groundwater operable unit work plans (i.e. DOE-RL 1992a) address studies common to the 100 Area, covering topics such as a river impact, shoreline, ecology, and cultural resources. Each operable unit work plan provides detail on the physical setting such as topography, geology, hydrogeology, surface water hydrology, meteorology, environmental resources, and human resources (DOE-RL 1992b). These studies provided data for the LFI, and for the selection of final remedies. References that are applicable to the 100 Area source operable unit FFS are summarized below.

- **Hanford Site Background.** Results of the characterization of the natural chemical composition of Hanford Site soil samples are presented in *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes* (DOE-RL 1993e). Background values for radionuclides are currently under evaluation but are not published at this time. The Process Document presents the background values proposed for the 100 Areas.

- **Ecological Analysis.** Bird, mammal, and plant surveys were conducted and reported in Sackschewsky and Landeen (1992). Current contamination data has been compiled from other sources, along with ecological pathways and lists of all wildlife and plants at the site, including threatened and endangered species (Weiss and Mitchell 1992). Another report (Cadwell 1994), discusses aquatic species on the Hanford Reach of the Columbia River; spatial distribution of vegetation types at the site and surveys of species of concern; shrub-steppe bird surveys; and mule deer and elk population monitoring. Report conclusions state that intrusive activities, such as remedial actions, that are conducted inside the controlled-area fences will not have significant impact on the wildlife. Intrusive activities outside the controlled-area fences will have minimal impact on wildlife if the recommendations contained in the three documents listed below are followed (Landeen et al. 1993):

  - *Bald Eagle Managements Plan* (Fitzner and Weiss 1992)
  - *Biological Assessment of Threatened and Endangered Species* (Fitzner et al. 1992)
  - *Biological Assessment for State Candidate and Monitor Species* (Stegen 1992)

- **Cultural Resources.** The Hanford Cultural Resources Laboratory conducted an archaeological survey during fiscal year 1991 for the 100 Area Reactor areas on the Hanford Site (Chatters et al. 1992). A summary of Hanford Site cultural resources can be found in Cushing (1992). The following is an excerpt from Cushing (1992) on the 100 D and 100 DR Areas.

  "These are located in a segment of the Columbia River considered to be poor in cultural resources, at least on the basis of reconnaissance-level surveys. Eight known archaeological sites lie within 2 km (1.2 mi) of the areas, two on the opposite bank of the Columbia River and six on the reactor side of the river. Sites 45GR307 and 45GR308 are open campsites of unknown age. Sites 45BN439 and 45BN459 are occupation sites of undetermined age; sites 45BN442, 45BN443, and 45BN444 are cairns or graves; and 45BN461 is a fishing site."

2.3 LIMITED FIELD INVESTIGATION

The 100-DR-1 LFI (DOE-RL 1993b) is an integral part of the RFI/CMS process and is based on Hanford-specific agreements discussed in the *Hanford Federal Facility Agreement and Consent Order* (Fourth Amendment) (Ecology et al. 1994), the *Hanford Site Baseline Risk Assessment Methodology* (DOE-RL 1993f), the *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-DR-1 Operable Unit* (DOE-RL 1992b), and the HPPS (DOE-RL 1991). The HPPS emphasized initiating and completing waste site cleanup through interim actions.

The primary purpose of the LFI is to collect sufficient data in order to recommend those sites that should remain candidates on the IRM pathway and those sites which should not remain candidates for the IRM pathway. Sites that are not recommended as candidates for an IRM will be addressed in the final remedy selection process. The data gathered in the LFI is also used to evaluate remedial alternatives in this FFS.

A QRA is performed as part of the LFI, and determines the principle risk drivers in the operable unit. The purpose of the 100-DR-1 QRA (WHC 1993) is to provide a qualitative evaluation of human health and environmental exposure scenarios in order to provide sufficient information to allow defensible decisions to be made on the necessity of IRM. The QRA is an evaluation of risk for a predefined set of human and environmental exposure scenarios and is not intended to replace or be a substitute for a baseline risk assessment.

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The QRA is streamlined to consider only two human health exposure scenarios (frequent- and occasional-use) with four pathways (soil ingestion, fugitive dust inhalation, inhalations of volatile organics from soil, and external radiation exposure) and a limited environmental evaluation.

Frequent- and occasional-use exposure scenarios were evaluated in the human health QRA to provide bounding estimates of risk consistent with the residential and recreational exposure scenarios presented in the *Hanford Site Baseline Risk Assessment Methodology* (DOE-RL 1993f). Currently there are no such land uses in the 100-DR-1 Operable Unit.

The qualitative risk estimations for carcinogens are grouped into the following categories based on lifetime incremental cancer risk (ICR):

- high - ICR $> 1 \times 10^{-2}$
- medium - ICR between 1×10^{-4} and 1×10^{-2}
- low - ICR between 1×10^{-6} and 1×10^{-4}
- very low - ICR $< 1 \times 10^{-6}$.

For noncarcinogenic COPC, a hazard quotient > 1.0 was considered unacceptable.

The ecological evaluation assesses dose to the Great Basin pocket mouse. The mouse is used as an indicator receptor because its home range is comparable to the size of most waste sites and will receive most of its dose from a waste site. Ecological risks are defined by calculating an environmental hazard quotient. An environmental hazard quotient greater than one (unity) indicates significant environmental risk.

The results of this assessment are used to help determine the need for IRM, to select the IRM alternatives, and to aid in the determination of risk-based cleanup levels for IRM. If an IRM is not justified, the site is still subject to further investigation and/or remediation under the RFI/CMS process. The LFI for the 100-DR-1 Operable Unit documents the results of the sampling, data evaluation, and risk assessment conclusions for the operable unit and identifies the constituent concentrations at each of the sites (DOE-RL 1993b).

To determine IRM candidacy, the 100-DR-1 high-priority sites were evaluated using the criteria given below:

- a site poses medium or high risk to human health under the occasional use scenario, or has an environmental hazard quotient > 1.0
- a site must have a complete conceptual model as defined in the LFI, otherwise additional data will be gathered and candidacy will be re-evaluated
- a site has contaminants at levels which exceed applicable or relevant and appropriate requirements (ARAR)
- a site has a probable current impact on groundwater

The LFI also assumes that burial grounds are IRM candidate sites regardless of the above criteria. The results of the IRM candidacy evaluation are presented in Table 2-1. Note that the sludge trenches were divided as the 107-D sludge trenches and the 107-DR sludge trenches. Due to the lack of site specific data on the sludge trenches, they are combined and designated as 107-D/DR sludge trenches in this FFS. Also, the outfall structures were originally on the IRM pathway, but have been recently designated for an expedited response action. The 100 Area River Effluent Pipelines Expedited Response Action Proposal (DOE-RL 1994b) indicates that the 100 Area outfall structures will be addressed concurrently with the river pipelines. The 116-D-5 and 116-DR-5 outfall structures are therefore removed from the IRM pathway and are not addressed further in this FFS.

The conclusions drawn during the LFI assessment are used solely to determine IRM candidacy for high-priority solid waste burial ground sites within the 100-DR-1 Operable Unit. While this FFS relies on the data presented in the LFI/QRA, assessments, evaluations, and conclusions drawn by the FFS are based on the methodology described in the Process Document.

2.4 DEVELOPMENT OF WASTE SITE PROFILES

To facilitate the implementation of the plug-in approach described in Section 1.1, waste site profiles are developed for each IRM candidate site. Development of the individual waste site profile is imperative to the identification of the appropriate group and the development of applicable remedial action alternatives. The waste site profiles are developed based on existing data for the 100-DR-1 Operable Unit IRM candidate sites. Where site-specific data is unavailable, the analogous site approach is implemented.

The analogous site approach allows conditions from a site, or sites with data to be assumed for sites without data as long as the sites are analogous (i.e., within the same group). This minimizes the amount of site-specific investigations required to define waste site characteristics. The group profiles presented in the Process Document serve as a basis for development of site-specific conditions addressed in each operable unit-specific FFS. For

the site-specific evaluation, the following methodology is used when assessing data from analogous waste sites:

- Contaminants:
  - assume contaminant types (radionuclides, inorganic, or organics) are the same for all sites within a group unless site-specific data indicates otherwise
  - if a site has no data, use contaminant inventory (specific constituents) from the group profile.
- Extent of contamination:
  - determine extent of contamination based only on site-specific data when available
  - if no data are available, use group profile data to assume extent of contamination.

The development of waste site profiles is accomplished by describing the original waste site, developing refined COPC, and finally by defining the parameters of the waste site profile.

2.4.1 Site Descriptions

To aid in the identification of the appropriate waste site group, the original physical and functional characteristics of each IRM candidate site has been developed. These characteristics include site name, functional use, and original dimensions.

Site Name - The site name is the initial indicator of the appropriate group.

Use - Functional use of the site is an important characteristic in determination of waste site groupings. For example, if it is known that a site was used for transport of liquid wastes, using Figure 1-3, it is possible to eliminate many potential groups.

Physical Description - This element defines the physical characteristics of a site by identifying both size and structure. These characteristics are valuable for evaluating extent of contamination, as well as identifying media/material.

Data Source - Identifies source of data for each waste site.

Descriptions of each IRM candidate site are presented in Table 2-2.

2.4.2 Refined COPC

In a manner similar to the method described in Section 2.6 of the Process Document, refined COPC have been developed for each IRM candidate site. These refined COPC are

developed by screening the COPC from the 100-DR-1 QRA (WHC 1993) against the PRG defined in Appendix A of the Process Document. Tables 2-3 through 2-10 present the evaluation of refined COPC for waste sites with site specific data. Waste sites which do not have site specific data use data from the group site profile for COPC, and therefore no site specific COPC evaluation table is presented. Burial grounds use process knowledge data from Miller and Wahlen (1987) to determine COPC, and no site specific evaluation tables are presented.

The PRG are developed under a recreational land use scenario considering risk to human and ecological receptors, compliance with ARAR, protection of groundwater, local background concentrations, and levels of detection. Table 2-11 presents the PRG values developed in the process document. Of these sources of PRG, the most stringent value is used for screening as long as the value is not below local background and is above contractual levels of detection. Another important aspect of the PRG is that the appropriate value varies with depth. As stated in Section 2.2.2 of Appendix A in the Process Document, humans are receptors in the first meter of soil, animals are receptors in the first 2 m (6.0 ft) of soil, plants are receptors in the first 3 m (10 ft) of soil, and protection of groundwater must be considered throughout the soil column.

The data sources used for the identification of refined-COPC include:

- LFI for the 100-DR-1 Operable Unit (DOE-RL 1993b)
- Radiological Characterization of the Retired 100 Areas (Dorian and Richards 1978)

These data sources are the same as what was used to perform the QRA, and constitute the basic data set for the 100 Area source operable units. The study by Dorian and Richards was fairly comprehensive with respect to the number of sites investigated, however only radiological data were taken, and sampling and analysis protocol was not equivalent to the current standards. The LFI data looked at a small number of sites, but collected data for radionuclides, inorganics and organics. Sampling and analysis protocols for the LFI data are based on standards presented in the associated work plan (DOE-RL 1992b).

The following steps were followed for the assemblage of data for the identification of the refined-COPC:

- The vadose zone was broken down into ranges consistent with the zones accessible by receptors as presented in the Process Document. (i.e., 0-3 ft, 3-6 ft, 6-10 ft, and below 10 ft in 5 ft intervals)
- Maximum concentrations from the LFI and Dorian and Richards (historical data) (1978) for each interval were identified, and the historical data was decayed to 1992 for consistency with the LFI data.
- The highest concentration between the LFI and historical data was recorded for each interval.

- The maximum concentrations were screened against the PRG presented in Table 2-11.

- All constituents which exceed PRG are identified, and those which exceed a PRG in any of the intervals are considered refined-COPC for the waste site.

When reviewing the data used for the identification of refined-COPC, the following should be considered:

- The tables report only maximum concentrations, therefore it should be noted that the entire data sets as well as the appropriate qualifiers and sampling and analysis protocols are discussed in the data source reports mentioned above.

- Data reported at an interval break, such as 15 ft was reported in the previous range, i.e. 10-15 ft.

- Data reported which overlaps ranges is recorded in both ranges. (i.e. data from 14.5-16 ft is recorded in the 10-15 ft and 15-20 ft ranges)

- Nickel-63 reported in Dorian and Richards may have been analyzed using a surrogate, therefore the concentrations reported may not be an accurate representation of the actual concentration at the waste site.

- Total-Uranium reported in Dorian and Richards has been recorded as uranium-238 since uranium-238 is the major risk contributor of the uranium isotopes in the QRA.

The screening process results in the identification of all refined COPC which must be addressed by any remedial action at the given IRM candidate site. Tables 2-3 through 2-10 present the PRG screening for those sites which have analytical data.

2.4.3 Waste Site Profiles

Based on the data from the 100-DR-1 Operable Unit LFI (DOE-RL 1993b) and the refined COPC discussed in Section 2.4.2, a profile for each IRM candidate site is developed. The site profiles consist of waste site characteristics such as extent of contamination, contaminated media/material, maximum concentrations of the refined COPC, and a determination of exceedance of allowable soil concentrations under a reduced infiltration scenario. The profiles perform two functions: first, they contain the information for comparison to the group profiles and alternative criteria defined in the Process Document; second, they aid in development of a data base used for determining costs and durations of

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remedial activities (i.e., contaminated volume impacts cost of disposal and duration of excavation). The profile parameters are defined below; site-specific profiles are detailed in Table 2-12.

- Extent of Contamination:

  Extent of contamination consists of impacted volume, length, width, area, and thickness. The values for these parameters are based on volume estimates performed for each site (presented in Appendix A of this document). Volume, length, width, and area do not necessarily impact the determination of appropriate remedial alternatives, however they are important considerations for developing costs and durations of remedial actions. Thickness of the contaminated lens impacts the implementability of in situ actions such as vitrification which has a limited vertical extent of influence.

- Contaminated Media/Material:

  Contaminated media and material located at the site are determined and described. Structural materials such as steel, concrete, and wooden timbers influence the applicability of remedial alternatives, as well as equipment needed for actions such as removal. Presence of soils and sludges are necessary for implementation of treatment options such as soil washing. Presence of solid waste media impacts material handling considerations and may require remedial alternatives which vary from sites with contaminated soil.

- Refined COPC/Maximum Concentrations:

  Refined COPC for a site are determined as discussed in Section 2.4.2. The associated maximum concentration for each constituent is the highest concentration detected above PRG in any of the IRM candidate site data. Refined COPC may influence the applicability of remedial alternatives. For instance, presence of radioactive contaminants may allow natural decay to be a consideration in determining appropriate remedial actions, while the presence of organic contaminants may require that enhancements such as thermal desorption be added to a treatment system. The presence of cesium-137 influences the effectiveness of treatment alternatives such as soil washing.

- Reduced Infiltration Concentration:

  The reduced infiltration concentration is a level which is considered protective of groundwater under a scenario where hydraulic infiltration is limited by the application of a surface barrier. The derivation of this concentration is documented in Appendix A of the Process Document. The maximum concentration detected is compared to the allowable reduced infiltration concentration. Exceedance of the reduced infiltration concentrations indicates

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that impact to groundwater will not be mitigated by containment alternatives such as a barrier.

The profiles for each IRM candidate site in the 100-DR-1 Operable Unit are presented in Table 2-12.

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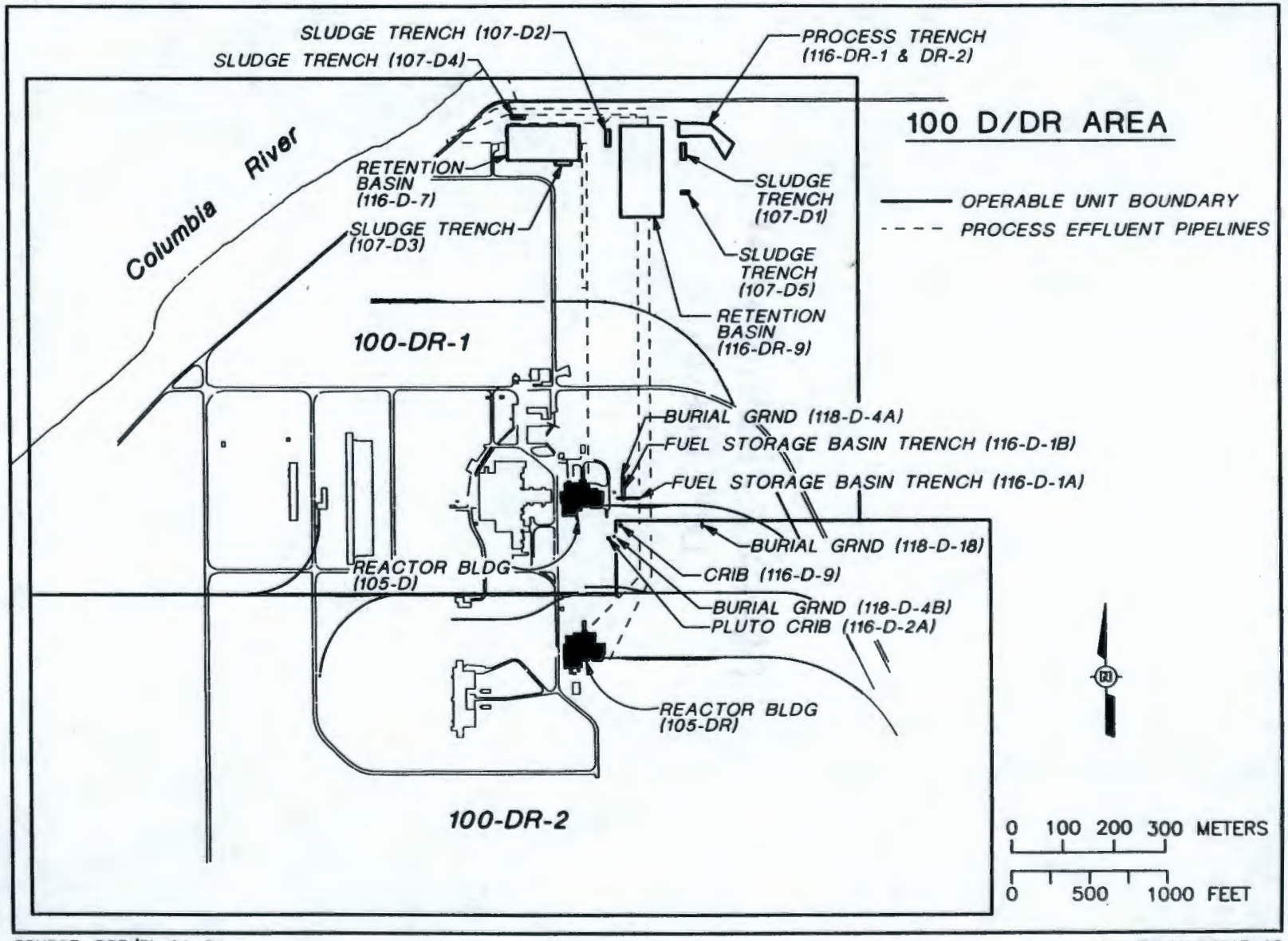

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Figure 2-1 100-DR-1 Operable Unit Map

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Table 2-1 IRM Recommendations from the 100-DR-1 LFI[a]

Waste Site	Qualitative Risk Assessment		Conceptual Model	Exceeds ARAR	Probable Current Impact on Groundwater	Potential for Natural Attenuation by 2018	IRM Candidate yes/no
	Low-frequency scenario	EHQ >1					
116-D-1A	medium	no	adequate	no	yes	yes	yes
116-D-1B	medium	no	adequate	no	yes	yes	yes
116-D-6	low	no	adequate	no	no	yes	no
116-D-7	high	yes	adequate	no	yes	no	yes
116-DR-9	high	yes	adequate	no	yes	no	yes
116-DR-1	medium	no	adequate	no	yes	yes	yes
116-DR-2	medium	no	adequate	no	yes	yes	yes
116-D-2A	low	no	adequate	no	yes	yes	yes
116-D-9	medium	-	adequate	no	yes	yes	yes
132-D-3	low	-	adequate	no	no	yes	yes
116-D-5	medium	no	adequate	no	no	yes	yes
116-DR-5	medium	-	adequate	no	no	yes	yes
116-D-3	very low	no	adequate	no	no	yes	no
116-D-4	very low	no	adequate	no	no	yes	no
130-D-1	low	no	incomplete*	no	no	yes	yes
108-D	low	no	adequate	no	no	yes	no
Sodium Dichromate Tanks	low	no	adequate	no	no	yes	no
103-D	low	-	incomplete*	no	no	yes	yes
126-D-2	medium	-	incomplete*	unknown	no	yes	yes
115-D	low	-	adequate	unknown	no	unknown	yes
117-D	low	-	adequate	unknown	no	unknown	yes
Process Effluent Pipelines	medium	-	adequate	unknown	yes	unknown	yes
107-D Sludge Trenches	high	no	adequate	unknown	yes	no	yes
107-DR Sludge Trenches	high	yes	adequate	unknown	yes	no	yes
118-D-4A, 4B, 18 Burial Grounds							yes

EHQ = Environmental Hazard Quotient calculated by the qualitative ecological risk assessment
- = Not rated by the qualitative ecological risk assessment
* = Data needed concerning nature and vertical extent of contamination, site remains an IRM candidate until data are available. Therefore not addressed in this FFS.
ARAR = Applicable or Relevant and Appropriate Regulation, specifically the Washington state Model Toxics Control Act Method B concentration values for soils
a) This table is from the 100-DR1 LFI report (DOE/RL 1993b)

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Table 2-2 100-DR-1 Site Description (page 1 of 2)

Site#/Name (Alias)	Use	Physical Description	Data Source
116-D-7 (107-D Retention Basin)	Received cooling water effluent from D Reactor and decontamination waste; discharged mostly to the Columbia River; probably received ruptured fuel element waste; much leakage from basin to soil.	Retention Basin Reinforced concrete single containment. 142.3 m x 70.1 m x 7.3m deep	LFI, historical
116-DR-9 (107-DR Retention Basin)	Received cooling water effluent from DR Reactor, probably received ruptured fuel element waste, may have been much leakage to soils from basins.	Retention Basin Reinforced concrete single containment. 182.9 m x 83.2 m x 6.1 m deep	LFI, historical
116-DR-1/DR-2 (107-DR Liquid Effluent Disposal Trench #1 and #2)	Received 40 million liters effluent overflow from the 107-D and 107-DR retention basins at times of high activity due to fuel element failure.	Trench Unlined variable dimensions	LFI, historical
107-D/DR Sludge Disposal Trench #1	Received sludge from D retention basins when they were dredged for repairs.	Trench 38.1 m x 15.2 m x 3.1 m deep	analogous
107-D/DR Sludge Disposal Trench #2	Received sludge from D retention basins when they were dredged for repairs.	Trench 38.1 m x 15.2 m x 3.1 m deep	analogous
107-D/DR Sludge Disposal Trench #3	Received sludge from D retention basins when they were dredged for repairs.	Trench 38.1 m x 15.2 m x 3.1 m deep	analogous
107-D/DR Sludge Disposal Trench #4	Received sludge from D retention basins when they were dredged for repairs.	Trench 32 m x 12.2 m x 3.1 m deep	analogous
107-D/DR Sludge Disposal Trench #5	Received sludge from D retention basins when they were dredged for repairs.	Trench 27.4 m x 18.3 m x 3.1 m deep	analogous
116-D-1A (105-D Fuel Storage Basin Trench #1)	Received contaminated water from 105-D fuel storage basin. 20,000 liters.	Trench Unlined 43.3 m x 6.7 m x 1.8 m deep	LFI, historical
116-D-1B (105-D Fuel Storage Basin Trench #2)	Received contaminated water from 105-D fuel storage basin. Eight million liters.	Trench Unlined 39.6 m x 12.2 m x 4.6 m deep	LFI, historical
116-D-2A (105-D Pluto Crib)	Received 4,000 liters effluent water from tubes following fuel cladding failures. In 1956 site was covered to grade with clean soil, sampling did not determine contamination, however, may not have found correct location of crib.	Crib/French Drain Gravel filled. 3.1 m x 3.1 m x 3.1 m deep	LFI
116-D-9 Confinement Seal Crib (117-D-Crib)	Received 420,000 liters of waste.	Crib/French Drain Gravel filled. 3.1 m x 3.1 m x 3.1 m deep	LFI

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Table 2-2 100-DR-1 Site Description (page 2 of 2)

Site#/Name (Alias)	Use	Physical Description	Data Source
Pipelines	Transported reactor cooling water effluent, decontamination wastes, and/or reactor confinement seal pit drainage to retention basins and disposal trenches.	Process Effluent Pipelines Total length approximately 4021 m; pipe diameter varies; depth below surface varies.	historical
118-D-4A Burial Ground	Received radioactive and nonradioactive solid waste.	Burial Ground 57.9 m x 18.3m x 6.1 m deep	analogous
118-D-4B Burial Ground	Received radioactive and nonradioactive solid waste.	Burial Ground 32 m x 7.3 m x 3.7 m deep	analogous
118-D-18 Burial Ground	Received radioactive and nonradioactive solid waste.	Burial Ground 24.4 m x 12.2 m x 6.1 m deep	analogous
132-D-1 (115-D Gas Recirculation Building)	Recirculated cover gases around reactor core.	D&D Facility Demolished reinforced concrete. 51.2 m x 29.9 x 3.4 m tall	D&D
132-D-2 (117-D Exhaust Air Filter)	Received reactor building exhaust gas.	D&D Facility Demolished reinforced concrete. Building: 18 m x 11.9 m x 8.2 m high Tunnels: 58 m long	D&D
132-D-3 (1608-D Effluent Pumping Facility)	Received water from D Reactor fuel storage basin overflows, also contained decontamination chemicals.	D&D Facility 6.1 m x 6.1 m x 9.8 m deep	D&D, LFI

D&D = decontamination and decommissioning
LFI = limited field investigation

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Table 2-3 116-D-7 Contaminants of Potential Concern

116-D-7	Zone 1		Zone 2		Zone 3		Zone 4												Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		35 - 40 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																			
Am-241		NO a b c d e	2.80E-03	NO b c d e	2.80E-03	NO c d e		NO d e		NO d e		NO d e	1.20E-02	NO d e	1.20E-02	NO d e	3.20E-03	NO d e	
C-14	5.89E+01	YES a b c	4.29E+02	YES b c	4.30E-01	NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Cs-134	1.33E+00	NO a b c d	7.82E+00	NO b c d	1.79E-02	NO c d e	6.58E-02	NO d e	1.75E-04	NO d e	2.44E-03	NO d e	1.70E-03	NO d e	1.43E-04	NO d e		NO d e	
Cs-137	1.32E+03	YES	1.04E+03	YES	3.39E+01	YES d	2.08E+01	NO d	1.87E+01	NO d	3.46E+01	NO d	3.11E+01	NO d	1.38E+01	NO d		NO d e	YES
Co-60	3.05E+03	YES	8.30E+02	YES d	6.95E+01	YES d	8.17E+01	NO d	2.56E+01	NO d	1.46E+02	NO d	9.03E+01	NO d	1.07E+01	NO d		NO d e	YES
Eu-152	2.96E+04	YES	7.96E+03	YES d	2.92E+02	YES d	2.78E+02	NO d	9.72E+01	NO d	2.61E+02	NO d	1.24E+02	NO d	2.74E+01	NO d		NO d e	YES
Eu-154	9.94E+03	YES d	5.68E+03	YES d	6.53E+01	YES d	7.10E+01	NO d	2.30E+01	NO d	5.68E+01	NO d	2.36E+01	NO d	5.40E+00	NO d		NO d e	YES
Eu-155	2.03E+02	NO a b c d	6.63E+02	NO b c d	3.10E+00	NO c d	5.46E+00	NO d	4.07E-01	NO d	2.89E+00	NO d	7.17E-01	NO d	9.95E-02	NO d e		NO d e	
H-3	1.74E+01	NO a b c d e	1.98E+04	YES b c	6.08E+00	NO c d e	7.29E+00	NO d e	2.19E+00	NO d e	1.01E+01	NO d e	6.08E+00	NO d e	1.90E+00	NO d e		NO d e	YES
K-40		NO a b c d e	8.71E+00	NO b c d	8.71E+00	NO c d		NO d e		NO d e		NO d e	1.25E+01	NO d	1.58E+01	NO d	1.58E+01	NO d	
Na-22		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Ni-63	1.97E+04	NO a b c d	1.43E+04	NO b c d		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238	4.14E+00	NO a b c d	4.14E+00	NO b c d		NO c d e	3.52E-03	NO d e		NO d e	2.20E-03	NO d e		NO d e	4.23E-01	NO d e		NO d e	
Pu-239/240	2.10E+02	YES	2.90E+02	YES	8.30E-01	NO c d e	1.20E+00	NO d	3.50E-01	NO d e	2.30E+00	NO d	7.70E-01	NO d e	1.30E+01	YES	5.60E-03	NO d e	YES
Ra-226		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	5.85E-01	YES	7.49E-01	YES	7.49E-01	YES	YES f
Sr-90	3.73E+02	YES a b c	2.24E+01	NO b c d	2.92E+00	NO c d	1.36E+00	NO d	1.63E+00	NO d	2.31E+00	NO d	1.90E+00	NO d	1.09E+00	NO d	5.70E-01	NO d e	YES
Tc-99		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Th-228		NO a b c d e	5.38E-01	NO b c e	5.38E-01	NO c e		NO d e		NO d e		NO d e	4.49E-01	NO e	5.60E-01	NO e	5.60E-01	NO e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e	4.20E-03	NO b c d e	4.20E-03	NO c d e		NO d e		NO d e		NO d e	4.60E-03	NO d e	4.60E-03	NO d e	1.50E-02	NO d e	
U-238	1.90E+00	NO a b c d	3.20E+00	NO b c d	7.40E-01	NO c d e	4.30E-01	NO d e	2.40E-01	NO d e	5.70E-01	NO d e	3.60E-01	NO d e	1.80E-01	NO d e	1.80E-01	NO d e	
INORGANICS (mg/kg)																			
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chromium VI		NO a b c d e	5.16E+01	YES b c	5.16E+01	YES c		NO d e		NO d e		NO d e	3.49E+01	YES		NO d e		NO d e	YES
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																			
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL
f) Ra-226 is eliminated as a COPC because non-waste site samples presented in Table 3-1 of the 100-BC-2 Operable Unit LFI Report (DOE-RL 1994d) show Radium-226 at a concentration of approximately 1 pCi/g (i.e., average + 2 standard deviations).

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
LFI = limited field investigation
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

DOE-RL, 1993d, Tables 3-13, 14, 15, 16

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-43, 44, 48, 50, 51

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Table 2-4 116-DR-9 Contaminants of Potential Concern

116-DR-9	Zone 1		Zone 2		Zone 3		Zone 4												Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		35 - 40 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																			
Am-241		NO a b c d e	1.00E-02	NO b c d e	*2.00E-02*	NO c d e	1.50E-02	NO d e	1.30E-02	NO d e	1.30E-02	NO d e	*5.00E-01*	NO d e	1.30E-03	NO d e	9.20E-03	NO d e	
C-14	1.80E+02	YES a b c	3.00E-01	NO b c d e	*5.00E-01*	NO c d e	3.00E-01	NO d e	2.20E-01	NO d e		NO d e	*6.00E-01*	NO d e	2.51E+01	NO e	2.51E+01	NO e	YES
Cs-134	1.24E+00	NO a b c d	5.52E-04	NO b c d e	*4.00E-02*	NO c d e	*4.00E-02*	NO d e	1.43E-04	NO d e		NO d e	*3.00E-02*	NO d e	3.00E-02	NO d e	3.00E-02	NO d e	
Cs-137	3.25E+03	YES	2.98E+02	YES d	9.69E+02	YES	1.94E+01	NO d	2.56E+00	NO d		NO d e	*3.00E-02*	NO d e	2.36E-01	NO d	3.00E-02	NO d e	YES
Co-60	2.07E+03	YES	4.27E+01	YES d	6.22E+01	YES d	6.83E+00	NO d	5.49E-02	NO d		NO d e	*3.00E-02*	NO d e	3.00E-02	NO d e	3.00E-02	NO d e	YES
Eu-152	1.11E+04	YES d	1.64E+02	YES d	2.61E+02	YES d	9.28E+00	NO d	4.15E-01	NO d		NO d e	7.51E-02	NO d e	7.00E-02	NO d e	7.00E-02	NO d e	YES
Eu-154	3.98E+03	YES d	3.86E+01	YES d	5.96E+01	YES d	2.22E+00	NO d	5.96E-02	NO d e		NO d e	7.38E-02	NO d e	9.00E-02	NO d e	9.00E-02	NO d e	YES
Eu-155	2.46E+01	NO a b c d	1.71E+00	NO b c d	3.21E+00	NO c d	*2.00E-01*	NO d	2.25E-02	NO d e		NO d e	2.46E-02	NO d e	9.00E-02	NO d e	9.00E-02	NO d e	
H-3	5.67E+00	NO a b c d e	2.03E+00	NO b c d e	3.32E+00	NO c d e	2.31E+00	NO d e	2.31E+00	NO d e		NO d e		NO d e		NO d e		NO d e	
K-40		NO a b c d e	8.22E+00	NO b c d	8.71E+00	NO c d	8.71E+00	NO d	1.13E+01	NO d	1.47E+01	NO d	1.47E+01	NO d	1.31E+01	NO d	1.31E+01	NO d	
Na-22		NO a b c d e		NO b c d e		NO c d e	1.03E-01	NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Ni-63	8.50E+03	NO a b c d		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238	9.69E-01	NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240	6.50E+01	YES a b c	1.00E+00	NO b c d e	2.10E+00	NO c d	2.40E+00	NO d	1.30E-03	NO d e	*5.00E-01*	NO d e	*5.00E-01*	NO d e	1.90E-03	NO d e	2.40E-02	NO d e	YES
Ra-226		NO a b c d e	1.10E+00	YES b c	1.10E+00	YES c	8.02E-01	YES	7.65E-01	YES	8.12E-01	YES	1.23E+00	YES	1.25E+00	YES	1.25E+00	YES	YES
Sr-90	1.70E+02	YES a b c	3.80E+00	NO b c d	6.72E+00	NO c d	2.50E+00	NO d	1.10E+00	NO d	6.60E-01	NO d e	1.09E+00	NO d	7.70E-01	NO d e	8.40E-01	NO d e	YES
Tc-99		NO a b c d e	1.50E+00	NO b c d e	1.50E+00	NO c d e	6.60E-01	NO d e		NO d e	*1.00E+00*	NO d e	*1.00E+00*	NO d e	2.40E-01	NO d e	5.60E-01	NO d e	
Th-228		NO a b c d e	4.76E-01	NO b c e	4.76E-01	NO c e	5.83E-01	NO e	5.83E-01	NO e	5.75E-01	NO e	5.75E-01	NO e	6.90E-01	NO e	1.02E+00	YES	YES
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e	7.12E-01	NO e	7.12E-01	NO e	
U-233/234		NO a b c d e	1.60E-01	NO b c d e	1.80E-01	NO c d e	1.80E-01	NO d e		NO d e		NO d e		NO d e	5.10E-01	NO d e	5.10E-01	NO d e	
U-235		NO a b c d e	4.40E-03	NO b c d e	1.10E-02	NO c d e	1.10E-02	NO d e	6.70E-03	NO d e	6.70E-03	NO d e	5.60E-03	NO d e	5.60E-03	NO d e	9.50E-03	NO d e	
U-238	9.00E-01	NO a b c d e	5.10E-01	NO b c d e	6.60E-01	NO c d e	3.40E-01	NO d e	1.30E-01	NO d e	2.00E-01	NO d e	2.00E-01	NO d e	1.70E-01	NO d e	4.60E-01	NO d e	
INORGANICS (mg/kg)																			
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e	1.24E+01	YES b c	1.24E+01	YES c		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium	6.80E-01	NO a b c d		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e	1.20E+00	YES	1.20E+00	YES	YES
Chromium VI		NO a b c d e		NO b c d e	7.34E+01	YES c	7.34E+01	YES		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																			
Aroclor 1260 (PCB)	1.30E-01	NO a b c d		NO b c d e		NO c d e		NO d e	2.10E-02	NO d e	2.10E-02	NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e	1.10E-01	NO d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e	1.40E-01	NO e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol	5.30E-02	NO d e		NO b c d e		NO c d e		NO d e		NO d e	5.60E-02	NO d e	5.60E-02	NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC
Italicized values are reported as "less than" in the source documents.

Sources:

DOE-RL, 1993, Tables 3-16 through 29

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-45, 46, 49, 54

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Table 2-5 116-D-1A Contaminants of Potential Concern

116-D-1A	Zone 1		Zone 2		Zone 3		Zone 4																Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		35 - 40 ft		40 - 45 ft		45 - 50 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																							
Am-241	1.70E-01	NO a b c d e		NO b c d e	1.20E-01	NO c d e	1.50E-02	NO d e	1.00E+00	NO d e	1.10E+00	NO d	1.10E+00	NO d	1.40E+00	NO d		NO d e	1.30E+00	NO d	1.30E+00	NO d	
C-14	4.00E-01	NO a b c d e		NO b c d e	4.00E-01	NO c d e		NO d e	4.50E-01	NO d e		NO d e	4.80E-01	NO d e	1.50E-01	NO d e		NO d e	3.60E-01	NO d e	2.90E-02	NO d e	
Cs-134	2.25E-04	NO a b c d e		NO b c d e		NO c d e	7.00E-02	NO d e		NO d e	1.79E-02	NO d e	6.40E-03	NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-137	2.57E+01	YES d	2.28E+01	YES d	7.88E-02	NO c d e	4.57E+01	NO d	1.48E+02	NO d	3.74E+02	NO d	3.05E+02	NO d	1.90E+02	NO d		NO d e	9.46E+01	NO d	9.46E+01	NO d	YES
Co-60	1.02E+00	NO a b c d	7.93E-01	NO b c d		NO c d e	1.15E+01	NO d	1.09E+01	NO d	8.91E+00	NO d	5.25E+00	NO d	1.54E+00	NO d		NO d e	5.57E+00	NO d	5.57E+00	NO d	
Eu-152	9.17E+00	YES d	6.63E+00	YES d		NO c d e	1.24E+02	NO d	1.12E+02	NO d	5.75E+01	NO d	7.07E+01	NO d	3.81E+01	NO d		NO d e	5.90E+01	NO d	5.90E+01	NO d	YES
Eu-154	8.69E-01	NO a b c d	8.24E-01	NO b c d		NO c d e	1.79E+01	NO d	1.00E+01	NO d	5.97E+00	NO d	6.25E+01	NO d	6.17E+00	NO d		NO d e	7.25E+00	NO d	7.25E+00	NO d	
Eu-155	8.24E-02	NO a b c d e	2.03E-02	NO b c d e		NO c d e	2.00E-01	NO d		NO d e	3.32E+00	NO d	2.35E+00	NO d		NO d e		NO d e		NO d e		NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e	3.40E+01	NO d e		NO d e	4.46E+01	NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
K-40	1.04E+01	NO a b c d		NO b c d e	1.11E+01	NO c d	1.34E+01	NO d	6.40E+00	NO d	7.73E+00	NO d	8.79E+00	NO d	8.27E+00	NO d		NO d e	1.20E+01	NO d	1.20E+01	NO d	
Na-22	3.38E-01	NO a b c d e		NO b c d e		NO c d e		NO d e	4.72E+00	NO d	2.39E+00	NO d e	2.39E+00	NO d e	1.84E+00	NO d e		NO d e	2.60E+00	NO d e	2.60E+00	NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240	4.60E-01	NO a b c d e	2.70E-01	NO b c d e	4.70E-01	NO c d e	4.50E+00	YES	6.80E+00	YES	7.10E+00	YES	7.10E+00	YES	8.30E+00	YES		NO d e	5.70E+00	YES	5.70E+00	YES	YES
Ra-226		NO a b c d e		NO b c d e	8.03E-01	YES c	1.00E+00	YES		NO d e	4.28E+01	YES	4.28E+01	YES		NO d e		NO d e		NO d e		NO d e	YES
Sr-90	5.00E+00	NO a b c d	2.99E+00	NO b c d	4.20E+00	NO c d	3.67E+01	NO d	1.10E-01	NO d e	3.94E+00	NO d	6.65E+00	NO d	1.20E+00	NO d		NO d e	2.20E+00	NO d	1.80E+00	NO d	
Tc-99		NO a b c d e		NO b c d e		NO c d e	8.00E-02	NO d e	9.90E-02	NO d e		NO d e	2.70E-01	NO d e	5.10E-01	NO d e		NO d e		NO d e		NO d e	
Th-228	5.62E-01	NO a b c e		NO b c d e	6.36E-01	NO c e	6.30E-01	NO e		NO d e		NO d e	5.00E-01	NO e		NO d e		NO d e		NO d e		NO d e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235	7.10E-03	NO a b c d e		NO b c d e	4.40E-03	NO c d e	5.40E-03	NO d e	6.70E-03	NO d e	1.20E-02	NO d e	1.20E-02	NO d e	7.30E-03	NO d e		NO d e	9.10E-03	NO d e	8.60E-03	NO d e	
U-238	1.10E-01	NO a b c d e		NO b c d e	1.30E-01	NO c d e	1.80E-01	NO d e	2.80E-01	NO d e	2.70E-01	NO d e	4.00E-02	NO d e	1.10E-01	NO d e		NO d e	1.20E-01	NO d e	1.20E-01	NO d e	
INORGANICS (mg/kg)																							
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e	1.00E+00	YES		NO d e		NO d e	9.50E-01	YES		NO d e	1.00E+00	YES		NO d e	YES
Chromium VI		NO a b c d e		NO b c d e		NO c d e	4.16E+01	YES	8.71E+01	YES		NO d e		NO d e	1.08E+02	YES		NO d e	4.21E+01	YES		NO d e	YES
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e	3.86E+01	YES	1.94E+01	YES	2.76E+01	YES	5.19E+01	YES		NO d e	3.60E+01	YES	3.60E+01	YES	YES
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																							
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
Max = Blank: No information is available, or not detected
Screening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

DOE-RL, 1993d, Tables 3-3, 4

Dorian, J.J., and V.R. Richards, 1978, Tables 3.4-13

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Table 2-6 116-D-1B Contaminants of Potential Concern

116-D-1B	Zone 1		Zone 2		Zone 3		Zone 4										Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																	
Am-241		NO a b c d e		NO b c d e		NO c d e	1.30E+00	NO d	1.30E+00	NO d	7.10E-02	NO d e	7.10E-02	NO d e		NO d e	
C-14		NO a b c d e		NO b c d e		NO c d e	2.30E-02	NO d e	4.40E-01	NO d e	3.50E-01	NO d e	*5.00E-01*	NO d e	*6.00E-01*	NO d e	
Cs-134		NO a b c d e		NO b c d e		NO c d e	1.75E-02	NO d e		NO d e		NO d e	1.95E-01	NO d	1.95E-01	NO d	
Cs-137	9.69E+00	YES d	2.49E+01	YES d		NO c d e	3.22E+02	NO d	3.22E+02	NO d	3.88E+01	NO d	4.22E+01	NO d	5.35E-02	NO d e	YES
Co-60	2.44E-01	NO a b c d	1.12E+00	NO b c d		NO c d e	1.63E+01	NO d	1.63E+01	NO d	2.32E+00	NO d	1.71E+00	NO d	*3.00E-02*	NO d e	
Eu-152	2.21E+00	NO a b c d	9.72E+00	YES d		NO c d e	1.47E+02	NO d	1.47E+02	NO d	6.63E+00	NO d	1.19E+01	NO d	1.42E+00	NO d	YES
Eu-154	3.41E-01	NO a b c d	1.11E+00	NO b c d		NO c d e	1.59E+01	NO d	9.82E+01	NO d	4.23E-01	NO d	1.48E+00	NO d	*1.00E-01*	NO d e	
Eu-155	1.18E-02	NO a b c d e	5.67E-02	NO b c d e		NO c d e	7.38E+01	NO d	3.85E-02	NO d e	2.68E-02	NO d e	*1.00E-01*	NO d e	*1.00E-01*	NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e	7.29E+00	NO d e	6.08E+00	NO d e		NO d e		NO d e	8.51E+00	NO d e	
K-40		NO a b c d e		NO b c d e		NO c d e	8.99E+00	NO d	1.41E+01	NO d	8.86E+00	NO d	8.86E+00	NO d	8.84E+00	NO d	
Na-22		NO a b c d e		NO b c d e		NO c d e	5.70E+00	NO d	5.70E+00	NO d		NO d e	1.25E-01	NO d e	1.25E-01	NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240		NO a b c d e	3.00E-01	NO b c d e		NO c d e	5.30E+00	YES	5.30E+00	YES	4.60E-01	NO d e	3.20E-01	NO d e		NO d e	YES
Ra-226		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	*5.00E-01*	YES	*6.00E-01*	YES	YES f
Sr-90	1.63E+00	NO a b c d	5.36E+00	NO b c d	3.20E+01	NO c d	3.20E+01	NO d	4.07E+01	NO d	8.40E+00	NO d	8.40E+00	NO d	1.97E+01	NO d	
Tc-99		NO a b c d e		NO b c d e		NO c d e		NO d e	4.90E-01	NO d e		NO d e	1.20E-01	NO d e	1.20E-01	NO d e	
Th-228		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e	8.25E-01	NO e	8.25E-01	NO e	5.35E-01	NO e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	6.08E-01	NO e	6.08E-01	NO e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e		NO b c d e		NO c d e	6.70E-03	NO d e	6.70E-03	NO d e		NO d e		NO d e		NO d e	
U-238		NO a b c d e		NO b c d e		NO c d e	2.50E-01	NO d e	2.50E-01	NO d e	1.20E-01	NO d e	1.20E-01	NO d e		NO d e	
INORGANICS (mg/kg)																	
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chromium VI		NO a b c d e		NO b c d e		NO c d e	3.04E+01	YES	3.04E+01	YES		NO d e		NO d e		NO d e	YES
Lead		NO a b c d e		NO b c d e		NO c d e	2.20E+01	YES	2.20E+01	YES		NO d e		NO d e		NO d e	YES
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e	1.06E+02	NO d	1.06E+02	NO d		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																	
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	5.80E-02	NO e	5.80E-02	NO e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a. b. c. d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL
f) Ra-226 is eliminated as a COPC because non-waste site samples presented in Table 3-1 of the 100-BC-2 Operable Unit LFI Report (DOE-RL 1994d) show Radium-226 at a concentration of approximately 1 pCi/g (i.e., average + 2 standard deviations).

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
LFI = limited field investigation
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC
Italicized values are reported as "less than" in the source documents.

Sources:

DOE-RL, 1993d, Tables 3-6. 8, 9

Dorian, J.J., and V.R. Richards, 1978, Tables 3.4-13

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Table 2-7 116-DR-1 Contaminants of Potential Concern

116-DR-1	Zone 1		Zone 2		Zone 3		Zone 4										Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																	
Am-241		NO a b c d e		NO b c d e		NO c d e	1.50E-01	NO d e	1.50E-01	NO d e	3.40E-02	NO d e	9.40E-03	NO d e	1.30E-02	NO d e	
C-14		NO a b c d e		NO b c d e		NO c d e	8.40E-02	NO d e	8.40E-02	NO d e	1.70E-01	NO d e	5.30E-01	NO d e	1.00E-02	NO d e	
Cs-134		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-137		NO a b c d e		NO b c d e		NO c d e	1.47E+02	NO d	1.47E+02	NO d	2.88E+01	NO d		NO d e	1.98E-01	NO d	
Co-60		NO a b c d e		NO b c d e		NO c d e	2.31E+01	NO d	2.31E+01	NO d	1.59E+00	NO d		NO d e		NO d e	
Eu-152		NO a b c d e		NO b c d e		NO c d e	2.58E+02	NO d	2.58E+02	NO d	1.33E+01	NO d	3.36E-01	NO d	3.39E-01	NO d	
Eu-154		NO a b c d e		NO b c d e		NO c d e	2.57E+01	NO d	2.57E+01	NO d	1.59E+00	NO d		NO d e		NO d e	
Eu-155		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
K-40		NO a b c d e		NO b c d e		NO c d e	2.00E+01	NO d	2.00E+01	NO d	8.42E+00	NO d	1.03E+01	NO d	1.02E+01	NO d	
Na-22		NO a b c d e		NO b c d e		NO c d e	9.91E+00	NO d	9.91E+00	NO d	6.10E-01	NO d e		NO d e		NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240		NO a b c d e		NO b c d e		NO c d e	8.20E-01	NO d e	8.20E-01	NO d e	1.20E-01	NO d e	1.90E-02	NO d e	1.10E-01	NO d e	
Ra-226		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e	6.60E-01	YES	9.24E-01	YES		NO d e	YES f
Sr-90		NO a b c d e		NO b c d e		NO c d e	1.00E+01	NO d	1.00E+01	NO d	2.20E+00	NO d	1.70E+00	NO d	1.60E-01	NO d e	
Tc-99		NO a b c d e		NO b c d e		NO c d e	9.10E-01	NO d e	9.10E-01	NO d e	5.30E-01	NO d e		NO d e		NO d e	
Th-228		NO a b c d e		NO b c d e		NO c d e		NO d e	5.08E-01	NO e	5.08E-01	NO e	4.64E-01	NO e	4.33E-01	NO e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e		NO b c d e		NO c d e	1.30E-02	NO d e	1.30E-02	NO d e	1.30E-02	NO d e	5.10E-03	NO d e		NO d e	
U-238		NO a b c d e		NO b c d e		NO c d e	2.00E-01	NO d e	2.00E-01	NO d e	1.90E-01	NO d e	1.30E-01	NO d e	1.20E-01	NO d e	
INORGANICS (mg/kg)																	
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chromium VI		NO a b c d e		NO b c d e		NO c d e	1.86E+02	YES	1.86E+02	YES		NO d e		NO d e		NO d e	YES
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e	1.09E+02	NO d	1.09E+02	NO d		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																	
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL
f) Ra-226 is eliminated as a COPC because non-waste site samples presented in Table 3-1 of the 100-BC-2 Operable Unit LFI Report (DOE-RL 1994d) show Radium-226 at a concentration of approximately 1 pCi/g (i.e., average + 2 standard deviations).

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
LFI = limited field investigation
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

DOE-RL, 1993d, Tables 3-32, 33
- Site specifc data for 116-DR-1. See 116-DR-2 for historical data.

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Table 2-8 116-DR-2 Contaminants of Potential Concern

116-DR-2	Zone 1		Zone 2		Zone 3		Zone 4												Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		35 - 40 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																			
Am-241		NO a b c d e		NO b c d e		NO c d e	2.60E-02	NO d e	2.60E-02	NO d e	5.50E-03	NO d e		NO d e		NO d e		NO d e	
C-14		NO a b c d e		NO b c d e		NO c d e	8.30E-01	NO d e	8.30E-01	NO d e	6.80E-01	NO d e	1.20E-01	NO d e	1.90E-01	NO d e	6.60E-03	NO d e	
Cs-134		NO a b c d e		NO b c d e	2.07E-03	NO c d e	1.20E-02	NO d e	1.43E-03	NO d e	1.10E-02	NO d e	*7.20E-02*	NO d e		NO d e		NO d e	
Cs-137		NO a b c d e		NO b c d e	5.61E+01	YES d	2.23E+02	NO d	2.33E+02	NO d	8.30E+02	YES	3.53E+01	NO d		NO d e		NO d e	YES
Co-60		NO a b c d e		NO b c d e	1.95E+00	NO c d	1.34E+01	NO d	5.73E+00	NO d	3.90E+01	NO d	2.44E+00	NO d		NO d e		NO d e	
Eu-152		NO a b c d e		NO b c d e	4.42E+01	YES d	2.03E+02	NO d	2.40E+01	NO d	2.78E+02	NO d	9.72E+00	NO d		NO d e		NO d e	YES
Eu-154		NO a b c d e		NO b c d e	5.96E+00	NO c d	2.81E+01	NO d	2.53E+00	NO d	4.26E+01	NO d	2.84E+00	NO d		NO d e		NO d e	
Eu-155		NO a b c d e		NO b c d e	5.56E-01	NO c d	3.10E+00	NO d	2.14E-02	NO d e	9.84E-01	NO d	2.25E-01	NO d		NO d e		NO d e	
H-3		NO a b c d e		NO b c d e	1.01E+00	NO c d e	6.08E+00	NO d e		NO d e	5.67E+00	NO d e		NO d e		NO d e		NO d e	
K-40		NO a b c d e		NO b c d e		NO c d e	1.00E+01	NO d	1.00E+01	NO d	9.09E+00	NO d	8.73E+00	NO d		NO d e		NO d e	
Na-22		NO a b c d e		NO b c d e		NO c d e	9.79E-01	NO d e	9.79E-01	NO d e		NO d e		NO d e		NO d e		NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240		NO a b c d e		NO b c d e	5.10E-01	NO c d e	1.40E+01	YES	1.40E+01	YES	3.20E+00	NO d		NO d e		NO d e		NO d e	YES
Ra-226		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	4.07E-01	YES		NO d e		NO d e	YES f
Sr-90		NO a b c d e		NO b c d e	3.19E+00	NO c d	5.09E+00	NO d	7.80E-01	NO d e	9.51E+00	NO d	4.55E+00	NO d	9.90E-01	NO d e	1.70E+00	NO d	
Tc-99		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	3.40E-01	NO d e	1.10E+00	NO d e		NO d e	
Th-228		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	3.67E-01	NO e		NO d e		NO d e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e	4.83E-01	NO e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-238		NO a b c d e		NO b c d e	1.80E-01	NO c d e	1.80E-01	NO d e	1.70E-01	NO d e	3.80E-01	NO d e		NO d e		NO d e		NO d e	
INORGANICS (mg/kg)																			
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e	1.10E+00	YES		NO d e		NO d e		NO d e		NO d e	YES
Chromium VI		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																			
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a. b. c, d. e. f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL
f) Ra-226 is eliminated as a COPC because non-waste site samples presented in Table 3-1 of the 100-BC-2 Operable Unit LFI Report (DOE-RL 1994d) show Radium-226 at a concentration of approximately 1 pCi/g (i.e., average + 2 standard deviations).

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
LFI = limited field investigation
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC
Italicized values are reported as "less than" in the source documents.

Sources:

DOE-RL, 1993d, Tables 3-36, 3-37

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-47
- Historical data is for 116-DR-1 and 116-DR-2 combined.

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Table 2-9 116-D-2A Contaminants of Potential Concern

116-D-2A	Zone 1		Zone 2		Zone 3		Zone 4										Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																	
Am-241		NO a b c d e		NO b c d e		NO c d e	1.00E-01	NO d e	1.50E-02	NO d e	6.00E-04	NO d e		NO d e		NO d e	
C-14		NO a b c d e		NO b c d e		NO c d e	4.40E-02	NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-134		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-137		NO a b c d e		NO b c d e		NO c d e	1.05E+02	NO d	1.99E+01	NO d	1.07E+00	NO d		NO d e		NO d e	
Co-60		NO a b c d e		NO b c d e		NO c d e	1.62E-01	NO d		NO d e		NO d e		NO d e		NO d e	
Eu-152		NO a b c d e		NO b c d e		NO c d e	6.87E+00	NO d	1.26E+00	NO d		NO d e		NO d e		NO d e	
Eu-154		NO a b c d e		NO b c d e		NO c d e	5.01E+00	NO d		NO d e		NO d e		NO d e		NO d e	
Eu-155		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
K-40		NO a b c d e		NO b c d e		NO c d e	1.07E+01	NO d	1.34E+01	NO d	8.54E+00	NO d		NO d e		NO d e	
Na-22		NO a b c d e		NO b c d e		NO c d e	2.14E-01	NO d e		NO d e		NO d e		NO d e		NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240		NO a b c d e		NO b c d e		NO c d e	1.00E+00	NO d e	1.40E-01	NO d e	1.40E-02	NO d e		NO d e		NO d e	
Ra-226		NO a b c d e		NO b c d e		NO c d e	1.30E+01	YES		NO d e		NO d e		NO d e		NO d e	YES
Sr-90		NO a b c d e		NO b c d e		NO c d e	2.60E+01	NO d	3.60E+00	NO d	3.30E-01	NO d e		NO d e		NO d e	
Tc-99		NO a b c d e		NO b c d e		NO c d e	5.80E-02	NO d e	8.00E-02	NO d e		NO d e		NO d e		NO d e	
Th-228		NO a b c d e		NO b c d e		NO c d e	3.77E-01	NO e	6.30E-01	NO e	4.23E-01	NO e		NO d e		NO d e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e		NO b c d e		NO c d e	8.40E-03	NO d e	5.40E-03	NO d e	1.70E-02	NO d e		NO d e		NO d e	
U-238		NO a b c d e		NO b c d e		NO c d e	1.30E-01	NO d e	1.80E-01	NO d e	9.20E-02	NO d e		NO d e		NO d e	
INORGANICS (mg/kg)																	
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chromium VI		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																	
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

DOE-RL, 1993d, Tables 3-40

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Table 2-10 116-D-9 Contaminants of Potential Concern

116-D-9	Zone 1		Zone 2		Zone 3		Zone 4										Refined COPC Summary
	0 - 3 ft		3 - 6 ft		6 - 10 ft		10 - 15 ft		15 - 20 ft		20 - 25 ft		25 - 30 ft		30 - 35 ft		
	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	Max	Screening*	
RADIONUCLIDES (pCi/g)																	
Am-241		NO a b c d e		NO b c d e		NO c d e		NO d e	6.10E-03	NO d e	6.10E-03	NO d e		NO d e		NO d e	
C-14		NO a b c d e		NO b c d e		NO c d e		NO d e	2.60E-01	NO d e	2.60E-01	NO d e	1.50E-01	NO d e		NO d e	
Cs-134		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-137		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Co-60		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Eu-152		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Eu-154		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Eu-155		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
K-40		NO a b c d e		NO b c d e		NO c d e		NO d e	7.39E+00	NO d	7.39E+00	NO d	9.35E+00	NO d		NO d e	
Na-22		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Ni-63		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-238		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pu-239/240		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Ra-226		NO a b c d e		NO b c d e		NO c d e		NO d e	3.55E-01	YES	3.55E-01	YES	7.26E-01	YES		NO d e	YES f
Sr-90		NO a b c d e		NO b c d e		NO c d e		NO d e	2.90E+00	NO d	2.90E+00	NO d	8.80E-02	NO d e		NO d e	
Tc-99		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Th-228		NO a b c d e		NO b c d e		NO c d e		NO d e	3.52E-01	NO e	3.52E-01	NO e	4.79E-01	NO e		NO d e	
Th-232		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-233/234		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-235		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
U-238		NO a b c d e		NO b c d e		NO c d e		NO d e	1.80E-01	NO d e	1.80E-01	NO d e	3.20E-01	NO d e		NO d e	
INORGANICS (mg/kg)																	
Antimony		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Arsenic		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Barium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chromium VI		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Lead		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Manganese		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Mercury		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Zinc		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
ORGANICS (mg/kg)																	
Aroclor 1260 (PCB)		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Benzo(a)pyrene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Chrysene		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Pentachlorophenol		NO a b c d e		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	

* Maximum concentrations are screened against the PRG.
The COPC are refined based on the soil concentration and the PRG.
The elimination of a COPC is described by the letters which follow (i.e., a, b, c, d, e, f).

a) Soil concentration < or = human health concentration
b) Soil concentration < or = animal concentration (human health as substitute)
c) Soil concentration < or = plant concentration (human health as substitute)
d) Soil concentration < or = protectiveness of ground water concentration
e) Soil concentration < or = CRQL/CRDL
f) Ra-226 is eliminated as a COPC because non-waste site samples presented in Table 3-1 of the 100-BC-2 Operable Unit LFI Report (DOE-RL 1994d) show Radium-226 at a concentration of approximately 1 pCi/g (i.e., average + 2 standard deviations).

PRG = Preliminary Remediation Goals
COPC = contaminants of potential concern
PCB = polychlorinated biphenyls
CRQL = contract required quantitation limit
CRDL = contract required detection limit
LFI = limited field investigation
Max = Blank: No information is available, or not detected
Sreening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

DOE-RL. 1993d. Tables 3-42

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Table 2-11 Potential Preliminary Remediation Goals

	HUMAN HEALTH		ECOLOGICAL (a)		Protection of GW (b)	CRQL/ CRDL (c)	ZONE SPECIFIC PRG			
	TR = 1E-06(g)	HQ = 0.1	Mouse	Plant			1 0-3 ft	2 3-6 ft	3 6-10 ft	4 > 10 ft
RADIONUCLIDES (pCi/g)										
Am-241	76.9	N/A	NC	NC	31	1	31	31	31	31
C-14	44200	N/A	NC	NC	18	50	50	50	50	50
Cs-134	3460	N/A	NC	NC	517	0.1 (h)	517	517	517	517
Cs-137	5.68	N/A	NC	NC	775	0.1	5.68	5.68	5.68	775
Co-60	17.5	N/A	NC	NC	1292	0.05	17.5	17.5	17.5	1292
Eu-152	5.96	N/A	NC	NC	20667	0.1	5.96	5.96	5.96	20667
Eu-154	10.6	N/A	NC	NC	20667	0.1	10.6	10.6	10.6	20667
Eu-155	3080	N/A	NC	NC	103333	0.1	3080	3080	3080	103333
H-3	2900000	N/A	NC	NC	517	400	517	517	517	517
K-40	12.1	N/A	NC	NC	145	4 (i)	12.1	12.1	12.1	145
Na-22	545	N/A	NC	NC	207	4 (i)	207	207	207	207
Ni-63	184000	N/A	NC	NC	46500	30	46500	46500	46500	46500
Pu-238	87.9	N/A	NC	NC	5	1	5	5	5	5
Pu-239/240	72.8	N/A	NC	NC	4	1	4	4	4	4
Ra-226	1.1	N/A	NC	NC	0.03	0.1	0.1	0.1	0.1	0.1
Sr-90	1930	N/A	NC	NC	129	1	129	129	129	129
Tc-99	28900	N/A	NC	NC	26	15	26	26	26	26
Th-228	7260	N/A	NC	NC	0.103	1 (d)	1	1	1	1
Th-232	162	N/A	NC	NC	0.013	1	1	1	1	1
U-233/234	165	N/A	NC	NC	5	1	5	5	5	5
U-235	23.6	N/A	NC	NC	6	1	6	6	6	6
U-238 (e)	58.4	N/A	NC	NC	6	1	6	6	6	6
INORGANICS (mg/kg)										
Antimony	N/A	167	NC	NC	0.002	6	6	6	6	6
Arsenic	16.2	125	NC	NC	0.013	1	1	1	1	1
Barium	N/A	29200	NC	NC	258	20	258	258	258	258
Cadmium	1360	417	NC	NC	0.775	0.5	0.775	0.775	0.775	0.775
Chromium VI	204	2086	NC	NC	0.026	1	1	1	1	1
Lead	N/A	N/A	NC	NC	8	0.3	8	8	8	8
Manganese	N/A	2086	NC	NC	13	1.5	13	13	13	13
Mercury	N/A	125	NC	NC	0.31	0.02	0.31	0.31	0.31	0.31
Zinc	N/A	100000 (f)	NC	NC	775	2	775	775	775	775
ORGANICS (mg/kg)										
Aroclor 1260 (PCB)	4.34	N/A	NC	NC	1.37	0.033	1.37	1.37	1.37	1.37
Benzo(a)pyrene	N/A	N/A	NC	NC	5.68	0.33	5.68	5.68	5.68	5.68
Chrysene	N/A	N/A	NC	NC	0.01	0.33	0.33	0.33	0.33	0.33
Pentachlorophenol	N/A	N/A	NC	NC	0.27	0.8	0.8	0.8	0.8	0.8

N/A= NOT APPLICABLE
NC=NOT CALCULATED. Appropriate calculation not established at this time.
TR=Target Risk
HQ=Hazard Quotient
(a)=Human health values used in zones 2 and 3 if Ecological values are not calculated.
(b)=Based on Summer's Model (EPA 1989b)
(c)=Based on 100-BC-5 OU Work Plan QAPjP (DOE-RL 1992)
(d)=Detection limit assumed to be same as Th-232
(e)=Includes total U if no other data exist
(f)=Value calculated exceeds 1,000,000 ppm therefore use 100,000 ppm as default
(g)=Recreational exposure scenario accounting for decay to 2018
(h)=Detection limit assumed to be same as Cs-137
(i)=Based on gross beta analysis

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Table 2-12 100-DR-1 Waste Site Profiles
(Page 1 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
107 D/DR #2 (sludge trench)	2316.0	38.1	15.2	572.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES
107 D/DR #3 (sludge trench)	2316.0	38.1	15.2	579.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES

Table 2-12 100-DR-1 Waste Site Profiles
(Page 2 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
107 D/DR #2 (sludge trench)	2316.0	38.1	15.2	572.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES
107 D/DR #3 (sludge trench)	2316.0	38.1	15.2	579.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES

Table 2-12 100-DR-1 Waste Site Profiles
(Page 3 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
107 D/DR #4 (sludge trench)	1561.0	32.0	12.2	390.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES
107 D/DR #5 (sludge trench)	2005.0	27.4	18.3	501.0	4.0	Sludge	Radionuclides	assumed from 116-DR-9 and 116-D-7 data	
							^{14}C		NO
							^{137}Cs		NO
							^{60}Co		NO
							^{152}Eu		NO
							^{154}Eu		NO
							^{3}H		NO
							$^{239/240}Pu$		NO
							^{90}Sr		NO
							^{226}Ra		NO
							^{228}Th		NO
							Inorganics		
							Arsenic		YES
							Cadmium		NO
							Chromium VI		YES

Table 2-12 100-DR-1 Waste Site Profiles
(Page 4 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-DR-9 (retention basin)	260414.0	210.3	101.5	21345.0	12.2	Soil Concrete Sludge	Radionuclides	pCi/g	
							^{14}C	1.8×10^2	NO
							^{60}Co	2.07×10^3	NO
							^{137}Cs	3.25×10^3	NO
							^{152}Eu	1.11×10^4	NO
							^{154}Eu	3.98×10^3	NO
							$^{239/240}Pu$	6.50×10^1	NO
							^{226}Ra	1.25	NO
							^{90}Sr	1.70×10^2	NO
							^{228}Th	1.02	NO
							Inorganics	mg/kg	
							Arsenic	1.24×10^1	YES
							Cadmium	1.20	NO
							Chromium VI	7.34×10^1	YES
116-D-1A (fuel storage basin trench)	4409.0	43.3	6.7	290.0	15.2	Soil	Radionuclides	pCi/g	
							^{137}Cs	2.57×10^1	NO
							^{152}Eu	9.17	NO
							$^{239/240}Pu$	8.30	NO
							^{226}Ra	4.28×10^1	YES
							Inorganics	mg/kg	
							Cadmium	1.00	NO
							Chromium VI	1.08×10^2	YES
							Lead	5.19×10^2	NO
116-D-1B (fuel storage basin trench)	2947.0	39.6	12.2	483.0	6.1	Soil	Radionuclides	pCi/g	
							^{137}Cs	2.49×10^1	NO
							^{152}Eu	9.72	NO
							$^{239/240}Pu$	5.30	NO
							Inorganics		
							Chromium VI	3.04×10^1	YES
							Lead	2.20×10^1	NO

Table 2-12 100-DR-1 Waste Site Profiles (Page 5 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-DR-1/2 (process effluent trench)	24,447.0	varies	varies	4,215	5.8	Soil	Radionuclides ^{137}Cs ^{152}Eu $^{239/240}Pu$ Inorganics Cadmium Chromium VI	pCi/g 8.30×10^2 4.42×10^1 1.40×10^1 mg/kg 1.10 1.86×10^2	 NO NO NO NO YES
116-D-2A (pluto crib)	14.4	3.1	3.1	9.6	1.5	Soil Timbers	Radionuclides ^{226}Ra	pCi/g 1.3×10^1	 YES
116-D-9 (seal pit crib)	0.0	0.0	0.0	0.0	0.0	NA	None	NA	NA
100 D/DR (pipelines)	(f)	(f)	(f)	(f)	(f)	Steel Concrete	Radionuclides ^{137}Cs ^{152}Eu ^{154}Eu ^{155}Eu ^{63}Ni ^{238}Pu $^{239/240}Pu$ ^{90}Sr	pCi/g assumed from pipeline group data	NO(c)

Table 2-12 100-DR-1 Waste Site Profiles
(Page 6 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-D-4A (burial ground)	4564.0	57.9	18.3	1059.0	6.1	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{3}H ^{63}Ni ^{90}Sr Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(a)	NO(d)

Table 2-12 100-DR-1 Waste Site Profiles (Page 7 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-D-4B (burial ground)	350.0	32.0	7.3	215.0	3.7	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{3}H ^{63}Ni ^{90}Sr Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(a)	NO(d)

Table 2-12 100-DR-1 Waste Site Profiles (Page 8 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-D-18 (burial ground)	625.0	24.4	12.2	237.0	6.1	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{3}H ^{63}Ni ^{90}Sr Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(a)	NO(d)
132-D-1 115-D Gas Recirculation Building (D&D)	0.0	0.0	0.0	0.0	0.0	NA	None	NA	NA

Table 2-12 100-DR-1 Waste Site Profiles (Page 9 of 9)

Waste Site (group)	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (e)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
132-D-2 117-D Filter Building (D&D)	0.0	0.0	0.0	0.0	0.0	NA	None	NA	NA
132-D-3 Effluent Pumping Station (D&D)	0.0	0.0	0.0	0.0	0.0	NA	None	NA	NA

(a) No quantitative data is available. Constituents are assumed from Miller and Wahlen 1987.
(b) Based on retention basin group profile
(c) Based on group profile
(d) It is assumed that burial grounds contain immobile forms of waste thus, no contaminants are assumed to exceed the reduced infiltration concentrations.
(e) Where concentration exceeds Preliminary Remediation Goals.
(f) no soil contamination has been identified associated with the pipelines, therefore no volume calculation is made; extent of contamination is limited to the pipeline itself.

COPC = contaminants of potential concern
D&D = decontamination and decommissioning
NA = not applicable

3.0 APPLICATION OF THE PLUG-IN APPROACH

This section summarizes the steps taken to implement the plug-in approach based on IRM candidate site characteristics which have been developed in the previous sections.

As stated in Section 3.0 of the Process Document, the group profiles were developed based on characteristics of IRM candidate sites from the 100-BC-1, 100-HR-1, and 100-DR-1 Operable Units. It is anticipated that there will be variations between site and group profiles which may require deviations from the remedial alternatives. The benefit of the plug-in approach however, is that the number of deviations will be minimized, and redundant analyses of alternatives are avoided to the maximum extent practicable.

The identification of appropriate groups for each site, an evaluation of the alternative applicability criteria, as well as a site-specific example of the manner in which a site is addressed by the plug-in approach are presented in the following sections.

3.1 GROUP IDENTIFICATION

Identification of the group to which the waste site belongs is accomplished by using the site descriptions defined in Section 2.0 and fitting the site into the appropriate group in Figure 1-3, as well as referring to the group descriptions defined in Section 3.0 of the Process Document. The appropriate group for each site is identified in Table 3-1.

3.2 EVALUATION OF ALTERNATIVE CRITERIA

The final step in the plug-in approach is an evaluation of waste site characteristics against the applicability criteria for each remedial alternative. The site characteristics are defined by the descriptions and profiles developed in Section 2.0. The applicability criteria and any enhancements for an alternative as defined in Section 4.0 of the Process Document are defined in Table 3-1.

The applicability criteria are elements which must be present for an alternative to be applicable at a given site. For example, for an in situ vitrification action to effectively address contaminants at a site, the contaminated lens must be no thicker than 5.8 m (19 ft), the maximum extent of influence realized by the technology.

Enhancements to alternatives are elements of an alternative which may be employed as necessary based on waste site characteristics, but do not limit or define the applicability of the alternative. Treatment is an alternative which has enhancements dependent upon the types of contaminants present at a site. One enhancement is thermal desorption which is used to treat organic contaminants. Presence of organic contaminants may warrant the use of thermal desorption, but is not required for the treatment alternative to apply since additional treatment technologies such as soil washing may be used to address other contaminants.

Table 3-1 presents the evaluation of the alternative applicability criteria for each IRM waste site. The evaluation represents step 6 of the plug-in approach and identifies which alternatives and enhancements apply to each site. Any deviation from alternatives developed for the appropriate group in the Process Document are footnoted. As stated in step 6, sites with deviations will be developed further in subsequent sections, however the general analysis of alternatives in the Process Document will be used for sites without deviations.

The deviations indicated on Table 3-1 are briefly summarized as follows: 100 D pipelines exclude the removal/treatment/disposal alternative since there is assumed to be no contaminated soils associated with the contaminated pipe and sludge.

3.3 EXAMPLE APPLICATION OF THE PLUG-IN APPROACH (116-D-2A)

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In order to achieve a further understanding of the plug-in approach, an example of its application has been developed. The example site, 116-D-2A, will be evaluated as dictated by the plug-in approach. The waste site profile has been defined in Section 2.0 (completing step 4 of the approach). Steps 5 and 6 are completed below.

3.3.1 Identification of Appropriate Group

The 116-D-2A pluto crib is assessed against the elements of Figure 1-3 to ensure that the appropriate group is identified.

Table 2-2 does not indicate that the site received solid waste, and states that the site received effluent waste from the reactor following fuel cladding failures. This indicates that it is a contaminated soil site used for liquid effluent disposal. Table 2-2 does indicate that the site is a 3.1 m x 3.1 m x 3.1 m (10 ft x 10 ft x 10 ft) site that is gravel filled. It can be concluded that the appropriate group for 116-D-2A is the pluto crib. The profile for the group and the associated detailed and comparative analyses are documented in the Process Document.

3.3.2 Evaluation of the Alternative Applicability Criteria

Based on the description and profile developed for 116-D-2A in Section 2.0, an evaluation of the alternative applicability criteria can be accomplished. The evaluation of each alternative is presented below:

No Interim Action - Data indicate that there is contamination present at the site which warrants an interim action, therefore no interim action is not an acceptable alternative.

Institutional Controls - Refined COPC are identified for 116-D-2A in Table 2-13, which indicates that there are contaminants present which exceed PRG. Therefore, institutional controls will not effectively address contaminants at the site.

Containment - Because there are contaminants which exceed reduced infiltration concentrations, containment will not be applicable at the site.

Removal/Disposal - Because contaminants exceed PRG, this alternative may be applicable.

In Situ Treatment - Since contaminants exceed PRG, and the contaminated lens is <5.8 m (19 ft), the in situ treatment option may be applicable.

Removal/Treatment/Disposal - Because contaminants exceed PRG, this alternative may be applicable. Thermal desorption enhancement is not necessary since organic contaminants are not present at the site. For cost purposes, it was assumed that the percentage of contaminated soil that can be effectively treated by soil washing is 100%. This percentage was based on the depth, distribution and concentration of contaminants at the waste site. This does not affect the application of the alternative but does impact the magnitude of volume reduction realized at the site.

This evaluation results in the identification of those alternatives which are applicable These results are compared to the results of the group analysis presented in Table 5-1 of the Process Document to identify deviations.

	116-D-2A Alternatives	Group Alternatives
Applicable	Removal/Disposal In Situ Treatment Removal/Treatment/Disposal	Removal/Disposal In Situ Treatment Removal/Treatment/Disposal
Not Applicable	No Interim Action Institutional Controls Containment	No Interim Action Institutional Controls Containment

The alternatives for 116-D-2A are the same as those for the pluto crib group, therefore no deviations are identified and the site completely plugs into the analyses for the group.

Table 3-1 Comparison of Waste Sites to Remedial Alternatives (page 1 of 3)

Waste Site / Group		116-D-7 Retention Basin	116-DR-9 Retention Basin	116-DR-1 116-DR-2 Process Effluent Trench	107-D/DR SLUDGE TRENCHES Sludge Trench
Alternative	**Applicability Criteria and Enhancements**	**Are Applicability Criteria and Enhancements Met?**			
No Interim Action					
SS-1 SW-1	Criterion: • Has site been effectively addressed in the past	No	No	No	No
Institutional Controls					
SS-2 SW-2	Criterion: • Contaminants < PRG	No	No	No	No
Containment					
SS-3 SW-3	Criteria: • Contaminants > PRG	Yes	Yes	Yes	Yes
	• Contaminants < reduced infiltration rate concentrations	No	No	No	No
Removal/Disposal					
SS-4 SW-4	Criterion: • Contaminants > PRG	Yes	Yes	Yes	Yes
In Situ Treatment					
SS-8A	Criteria: • Contaminants > PRG	Yes	Yes	Yes	Yes
	• Contamination < 5.8 m in depth	No	No	Yes	Yes
SS-8B	Criteria: • Contaminants > PRG	NA	NA	NA	NA
	• Contaminants < reduced infiltration rate concentrations	NA	NA	NA	NA
SW-7	Criteria: • Contaminants > PRG	NA	NA	NA	NA
	• Contaminants < reduced infiltration rate concentrations	NA	NA	NA	NA
Removal/Treatment/Disposal					
SS-10	Criterion: • Contaminants > PRG	Yes	Yes	Yes	Yes
	Enhancements: • Organic contaminants (if yes, thermal desorption must be included in the treatment system)	No	No	No	No
	• Percentage of contaminated volume less than twice the PRG for cesium-137.	67%	67%	100%	67%
SW-9	Criterion: • Contaminants > PRG	NA	NA	NA	NA
	Enhancement: • Organic contaminants	NA	NA	NA	NA

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Table 3-1 Comparison of Waste Sites to Remedial Alternatives (page 2 of 3)

Waste Site Group		116-D-1A Fuel Storage Basin Trench	116-D-1B Fuel Storage Basin Trench	116-D-2A Pluto Crib	116-D-9 Seal Pit Crib
Alternative	**Applicability Criteria and Enhancements**	**Are Applicability Criteria and Enhancements Met?**			
No Interim Action					
SS-1 SW-1	Criterion: • Has site been effectively addressed in the past	No	No	No	No
Institutional Controls					
SS-2 SW-2	Criterion: • Contaminants < PRG	No	No	No	Yes
Containment					
SS-3 SW-3	Criteria: • Contaminants > PRG	Yes	Yes	Yes	NA
	• Contaminants < reduced infiltration rate concentrations	No	No	No	NA
Removal/Disposal					
SS-4 SW-4	Criterion: • Contaminants > PRG	Yes	Yes	Yes	NA
In Situ Treatment					
SS-8A	Criteria: • Contaminants > PRG	Yes	Yes	Yes	NA
	• Contamination < 5.8 m in depth	No	No	Yes	NA
SS-8B	Criteria: • Contaminants > PRG	NA	NA	NA	NA
	• Contaminants < reduced infiltration rate concentrations	NA	NA	NA	NA
SW-7	Criteria: • Contaminants > PRG	NA	NA	NA	NA
	• Contaminants < reduced infiltration rate concentrations	NA	NA	NA	NA
Removal/Treatment/Disposal					
SS-10	Criterion: • Contaminants > PRG	Yes	Yes	Yes	NA
	Enhancements: • Organic contaminants (if yes, thermal desorption must be included in the treatment system)	No	No	No	NA
	• Percentage of contaminated volume less than twice the PRG for cesium-137.	100%	100%	100%	NA
SW-9	Criterion: • Contaminants > PRG	NA	NA	NA	NA
	Enhancement: • Organic contaminants	NA	NA	NA	NA

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Table 3-1 Comparison of Waste Sites to Remedial Alternatives (page 3 of 3)

Waste Site Group		PIPELINES Pipeline	118-D-4A 118-D-4B 118-D-18 Burial Grounds	132-D-1 132-D-2 132-D-3 D&D Facilities
Alternative	**Applicability Criteria and Enhancements**	**Are Applicability Criteria and Enhancements Met?**		
No Interim Action				
SS-1 SW-2	Criterion: • Has site been effectively addressed in the past	No	No	Yes
Institutional Controls				
SS-2 SW-2	Criterion: • Contaminants < PRG	No	No	NA
Containment				
SS-3 SW-3	Criteria: • Contaminants > PRG	Yes	Yes	NA
	• Contaminants < reduced infiltration rate concentrations	Yes	Yes	NA
Removal/Disposal				
SS-4 SW-4	Criterion: • Contaminants > PRG	Yes	Yes	NA
In Situ Treatment				
SS-8A	Criteria: • Contaminants > PRG	NA	NA	NA
	• Contamination < 5.8 m in depth	NA	NA	NA
SS-8B	Criteria: • Contaminants > PRG	Yes	NA	NA
	• Contaminants < reduced infiltration rate concentrations	Yes	NA	NA
SW-7	Criteria: • Contaminants > PRG	NA	Yes	NA
	• Contaminants < reduced infiltration rate concentrations	NA	Yes	NA
Removal/Treatment/Disposal				
SS-10	Criterion: • Contaminants > PRG	NA(d)	NA	NA
	Enhancements: • Organic contaminants (if yes, thermal desorption must be included in the treatment system)	NA(d)	NA	NA
	• Percentage of contaminated volume less than twice the PRG for cesium-137.	NA(d)	NA	NA
SW-9	Criterion: • Contaminants > PRG	NA	Yes	NA
	Enhancement: • Organic contaminants	NA	Yes	NA

NA - Not Applicable (d) - deviation from waste site group PRG - Preliminary Remediation Goals

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4.0 ALTERNATIVE DEVELOPMENT

In accordance with step 6 (see Section 1.1) of the plug-in approach, the degree to which an individual site plugs into the analyses presented in the Process Document is dependent on its compatibilities with the applicable group profiles. Deviations from the group profiles are addressed by alternative enhancement or site-specific alternative development.

Alternatives do not require further development if the site plugs directly into the group's alternatives (step 6a). The alternatives are originally developed in Section 4.0 of the Process Document (DOE-RL 1994a). The sites which meet this requirement include 116-D7, 116-DR-9, 116-DR-1/2, 107-D/DR sludge trenches, 116-D-A, 116-D-1B, 116-D-2A, 116-D-9, 118-D-4A, 118-D-4B, 118-D-18, 132-D-1, 132-D-2, and 132-D-3.

The sites which do not plug in directly (step 6b) can be divided into two sets. The first set contains those sites which require enhancements to an alternative or an inclusion or dismissal of an alternative as originally proposed for a group. Alternatives for sites included in this first set do not have to be developed because the appropriate enhancements have already been developed in the Process Document (DOE-RL 1994a). The sites which meet this requirement, and the applicable deviation, are as follows: 100 D/DR pipeline does not meet all of the applicability criteria for the pipeline group alternative identified in the Process Document (DOE-RL 1994). No contaminated soils have been identified around the pipelines, therefore the removal/treatment/disposal alternative no longer applies. Accordingly, this site deviates from the group due to change in the applicable alternatives.

The second set of sites which do not plug in are those sites which require a significant modification to an alternative, such as changes in the excavation process or disposal options. Alternatives for sites included in this second set will require additional development. None of the sites within the 100-DR-1 Operable Unit fit into this second set, therefore, additional alternative development is not required.

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5.0 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of the alternatives applicable to the individual waste sites within the 100-DR-1 Operable Unit. In the detailed analysis, each alternative is assessed against the evaluation criteria described in Section 5.1. The purpose of the detailed analysis is to provide a basis for the comparison of the alternatives and support a subsequent evaluation of the alternatives made by the decision makers in the remedy selection process.

The detailed analysis for the sites within the 100-DR-1 Operable Unit are presented in the following manner:

- The detailed analyses for those individual waste sites which do not deviate from the waste site groups are referenced to the group discussion presented in the Process Document (DOE-RL 1994a).

- The detailed analyses for those individual waste sites which deviate from the waste site groups are discussed in Section 5.2.

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5.1 EVALUATION CRITERIA DESCRIPTION

Nine evaluation criteria have been developed by the EPA to address the statutory requirements and the additional technical and policy considerations proven to be important for selection of remedial alternatives. These evaluation criteria serve as the basis for conducting the detailed analysis during the FFS and for subsequently selecting an appropriate remedial action. An overview of the criteria is described as follows:

1. Overall Protection of Human Health and the Environment:

   This evaluation criterion assesses the alternatives with regard to the level of elimination, reduction, or control of risks for human health and the environment from refined COPC.

2. Compliance with ARAR:

   This criterion evaluates whether the sites comply with chemical-specific, location-specific, and action-specific ARAR.

3. Long-Term Effectiveness and Permanence:

   This criterion considers the magnitude of residual risk and adequacy and reliability of controls after remedial action objectives have been achieved.

4. Reduction of Toxicity, Mobility, or Volume:

This criterion focuses on the alternatives ability to address the principle threats at a site by destruction, or reduction of mass, volume, and mobility of contaminants.

5. Short-Term Effectiveness:

This criterion evaluates the time until protection is achieved, the health and safety of the community and workers during remedial actions, and environmental impacts of remedial actions.

Human health short-term impact are closely related to exposure duration, specifically, the amount of time a person may be exposed to hazards associated with the waste itself or the removal of the waste. The greater the exposure duration, the greater the potential risk. Ecological impacts are based primarily on the physical disturbance of habitat. Risks may also be associated with the potential disturbance of sensitive species such as the bald eagles which roost adjacent to the reactor areas.

The evaluation of short term risks can range from qualitative to quantitative (DOE-RL 1994c). A qualitative assessment of short term risk is appropriate considering that the risk associated with contamination at the waste sites was evaluated in a QRA. Furthermore, the sites evaluated in this FFS are high-priority waste sites that have been identified as warranting action on the near-term. The qualitative evaluation allows a sufficient differentiation between alternatives relative to short-term risks, therefore not requiring quantification. A qualitative estimation of short term risk is given below for both human and ecological receptors.

Remedial Alternative	Qualitative Short-Term Risk	
	Human	Ecological
Institutional Controls	low	low
Containment	low-medium	medium
In Situ Treatment	low-medium	medium
Removal/Treatment/Disposal	high	medium
Removal/Disposal	medium	medium

6. Implementability:

This criterion evaluates the alternatives with respect to technical feasibility, administrative feasibility, and availability of services and materials.

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7. Cost:

A detailed cost analysis of the alternatives is performed and involves estimating the expenditures required to complete each remedial alternative in terms of capital and operation and maintenance (O&M) costs. Once these values have been identified a present worth is calculated for each alternative. An example of the present worth calculation can be found in Appendix B.

8. Regulatory Acceptance:

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

9. Community Acceptance:

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

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5.2 SITE-SPECIFIC DETAILED ANALYSIS

Based on the comparison presented in Table 3-1, several of the individual waste sites within the 100-DR-1 Operable Unit plug into the waste site group alternatives, therefore, the detailed analysis for these individual waste sites can be referenced to the Process Document (DOE-RL 1994a). These individual waste sites include 116-D-7, 116-DR-9, 116-DR-1/2, 107-D/DR sludge trenches, 116-D-1A, 116-D-1B, 116-D-2A, 116-D-9, 118-D-4A, 118-D-4B, 118-D-18, 132-D-1, 132-D-2, and 132-D-3.

The detailed analysis for the remaining waste site (100 D/DR pipelines) is discussed in the following sections. Table 5-1 summarizes the alternatives applicable to each waste site and whether the detailed analysis is covered in the Process Document or discussed in this document. Tables 5-2 and 5-3 present the remediation costs and durations associated with all waste sites.

5.2.1 100 D/DR Pipeline

This section evaluates the 100 D/DR pipeline site against the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) evaluation criteria. The removal/treatment/disposal alternative (SS-10) is applicable to sites which have contaminated soil. Current documentation indicates that the soil surrounding the 100 D/DR pipeline is not contaminated. Therefore, the soil surrounding the pipelines will not require remedial action. Since this is an omission of a remedial alternative, no additional detailed analysis is required.

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Table 5-1 Waste Site Remedial Alternatives and Technologies

Alternatives		Technologies Included	Waste Site										
			116-D-7	116-DR-9	116-DR-1 116-DR-2	107-D/DR Sludge Trenches	116-D-1A	116-D-18	116-D-2A	116-D-9	Pipelines	118-D-4A 118-D-4B 118-D-18	132-D-1 132-D-2 132-D-3
No Action	SS-1 SW-1	None											P
Institutional Controls	SS-2 SW-2	Deed Restrictions								P			
		Groundwater Monitoring								P			
Containment	SS-3 SW-3	Surface Water Controls									P	P	
		Modified RCRA Barrier									P	P	
		Deed Restrictions									P	P	
		Groundwater Monitoring									P	P	
Removal, Disposal	SS-4 SW-4	Removal	P	P	P	P	P	P	P		P	P	
		Disposal	P	P	P	P	P	P	P		P	P	
In Situ Treatment	SS-8A	Surface Water Controls			P	P			P				
		In Situ Vitrification			P	P			P				
		Groundwater monitoring			P	P			P				
		Deed restrictions			P	P			P				
	SS-8B	Void Grouting									P		
		Modified RCRA Barrier									P		
		Surface Water Controls									P		
		Deed Restrictions									P		
		Groundwater Monitoring									P		
	SW-7	Dynamic Compaction										P	
		Modified RCRA Barrier										P	
		Surface Water Controls										P	
		Groundwater Monitoring										P	
		Deed Restrictions										P	
Removal, Treatment, Disposal	SS-10	Removal	P	P	P	P	P	P	P				
		Thermal Desorption											
		Soil Washing	P	P	P	P	P	P	P				
		Disposal	P	P	P	P	P	P	P				
	SW-9	Removal									P		
		Thermal Desorption									P		
		Compaction									P		
		ERDF Disposal									P		

Note: blank - Technology does not apply to this waste site
RCRA - Resource Conservation and Recovery Act
P - indicates detailed analysis in Process Document
ERDF - Environmental Restoration Disposal Facility

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Table 5-2 100-DR-1 Site-Specific Alternative Costs

Site	Containment			Removal/Disposal			In Situ Treatment			Removal/Treatment/Disposal		
	Capital	O&M	Present Worth	Capital	O&M	Present Worth	Capital	O&M	Present Worth	Capital	O&M	Present Worth
100-DR-1 OPERABLE UNIT												
116-D-7				$8.15E+07	$0.00E+00	$7.68E+07				$8.23E+07	$1.26E+07	$8.77E+07
107 D/DR SLUDGE TRENCHES #1				$1.69E+06	$0.00E+00	$1.61E+06	$3.53E+06	$2.24E+06	$5.49E+06	$2.08E+06	$2.69E+05	$2.24E+06
#2				$1.75E+06	$0.00E+00	$1.67E+06	$3.61E+06	$2.29E+06	$5.63E+06	$2.13E+06	$2.77E+05	$2.30E+06
#3				$1.72E+06	$0.00E+00	$1.64E+06	$3.58E+06	$2.27E+06	$5.57E+06	$2.11E+06	$2.73E+05	$2.28E+06
#4				$1.27E+06	$0.00E+00	$1.22E+06	$2.63E+06	$1.56E+06	$4.00E+06	$1.68E+06	$1.88E+05	$1.79E+06
#5				$1.31E+06	$0.00E+00	$1.25E+06	$2.65E+06	$1.78E+06	$4.42E+06	$1.72E+06	$2.07E+05	$1.84E+06
116-DR-9				$1.02E+08	$0.00E+00	$9.60E+07				$1.02E+08	$2.45E+07	$1.14E+08
116-D-1A				$4.69E+06	$0.00E+00	$4.47E+06				$4.88E+06	$9.50E+05	$5.57E+06
116-D-1B				$1.95E+06	$0.00E+00	$1.86E+06				$2.29E+06	$4.09E+05	$2.58E+06
116-DR-1/2				$1.39E+07	$0.00E+00	$1.33E+07	$3.10E+07	$2.30E+07	$4.88E+07	$1.37E+07	$3.48E+06	$1.63E+07
116-D-2A				$2.77E+05	$0.00E+00	$2.67E+05	$5.98E+05	$8.96E+04	$6.61E+05	$7.08E+05	$9.24E+03	$6.92E+05
116-D-9	Institutional Controls proposed at site											
100 D/DR PIPELINES	$3.23E+07	$1.48E+07	$3.81E+07	$9.03E+06	$0.00E+00	$8.61E+06	$3.68E+06	$0.00E+00	$3.51E+06			
118-D-4A	$1.22E+06	$5.14E+05	$1.45E+06	$2.50E+06	$0.00E+00	$2.38E+06	$1.43E+06	$5.76E+05	$1.69E+06	$2.51E+06	$1.37E+05	$2.53E+06
118-D-4B	$7.01E+05	$2.90E+05	$8.32E+05	$4.34E+05	$0.00E+00	$4.15E+05	$8.18E+05	$3.22E+05	$9.62E+05	$9.16E+05	$2.31E+04	$9.07E+05
118-D-18	$7.50E+05	$2.67E+05	$8.66E+05	$5.72E+05	$0.00E+00	$5.47E+05	$8.78E+05	$2.95E+05	$1.00E+06	$1.02E+06	$3.08E+04	$1.02E+06
132-D-1	No interim action proposed at site											
132-D-2	No interim action proposed at site											
132-D-3	No interim action proposed at site											

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Table 5-3 100-DR-1 Site-Specific Alternative Durations

Site	Containment Duration (yrs)	Removal/Disposal Duration (yrs)	In Situ Treatment Duration (yrs)	Removal/Treatment/Disposal Duration (yrs)
100-DR-1 OPERABLE UNIT				
116-D-7		1.2		2.1
107 D/DR SLUDGE TRENCHES #1		0.1	0.4	0.1
#2		0.1	0.4	0.1
#3		0.1	0.4	0.1
#4		0.1	0.3	0.1
#5		0.1	0.3	0.1
116-DR-9		1.4		3.2
116-D-1A		0.2		0.3
116-D-1B		0.1		0.1
116-DR-1/2		0.4	3.1	0.5
116-D-2A		0.1	0.1	0.1
116-D-9	Institutional Controls proposed at site			
100 D/DR PIPELINES	1.6	1.0	0.1	
118-D-4A	0.1	0.1	0.1	0.1
118-D-4B	0.1	0.1	0.1	0.1
118-D-18	0.1	0.1	0.1	0.1
132-D-1	No interim action proposed at site			
132-D-2	No interim action proposed at site			
132-D-3	No interim action proposed at site			

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6.0 COMPARATIVE ANALYSIS

This section presents the comparative analysis of remedial alternatives which involves evaluation of the relative performance of each alternative with respect to the evaluation criteria presented in Section 5.0. The purpose of this comparison is to identify the advantages and disadvantages of each alternative so that key tradeoffs can be identified.

Following the methodology of the Process Document (DOE-RL 1994a), the comparative analysis of the 100-DR-1 alternatives is presented in tabular format (Tables 6-1 through 6-7). The tables present the alternatives applicable to each waste site and a comparison of the relative differences between each alternative. The comparison consists of identifying the relative rank of the alternative (relative to other applicable alternatives) along with the cost[1], and a discussion of its specific advantages and disadvantages. To determine which alternative ranks highest overall for a waste site, the reader must determine what criteria are most important, then consult the appropriate table to see which alternatives rank highest in those criteria. Table 6-8 presents a summary of the comparative analysis of the applicable alternatives for each waste site.

Institutional controls are identified as the only applicable alternative for the 116-D-9 seal pit crib (see Section 5.0 of this document and the Process Document). Because there are no other alternatives to compare against, the site is not included in the comparative analysis. The Process Document identifies no interim action for the D&D groups. Thus, these sites (132-D-1, 132-D-2, and 132-D-3) are not presented in the following tables.

[1] Estimates of durations for each alternative are presented in Section 5.0, Table 5-3.

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Table 6-6 Comparative Analysis - 100 D/DR Pipelines (page 2 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8B
Implementability	SS-3 is more implementable than SS-4 and SS-8B since no intrusive activities are proposed. Installation of an engineered barrier is well demonstrated.	SS-4 offers a higher level of implementability compared to SS-8B but is less implementable compared to SS-3. Excavation is well demonstrated and no treatment is proposed.	SS-8B is less implementable compared to SS-3 and SS-4 since it is an innovative technology provided by one exclusive vendor. Extent of contamination needs to be adequately defined prior to implementation of the remedial action. Location of existing buildings and waste sites needs to be considered.
Present Worth*	$38,100,000	$8,610,000	$3,510,000

* 5% discount rate
O&M - operation and maintenance
W-025 - Radioactive Mixed Waste Disposal Facility
ARAR - applicable or relevant and appropriate requirement
PRG - preliminary remediation goal
RAO - remedial action objectives
ERDF - Environmental Restoration Disposal Facility

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Table 6-7 Comparative Analysis - 118-D-4A, 118-D-4B, and 118-D-18 Burial Grounds (page 1 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SW-3	REMOVAL/DISPOSAL SW-4	IN SITU TREATMENT SW-7	REMOVAL/TREATMENT/DISPOSAL SW-9
Overall Protection of Human Health and the Environment	Less effective than SW-4, SW-7, and SW-9. Potential exposure risk pathways are reduced/eliminated by installation of a engineered barrier over the contaminated material. However, the contaminated material remains at the waste site.	Nearly as effective as SW-9 but more effective than SW-3 and SW-7. Potential risk is eliminated by removal of the contaminated material. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	More effective than SW-3 but less effective than SW-4 and SW-9. Potential exposure risk pathways are reduced by installation of an engineered barrier over the contaminated material. Dynamic compaction of the contaminated materials reduces the mobility of contaminants. However, the contaminated materials remain at the waste site.	More effective than SW-3, SW-4 and SW-7 since any potential risk is eliminated by removal and treatment of the contaminated material. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF) along with the excavated pipeline.
Compliance with ARAR	SW-3, SW-4, SW-7, and SW-9 comply with all chemical-, location-, and action-specific ARAR.			
Long-Term Effectiveness and Permanence	Less effective than SW-4, SW-7, and SW-9. RAO are achieved; however, contaminated material exceeding PRG, remain at the waste site. Long-term O&M requirements consist of: repair and maintenance of the engineered barrier, deed restrictions, and groundwater surveillance monitoring.	More effective than SW-3 and SW-7 and equally effective as SW-9 in achieving RAO. The contaminated material, exceeding PRG, is removed and disposed thereby eliminating the potential source at the waste site.	Nearly as effective as SW-4 and SW-9 but more effective than SW-3. Remedial action objectives are achieved. Contaminated material will be compacted prior to installation of an engineered barrier over the contaminated material. The contaminated materials however remain at the waste site. Long-term O&M requirements consist of: maintenance of the engineered barrier, deed restrictions, and groundwater surveillance monitoring.	More effective than SW-3 and SW-9 and equally effective as SW-4 in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed thereby eliminating the potential source at the waste site. Long-term O&M requirements consist of: operation and maintenance of the thermal desorption system.
Reduction of Toxicity, Mobility, or Volume	Less effective than SW-4, SW-7 and SW-9. All contaminated material, exceeding PRG, remains at the waste site. No treatment is proposed, therefore, no reduction of toxicity, or volume is achieved. Contaminants are effectively immobilized by the engineered barrier through reduction in hydraulic infiltration. Radionuclides present in the contaminated material will naturally degrade.	Less effective than SW-7 and SW-9 but more effective than SW-3. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SW-3, SW-4, and SW-9. Contaminants, exceeding PRG, are dynamically compacted and principle exposure pathways are eliminated through installation of an engineered barrier. Hydraulic infiltration and contaminant mobilization are minimized. Radionuclides present in the contaminated material will naturally degrade.	Nearly as effective as SW-7 but more effective than SW-3 and SW-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., compaction and thermal desorption) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 50%). Radionuclides present in the contaminated material will naturally degrade.

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Table 6-7 Comparative Analysis - 118-D-4A, 118-D-4B, and 118-D-18 Burial Grounds (page 2 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SW-3	REMOVAL/DISPOSAL SW-4	IN SITU TREATMENT SW-7	REMOVAL/TREATMENT/DISPOSAL SW-9
Short-Term Effectiveness	More effective than SW-4, SW-7, and SW-9. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk remain at the waste site; however, installation of an engineered barrier effectively immobilizes the contaminants and eliminates exposure pathways. The contaminated material is not disturbed during the remedial action.	Nearly as effective as SW-7, more effective than SW-9, and less effective than SW-3. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	More effective than SW-4 and SW-9 but not as effective as SW-3. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk remain at the waste site; however, installation of an engineered barrier eliminates exposure pathways. The contaminated material is not disturbed during the remedial action.	Less effective than SW-3, SW-4 and SW-7. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.
Implementability	SW-3 is more implementable than SW-4, SW-7 and SW-9 since no intrusive activities are proposed.	SW-4 offers a higher level of implementability compared to SW-7 and SW-9 but is less implementable compared to SW-3. Excavation is well demonstrated and no treatment is proposed.	SW-7 is less implementable compared to SW-3, SW-4, and SW-9 since the extent of contamination needs to be adequately defined prior to implementation of the remedial action. Location of existing buildings and waste sites needs to be considered.	SW-9 is more implementable than SW-7 but less implementable compared to SW-3 and SW-4. Excavation is well demonstrated; however, a study is necessary to examine the effectiveness of the implementability of the treatment at the field scale.
Present Worth*	118-D-4A: $1,450,000 118-D-4B: $832,000 118-D-18: $866,000	118-D-4A: $2,380,000 118-D-4B: $415,000 118-D-18: $547,000	118-D-4A: $1,690,000 118-D-4B: $962,000 118-D-18: $1,000,000	118-D-4A: $2,530,000 118-D-4B: $907,000 118-D-18: $1,020,000

* 5% discount rate
O&M - operation and maintenance
RAO - remedial action objectives
W-025 - Radioactive Mixed Waste Disposal Facility
ARAR - applicable or relevant and appropriate requirement
PRG - preliminary remediation goal
ERDF - Environmental Restoration Disposal Facility

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Table 6-8 Comparative Analysis Summary[a] (page 1 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Retention Basins 116-D-7 (Table 6-1)		Retention Basins 116-DR-9 (Table 6-1)		Process Effluent Trenches 116-DR-1, 2 (Table 6-2)			Sludge Trenches 107-D/DR (1) (Table 6-3)			Sludge Trenches 107-D/DR (2) (Table 6-3)			Sludge Trenches 107-D/DR (3) (Table 6-3)			Sludge Trenches 107-D/DR (4) (Table 6-3)			Sludge Trenches 107-D/DR (5) (Table 6-3)			Fuel Storage Basin Trenches 116-D-1A (Table 6-4)		Fuel Storage Basin Trenches 116-D-1B (Table 6-4)	
	Alternatives[b]	SS-4	SS-10	SS-4	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-8A	SS-10	SS-4	SS-10	SS-4	SS-10
Overall Protection of Human Health and Environment																											
Compliance with ARAR																											
Long-Term Effectiveness and Permanence																											
Reduction of Toxicity, Mobility, and Volume																											
Short-Term Effectiveness																											
Implementability																											
Present Worth[c] ($ millions)		76.8	87.7	96.0	114.0	13.3	48.8	16.3	1.61	5.49	2.24	1.67	5.63	2.23	1.64	5.57	2.28	1.22	4.0	1.79	1.25	4.42	1.84	4.47	5.57	1.86	2.58

Key:

- Best
- Better
- Good
- Fair
- Poor

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Table 6-8 Comparative Analysis Summary[a] (page 2 of 2)

Evaluation Criteria	Waste Site Groups (Table Reference)	Pluto Crib 116-D-2A (Table 6-5)			Pipelines 100-D/DR (Table 6-6)			Burial Grounds 118-D-4A (Table 6-7)				Burial Grounds 118-D-4B (Table 6-7)				Burial Grounds 18 (Table 6-7)			
	Alternatives[b]	SS-4	SS-8A	SS-10	SS-3	SS-4	SS-8B	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9	SW-3	SW-4	SW-7	SW-9
Overall Protection of Human Health and Environment		Good	Fair	Better	Fair	Better	Good	Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best
Compliance with ARAR		Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Long-Term Effectiveness and Permanence		Better	Good	Better	Fair	Better	Good	Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better
Reduction of Toxicity, Mobility, and Volume		Fair	Better	Good	Fair	Good	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better
Short-Term Effectiveness		Good	Better	Fair	Better	Fair	Good	Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair
Implementability		Better	Fair	Good	Better	Good	Fair	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good
Present Worth[c] ($ millions)		0.267	0.661	0.692	38.1	8.61	3.51	1.45	2.38	1.69	2.53	0.832	0.415	0.962	0.907	0.866	0.547	1.0	1.02

Notes:

ARAR = applicable or relevant and appropriate requirement.

[a] Comparative Analysis Summary is based on Tables 6-1 through 6-7. Comparisons are made between relevant alternatives for each individual waste site group only.

[b] Alternatives are summarized from Table 5-1.
- SS-3/SW-3 Containment
- SS-4/SW-4 Removal and disposal
- SW-7 In situ treatment of solid waste
- SS-8A In situ treatment of soils (except pielines)
- SS-8B In situ treatment of soils (pipelines)
- SW-9 Removal, treatment and disposal of solid waste
- SS-10 Removal, treatment and disposal of soil

[c] Cost is present worth at 5% discount rate.

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Table 6-1 Comparative Analysis - 116-D-7 and 116-DR-9 Retention Basins

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as effective as SS-10 since any potential risk is eliminated by removal of the source. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	More effective than SS-4 since any potential risk is eliminated by removal and treatment of the source. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF).
Compliance with ARAR	Both SS-4 and SS-10 comply with all chemical-, location-, and action-specific ARAR.	
Long-Term Effectiveness and Permanence	Both SS-4 and SS-10 are judged to offer the same degree of effectiveness in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed thereby eliminating the potential source at the waste site.	
Reduction of Toxicity, Mobility, or Volume	Less effective than SS-10. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 49%). Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	More effective than SS-10. Remedial action objectives are achieved within approximately 1.2 and 1.4 years (116-D-7 and 116-DR-9 respectively). Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	Nearly as effective as SS-4. Remedial action objectives are achieved within approximately 2.1 and 3.2 years (116-D-7 and 116-DR-9 respectively). Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.
Implementability	SS-4 offers a higher level of implementability compared to SS-10 since excavation is well demonstrated and no treatment is proposed.	SS-10 is readily implementable; however, a study is necessary to examine the effectiveness of implementability of soil washing at the field scale.
Present Worth*	116-D-7: $76,800,000 116-DR-9: $96,000,000	116-D-7: $87,700,000 116-DR-9: $114,000,000

* 5% discount rate

ARAR - applicable or relevant and appropriate requirement
O&M - operation and maintenance
PRG - preliminary remediation goal
RAO - remedial action objectives
ERDF - Environmental Restoration Disposal Facility
W-025 - Radioactive Mixed Waste Disposal Facility

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Table 6-2 Comparative Analysis - 116-DR-1 and 2 Process Effluent Trenches

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as effective as SS-10 but more effective than SS-8A. Potential risk is eliminated by removal of the source. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	Less effective than SS-4 and SS-10. Potential exposure risk pathways are reduced by immobilization of the contaminated material through encapsulation (i.e., vitrification). However, the encapsulated material remains at the waste site.	More effective than SS-4 and SS-8A since any potential risk is eliminated by removal and treatment of the source. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF).
Compliance with ARAR	SS-4, SS-8A, and SS-10 comply with all chemical-, location-, and action-specific ARAR.		
Long-Term Effectiveness and Permanence	More effective than SS-8A and equally effective as SS-10 in achieving RAO. Contaminated material, exceeding PRG, is removed and disposed thereby eliminating the potential source at the waste site.	Nearly as effective as SS-4 and SS-10. Remedial action objectives are achieved; however, contaminated material exceeding PRG is vitrified and remains at the waste site. Long-term O&M requirements consist of: maintenance of soil cover, deed restrictions, operation and maintenance of the vitrification system, and groundwater surveillance monitoring.	More effective than SS-8A and equally effective as SS-4 in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed of thereby eliminating the potential source at the waste site.
Reduction of Toxicity, Mobility, or Volume	Less effective than SS-8A and SS-10. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-4 and SS-10. Contaminants, exceeding PRG, are effectively immobilized and principle exposure pathways are eliminated through in situ treatment (i.e., vitrification). Hydraulic infiltration and contaminant mobilization are eliminated. Radionuclides present in the contaminated material will naturally degrade.	Nearly as effective as SS-8A but more effective than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 23%). Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	Nearly as effective as SS-8A but more effective than SS-10. Remedial action objectives are achieved within approximately 0.4 years. Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	More effective than SS-4 and SS-10. Remedial action objectives are achieved within approximately 3.1 years. Potential sources of risk remain at the waste site; however, treatment immobilizes the contaminants and eliminates exposure pathways. Slight potential exists for worker exposure to contaminant offgas during treatment.	Less effective than SS-4 and SS-8A. Remedial action objectives are achieved within approximately 0.5 years. Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.
Implementability	SS-4 offers a higher level of implementability compared to SS-8A and SS-10 since excavation is well demonstrated and no treatment is proposed.	SS-8A is less implementable compared to SS-4 and SS-10 since it is an innovative technology provided by one exclusive vendor. Site-specific parameters such as location and subsurface geology must be adequately defined prior to implementation of the in situ treatment. In situ vitrification has only been proven effective to a maximum depth of 5.8 meters.	SS-10 offers a higher level of implementability compared to SS-8A but is less implementable than SS-4. Excavation is well demonstrated; however, a study is necessary to examine the effectiveness and implementability of soil washing at the field scale.
Present Worth*	$13,300,000	$48,800,000	$16,300,000

* 5% discount rate
PRG - preliminary remediation goal
ARAR - applicable or relevant and appropriate requirement
RAO - remedial action objectives
O&M - operation and maintenance
ERDF - Environmental Restoration Disposal Facility
W-025 - Radioactive Mixed Waste Disposal Facility

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Table 6-3 Comparative Analysis - 107-D/DR Sludge Trenches (page 1 of 2)

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as effective as SS-10 but more effective than SS-8A. Potential risk is eliminated by removal of the source. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	Less effective than SS-4 and SS-10. Potential exposure risk pathways are reduced by immobilization of the contaminated material through encapsulation (i.e., vitrification). However, the encapsulated material remains at the waste site.	More effective than SS-4 and SS-8A since any potential risk is eliminated by removal and treatment of the source. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF).
Compliance with ARAR	SS-4, SS-8A, and SS-10 comply with all chemical-, location-, and action-specific ARAR.		
Long-Term Effectiveness and Permanence	More effective than SS-8A and equally effective as SS-10 in achieving RAO. Contaminated material, exceeding PRG, is removed and disposed thereby eliminating the potential source at the waste site.	Nearly as effective as SS-4 and SS-10. Remedial action objectives are achieved; however, contaminated material exceeding PRG is vitrified and remains at the waste site. Long-term O&M requirements consist of: maintenance of soil cover, deed restrictions, operation and maintenance of the vitrification system, and groundwater surveillance monitoring.	More effective than SS-8A and equally effective as SS-4 in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed of thereby eliminating the potential source at the waste site.
Reduction of Toxicity, Mobility, or Volume	Less effective than SS-8A and SS-10. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-4 and SS-10. Contaminants, exceeding PRG, are effectively immobilized and principle exposure pathways are eliminated through in situ treatment (i.e., vitrification). Hydraulic infiltration and contaminant mobilization are eliminated. Radionuclides present in the contaminated material will naturally degrade.	Nearly as effective as SS-8A but more effective than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 49%). Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	Nearly as effective as SS-8A but more effective than SS-10. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	More effective than SS-4 and SS-10. Remedial action objectives are achieved within approximately 0.4 years. Potential sources of risk remain at the waste site; however, treatment immobilizes the contaminants and eliminates exposure pathways. Slight potential exists for worker exposure to contaminant offgas during treatment.	Less effective than SS-4 and SS-8A. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.

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Table 6-3 Comparative Analysis - 107-D/DR Sludge Trenches (page 2 of 2)

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Implementability	SS-4 offers a higher level of implementability compared to SS-8A and SS-10 since excavation is well demonstrated and no treatment is proposed.	SS-8A is less implementable compared to SS-4 and SS-10 since it is an innovative technology provided by one exclusive vendor. Site-specific parameters such as location and subsurface geology must be adequately defined prior to implementation of the in situ treatment. In situ vitrification has been proven to be effective to a maximum depth of 5.8 meters.	SS-10 offers a higher level of implementability compared to SS-8A but is less implementable than SS-4. Excavation is well demonstrated; however, a study is necessary to examine the effectiveness of implementability of soil washing at the field scale.
Present Worth*	#1: $1,610,000 #2: $1,670,000 #3: $1,640,000 #4: $1,220,000 #5: $1,250,000	#1: $5,490,000 #2: $5,630,000 #3: $5,570,000 #4: $4,000,000 #5: $4,420,000	#1: $2,240,000 #2: $2,230,000 #3: $2,280,000 #4: $1,790,000 #5: $1,840,000

* 5% discount rate
ARAR - applicable or relevant and appropriate requirement
O&M - operation and maintenance
PRG - preliminary remediation goal
RAO - remedial action objectives
ERDF - Environmental Restoration Disposal Facility
W-025 - Radioactive Mixed Waste Disposal Facility

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Table 6-4 Comparative Analysis - 116-D-1A and 116-D-1B Fuel Storage Basin Trenches

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as effective as SS-10 since any potential risk is eliminated by removal of the source. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	More effective than SS-4 since any potential risk is eliminated by removal and treatment of the source. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF).
Compliance with ARAR	Both SS-4 and SS-10 comply with all chemical-, location-, and action-specific ARAR.	
Long-Term Effectiveness and Permanence	Both SS-4 and SS-10 are judged to offer the same degree of effectiveness in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed thereby eliminating the potential source at the waste site.	
Reduction of Toxicity, Mobility, or Volume	Nearly as effective as SS-10. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 61%). Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	More effective than SS-10. Remedial action objectives are achieved within approximately 0.2 and 0.1 years (116-D-1A and 116-D-1B respectively). Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	Nearly as effective as SS-4. Remedial action objectives are achieved within approximately 0.3 and 0.1 years (116-D-1A and 116-D-1B respectively). Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.
Implementability	SS-4 offers a higher level of implementability compared to SS-10 since excavation is well demonstrated and no treatment is proposed.	SS-10 is readily implementable; however, a study is necessary to examine the effectiveness of implementability of soil washing at the field scale.
Present Worth*	116-D-1A: $4,470,000 116-D-1B: $1,860,000	116-D-1A: $5,570,000 116-D-1B: $2,580,000

* 5% discount rate

ARAR - applicable or relevant and appropriate requirement
O&M - operation and maintenance
PRG - preliminary remediation goal
RAO - remedial action objectives
ERDF - Environmental Restoration Disposal Facility
W-025 - Radioactive Mixed Waste Disposal Facility

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Table 6-5 Comparative Analysis - 116-D-2A Pluto Crib

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as effective as SS-10 but more effective than SS-8A. Potential risk is eliminated by removal of the source. Contaminated material, exceeding PRG, is excavated and transported to a common disposal facility (i.e., W-025 or ERDF).	Less effective than SS-4 and SS-10. Potential exposure risk pathways are reduced by immobilization of the contaminated material through encapsulation (i.e., vitrification). However, the encapsulated material remains at the waste site.	More effective than SS-4 and SS-8A since any potential risk is eliminated by removal and treatment of the source. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility (i.e., W-025 or ERDF).
Compliance with ARAR	SS-4, SS-8A, and SS-10 comply with all chemical-, location-, and action-specific ARAR.		
Long-Term Effectiveness and Permanence	More effective than SS-8A and equally effective as SS-10 in achieving RAO. Contaminated material, exceeding PRG, is removed and disposed thereby eliminating the potential source at the waste site.	Nearly as effective as SS-4 and SS-10. Remedial action objectives are achieved; however, contaminated material exceeding PRG is vitrified and remains at the waste site. Long-term O&M requirements consist of: maintenance of soil cover, deed restrictions, operation and maintenance of the vitrification system, and groundwater surveillance monitoring.	More effective than SS-8A and equally effective as SS-4 in achieving RAO. Contaminated material, exceeding PRG, is removed and ultimately disposed thereby eliminating the potential source at the waste site.
Reduction of Toxicity, Mobility, or Volume	Less effective than SS-8A and SS-10. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-4 and SS-10. Contaminants, exceeding PRG, are effectively immobilized and principle exposure pathways are eliminated through in situ treatment (i.e., vitrification). Hydraulic infiltration and contaminant mobilization are eliminated. Radionuclides present in the contaminated material will naturally degrade.	Nearly as effective as SS-8A but more effective than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing) is proposed, therefore, the mass of contaminants present will be reduced (by approximately 61%). Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	Nearly as effective as SS-8A but more effective than SS-10. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	More effective than SS-4 and SS-10. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk remain at the waste site; however, treatment immobilizes the contaminants and eliminates exposure pathways. Slight potential exists for worker exposure to contaminant offgas during treatment.	Less effective than SS-4 and SS-8A. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk are removed through excavation and the ultimate disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation and treatment.
Implementability	SS-4 offers a higher level of implementability compared to SS-8A and SS-10 since excavation is well demonstrated and no treatment is proposed.	SS-8A is less implementable compared to SS-4 and SS-10 since it is an innovative technology provided by one exclusive vendor. Site-specific parameters such as location and subsurface geology must be adequately defined prior to implementation of the in situ treatment. In situ vitrification has been proven effective to a maximum depth of 5.8 meters.	SS-10 offers a higher level of implementability compared to SS-8A but is less implementable than SS-4. Excavation is well demonstrated; however, a study is necessary to examine the effectiveness of the implementability of soil washing at the field scale.
Present Worth*	$267,000	$661,000	$692,000

* 5% discount rate
O&M - operation and maintenance
RAO - remedial action objectives
ARAR - applicable or relevant and appropriate requirement
PRG - preliminary remediation goal
ERDF - Environmental Restoration Disposal Facility
W-025 - Radioactive Mixed Waste Disposal Facility

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Table 6-6 Comparative Analysis - 100 D/DR Pipelines (page 1 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8B
Overall Protection of Human Health and the Environment	Less effective than SS-4 and SS-8B. Potential exposure risk pathways are reduced/eliminated by installation of a engineered barrier over the pipeline and associated contaminated material. However, the pipeline and contaminated material remains at the waste site.	More effective than SS-3 and SS-8B. Potential risk is eliminated by removal of the pipeline and associated contaminated material. Contaminated material, exceeding PRG, and the pipeline is excavated, along with any contaminated material exceeding PRG, is transported to a disposal facility (i.e., W-025 or ERDF).	More effective than SS-3 but less effective than SS-4. Potential exposure risk pathways are reduced by immobilization of the contaminated material through encapsulation (i.e., grouting the pipeline), and installation of an engineered barrier over the pipeline and associated contaminated material. However, the pipeline and contaminated material remain at the waste site.
Compliance with ARAR	SS-3, SS-4, and SS-8B comply with all chemical-, location-, and action-specific ARAR.		
Long-Term Effectiveness and Permanence	Less effective than SS-4 and SS-8B. Remedial action objectives are achieved; however, contaminated material exceeding PRG, and the pipeline remain at the waste site. Long-term O&M requirements consist of: repair and maintenance of the engineered barrier, deed restrictions, and groundwater surveillance monitoring.	More effective than SS-3 and SS-8B in achieving RAO. The pipeline and associated contaminated material, exceeding PRG, are removed and disposed thereby eliminating the potential source at the waste site.	Nearly as effective as SS-4 but more effective than SS-3. Remedial action objectives are achieved. Contaminated material (i.e., sludge) will be stabilized through grouting the pipeline. Additionally, an engineered barrier will be installed over the pipeline and the associated contaminated material. The contaminated materials however remain at the waste site. Long-term O&M requirements consist of: maintenance of the engineered barrier, deed restrictions, and groundwater surveillance monitoring.
Reduction of Toxicity, Mobility, or Volume	Less effective than SS-4 and SS-8B. All contaminated material, exceeding PRG, remains at the waste site. No treatment is proposed, therefore, no reduction of toxicity, or volume is achieved. Contaminants are effectively immobilized by the engineered barrier through reduction in hydraulic infiltration. Radionuclides present in the contaminated material will naturally degrade.	Less effective than SS-8B but more effective than SS-3. All contaminated material, exceeding PRG, is removed and transported to a common disposal facility. No treatment is proposed, therefore, no reduction of mobility, toxicity, or volume is achieved. Radionuclides present in the contaminated material will naturally degrade.	More effective than SS-3 and SS-4. Contaminants, exceeding PRG, are effectively immobilized and principle exposure pathways are eliminated through in situ treatment (i.e., grouting). Principle exposure pathways are also eliminated through installation of an engineered barrier. Hydraulic infiltration and contaminant mobilization are eliminated. Radionuclides present in the contaminated material will naturally degrade.
Short-Term Effectiveness	More effective than SS-4 and SS-8B. Remedial action objectives are achieved within approximately 1.6 years. Potential sources of risk remain at the waste site; however, installation of an engineered barrier effectively immobilizes the contaminants and eliminates exposure pathways. The contaminated soil is not disturbed during the remedial action.	Nearly as effective as SS-8B and less effective than SS-3. Remedial action objectives are achieved within approximately 1.0 years. Potential sources of risk are removed through excavation and disposal of contaminated materials exceeding PRG. Potential exists for worker exposure to contaminants during excavation.	More effective than SS-4 but not as effective as SS-3. Remedial action objectives are achieved within approximately 0.1 years. Potential sources of risk remain at the waste site; however, grouting of the pipeline immobilizes the contaminants and installation of an engineered barrier eliminates exposure pathways. The contaminated soil is not disturbed during the remedial action.

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APPENDIX A

100-DR-1 OPERABLE UNIT WASTE SITE VOLUME ESTIMATES

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Volume Estimate
100-DR-1 Operable Unit

OBJECTIVE:

Provide estimates of:

- The volume of contaminated materials within selected waste sites in the 100-DR-1 Operable Unit.
- The volume of materials which will need to be excavated to remove the contaminated materials.
- The areal extent of contamination.

Estimates are provided for the following waste sites:

Site Number	Site Name	Page
116-D-1A	105-D Storage Basin Trench No. 1	A-6
116-D-1B	105-D Storage Basin Trench No. 2	A-8
116-D-2A	105-D Pluto Crib	A-10
116-D-7	107-D Retention Basin	A-14
116-DR-1 & 2	107-DR Liquid Waste Trench No. 1 & 2	A-16
116-D-9	117-D Seal Crib	A-19
116-DR-9	107-DR Retention Basin	A-21
132-D-1	115-D Gas Recirculation Building	A-23
132-D-2	117-D Filter Building	A-24
132-D-3	Effluent Pumping Station	A-25
	107-D/DR Sludge Disposal Trench No. 1	A-26
	107-D/DR Sludge Disposal Trench No. 2	A-28
	107-D/DR Sludge Disposal Trench No. 3	A-30
	107-D/DR Sludge Disposal Trench No. 4	A-32
	107-D/DR Sludge Disposal Trench No. 5	A-34
	118-D4-A Burial Ground	A-36
	118-D4-B Burial Ground	A-38
	118-18 Burial Ground	A-40
Pipelines	107-D & 107-DR Process Pipelines	A-42

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Volume Estimate
100-DR-1 Operable Unit

METHOD:

The following steps are used to calculate volumes and areas for each waste site:

- Estimate the dimensions of each waste site.
- Estimate the location of the site.
- Estimate the extent of contamination present at each site.
- Estimate the extent of the excavation necessary to remove the contamination present.
- Calculate the volume of contamination present, the volume of material to be removed, and the areal extent of contamination.

Waste Site Dimensions -
Dimensions of the waste site are derived from all pertinent references. The reference used is noted in brackets [].

Waste Site Location -
Location of the waste site is derived from pertinent references, confirmed by field visit. The specific reference or method used to locate each site is discussed in a separate brief (see reference 9). Coordinates for each waste site are converted to Washington State coordinates (see reference 9). Resulting Washington State coordinates are presented herein.

Contaminated Volume Dimensions -
The extent of contamination present at the waste site is estimated from analytical data which exists for the site. The data used, assumptions made, and method for estimating extent is discussed in a separate brief (see reference 10). Dimensions are summarized herein.

Excavated Volume Dimensions -
The extent of the excavation necessary to remove the contamination is based on a 1.5 H : 1.0 V excavation slope with the extent of contamination at depth serving as the bottom of the excavation.

Volume and Area Calculations -
The above information is used to construct a digital terrain model of each site within the computer program AutoCad. The computer program DCA is then used to calculate volumes and areas for the waste site.

ASSUMPTIONS:

The following assumptions were used to locate and/or provide dimensions for a waste site if no other data exists. See reference 10 for assumptions concerning extent of contamination and reference 9 for assumptions concerning location of the waste site.

9413296.0756

Volume Estimate
100-DR-1 Operable Unit

ASSUMPTIONS (continued):

Burial Grounds -

- Burial ground dimensions are 20 ft wide at the bottom, 20 ft deep, and have 1.0 H : 1.0 V side slopes.
- Five feet of additional cover was provided.
- Burial grounds were filled completely.

Liquid Waste Sites -

- Trenches were built with 1.0 H : 1.0 V side slopes.
- Tops of cribs are 6 ft below grade.

The following assumptions were used in calculating volumes and areas:

- No site interferences or overlaps are considered, volumes and areas are calculated for each waste site separately.

All depths are below grade unless otherwise noted.

REFERENCES:

1. U.S. Department of Energy, Richland Operations Office (DOE-RL), 1994, Hanford Site Waste Information Data System (WIDS), Richland, Washington.

2. 100-D Area Technical Baseline Report.

3. Hanford Site Drawings and Plans.

4. Site topographic maps, Drawings.

5. Historical photographs of the 100-D/DR Area.

6. Dorian, J.J., and V.R. Richards, "Radiological Characterization of the Retired 100 Areas", UNI-946, May 1978, United Nuclear Industries, Richland, Washington.

7. U.S. Department of Energy, Richland Operations Office (DOE-RL), 1993, "Limited Field Investigations Report for the 100-DR-1 Operable Unit. DOE/RL-93-29, Draft A, U.S. Department of Energy, Richland, Washington.

8. LFI Report for 100-DR-3 OU.

9. IT Corporation, 1994, "100-DR-1 Waste Site Locations", IT Corporation Calculation Brief, Project Number 199806.406.

10. IT Corporation, 1994, "100-DR-1 Waste Site Contamination Extent", IT Corporation Calculation Brief, Project Number 199806.406.

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-D-1A
SITE NAME: 105-D Storage Basin Trench No. 1

WASTE SITE DIMENSIONS:

Length - 130 ft (39.6 m) along the bottom, 142 ft (43.3 m) at surface [1]
Width - 10 ft (3.1 m) along the bottom, 22 ft (6.7 m) at surface [1]
Depth - 6 ft (1.8 m) [1]
Slopes - 1.0 H : 1.0 V
Orientation - East-West lengthwise

Site was backfilled to 2 ft (0.6 m) above existing grade [2].

CONTAMINATED VOLUME DIMENSIONS:

Trench was filled to grade with liquids, side slopes and substrate and are contaminated from surface to 56 ft bls [10].

Length - 142 ft (43.3 m) [10]
Width - 22 ft (6.7 m) [10]
Depth - 50 ft (15.2 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Base of excavation is 142 ft (43.3 m) long by 22 ft (6.7 m) wide at a depth of 50 ft (15.2 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 151,590 [9]
Easting: 573,860 [9]

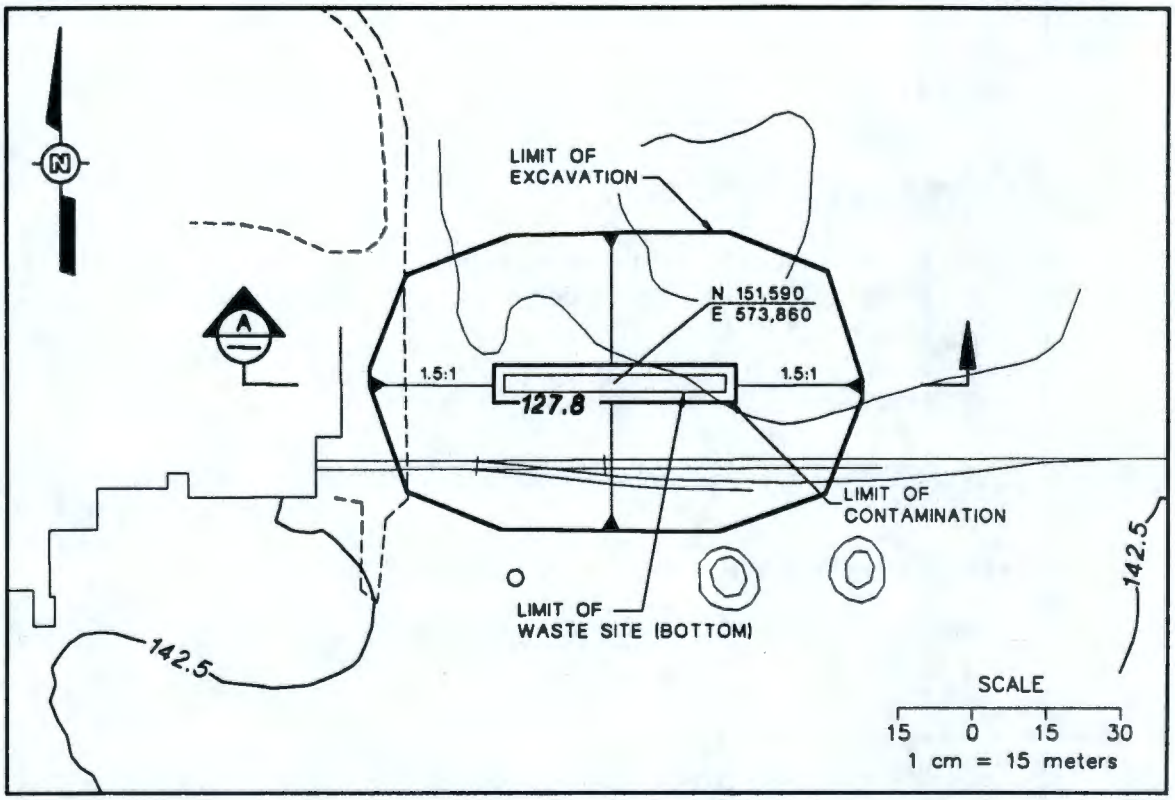
Reference Point: Center of trench [6]

ELEVATIONS:

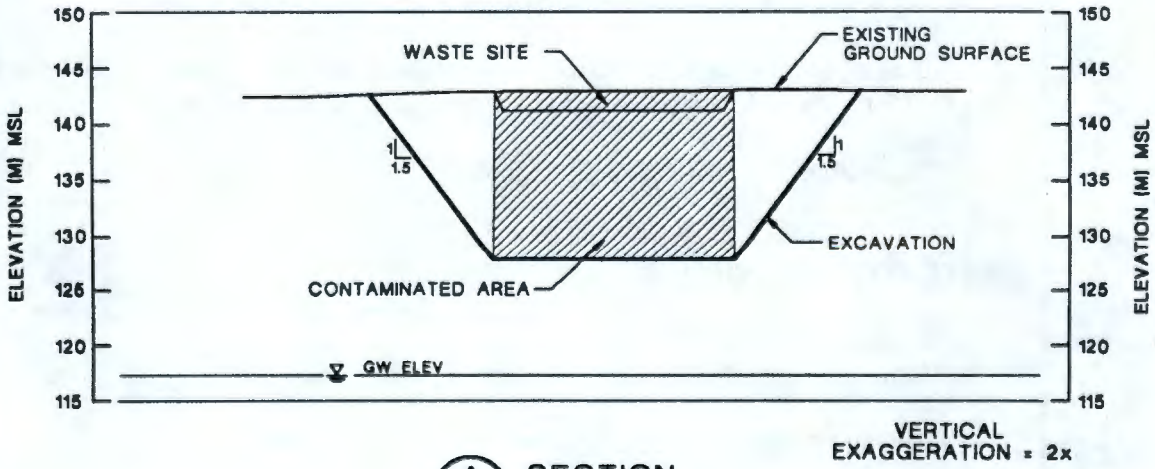
Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0758

Figure A-1 IRM Site: 116-D-1A



PLAN



A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 290 sq. meters
VOLUME = 4,409 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 4,012 sq. meters
VOLUME = 28,937 cu. meters

116D1A

9413296.0759

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-D-1B
SITE NAME: 105-D Storage Basin Trench No. 2

WASTE SITE DIMENSIONS:

Length - 100 ft (30.5 m) along the bottom, 130 ft (39.6 m) at the surface [1]
Width - 10 ft (3.1 m) along the bottom, 40 ft (12.2 m) at the surface [1]
Depth - 15 ft (4.6 m) [1]
Slopes - 1.0 H : 1.0 V
Orientation - North-South lengthwise

Site was backfilled to 2 ft (0.6 m) above grade [2].

CONTAMINATED VOLUME DIMENSIONS:

Trench was filled to grade with liquids, side slopes, and substrate are contaminated from surface to 20 ft (6.1 m) bls [10].

Length - 130 ft (39.6 m) [10]
Width - 40 ft (12.2 m) [10]
Depth - 20 ft (6.1 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Base of excavation is 228 ft (69.5 m) long by 138 ft (42.1 m) wide at a depth of 20 ft (6.7 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 151,611 [9]
Easting: 573,848 [9]

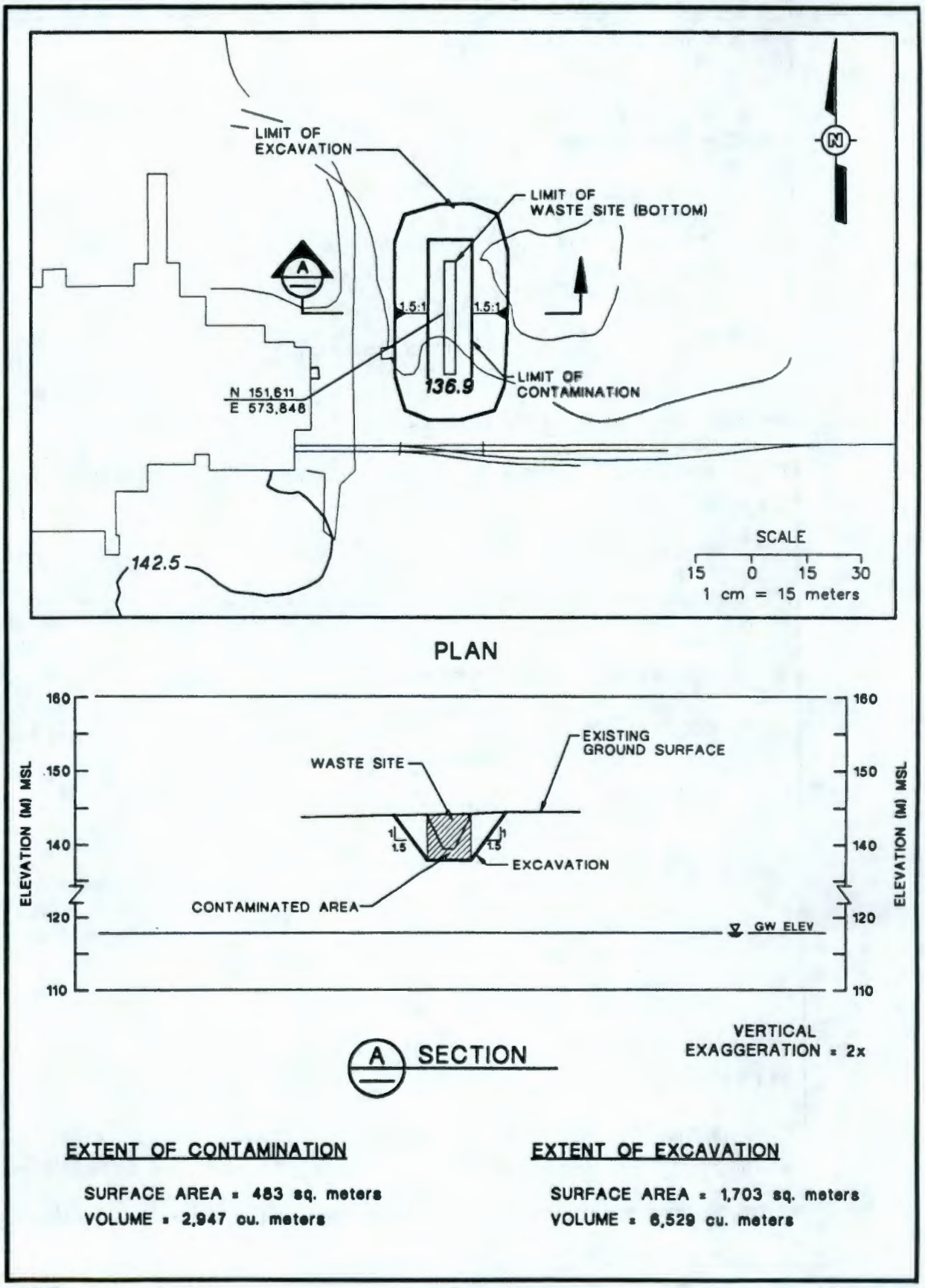
Reference Point: Center of west edge of bottom of unit [6].

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0760

Figure A-2 IRM Site: 116-D-1B



116D1B

9413296.1161

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-D-2
SITE NAME: 105-D Pluto Crib

WASTE SITE DIMENSIONS:

Length - 10 ft (3.1 m) [1,2]
Width - 10 ft (3.1 m) [1,2]
Depth - 10 ft (3.1 m) [1,2]
Slopes - Vertical
Orientation - North-South [5]

The crib was set in ground with its upper surface at grade [2].

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 10 ft (3.0 m) below surface and extends to 15 ft (4.6 m) below surface [10].

Length - 10 ft (3.1 m) [10]
Width - 10 ft (3.1 m) [10]
Depth - 5 ft (1.5 m); from 10 ft (3.1 m) to 15 ft (4.6m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 10 ft (3.1 m) by 10 ft (3.1 m) at a depth of 15 ft (4.6 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 151,510 [9]
Easting: 573,820 [9]

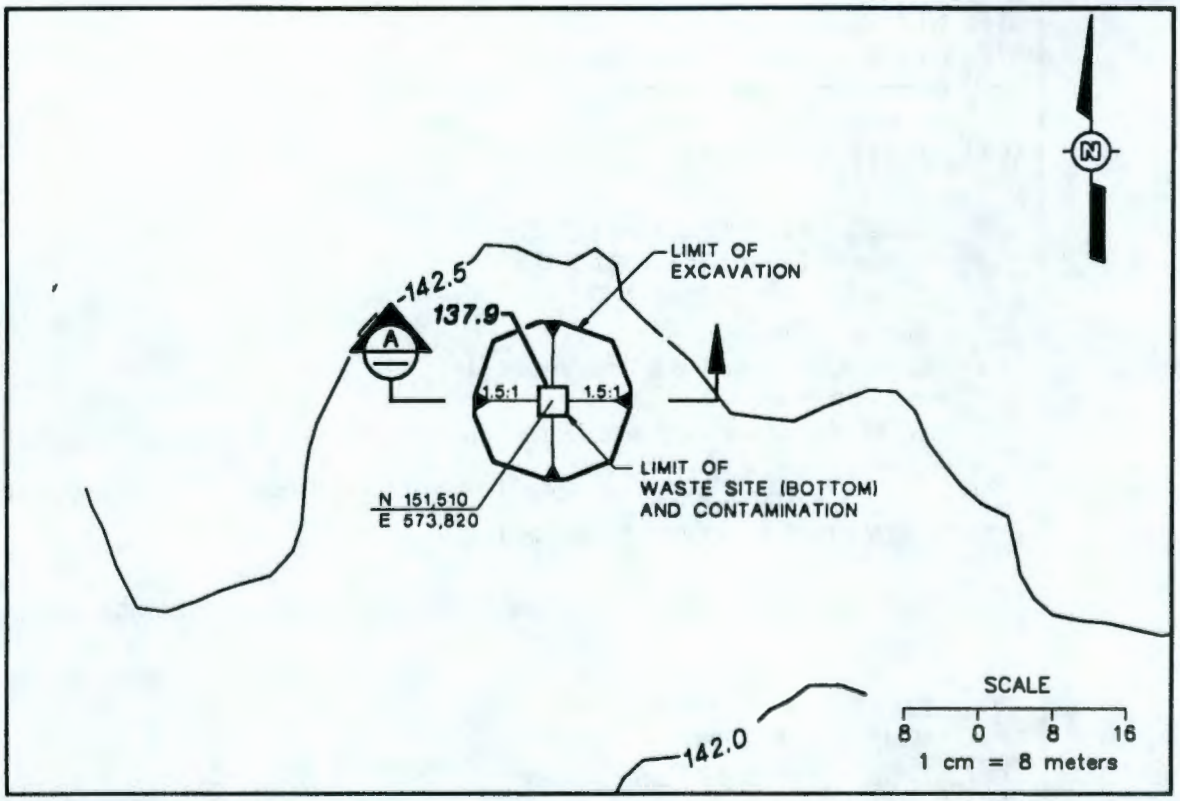
Reference Point: Center of crib [9].

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0762

Figure A-3 IRM Site: 116-D-2



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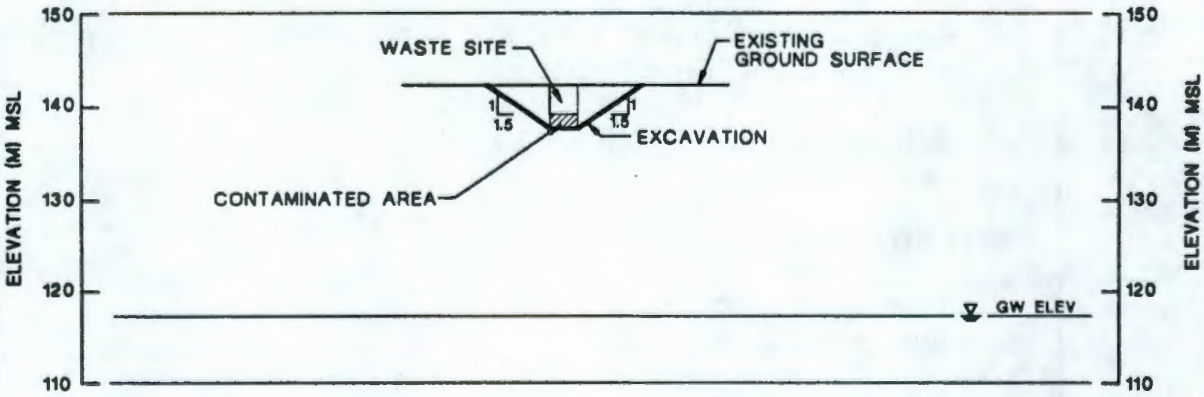


A SECTION

VERTICAL
EXAGGERATION = 1x

EXTENT OF CONTAMINATION

SURFACE AREA = 9.6 sq. meters
VOLUME = 14.4 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 224 sq. meters
VOLUME = 424 cu. meters

116D2A

9413296.0763

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-D-7
SITE NAME: 107-D Retention Basin

WASTE SITE DIMENSIONS:

Length - 467 ft (142.3 m) [1,2,3]
Width - 230 ft (70.1 m) [1,2,3]
Depth - 24 ft (7.3 m) [1,2]
Slopes - Vertical
Orientation - East-West lengthwise [3]

Walls and baffles were demolished, site backfilled with 2 ft (0.6 m) of soil [1].

CONTAMINATED VOLUME DIMENSIONS:

Contamination extends 20 ft (6.1 m) to the north, 10 ft (3.1 m) to the south, east, and west [10].

Length - 487 ft (148.4 m) [10]
Width - 260 ft (79.2 m) [10]
Depth - 35 ft (10.7 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 487 ft (148.4 m) by 260 ft (79.2 m) at a depth of 35 ft (10.7 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,337 [9]
Easting: 573,624 [9]

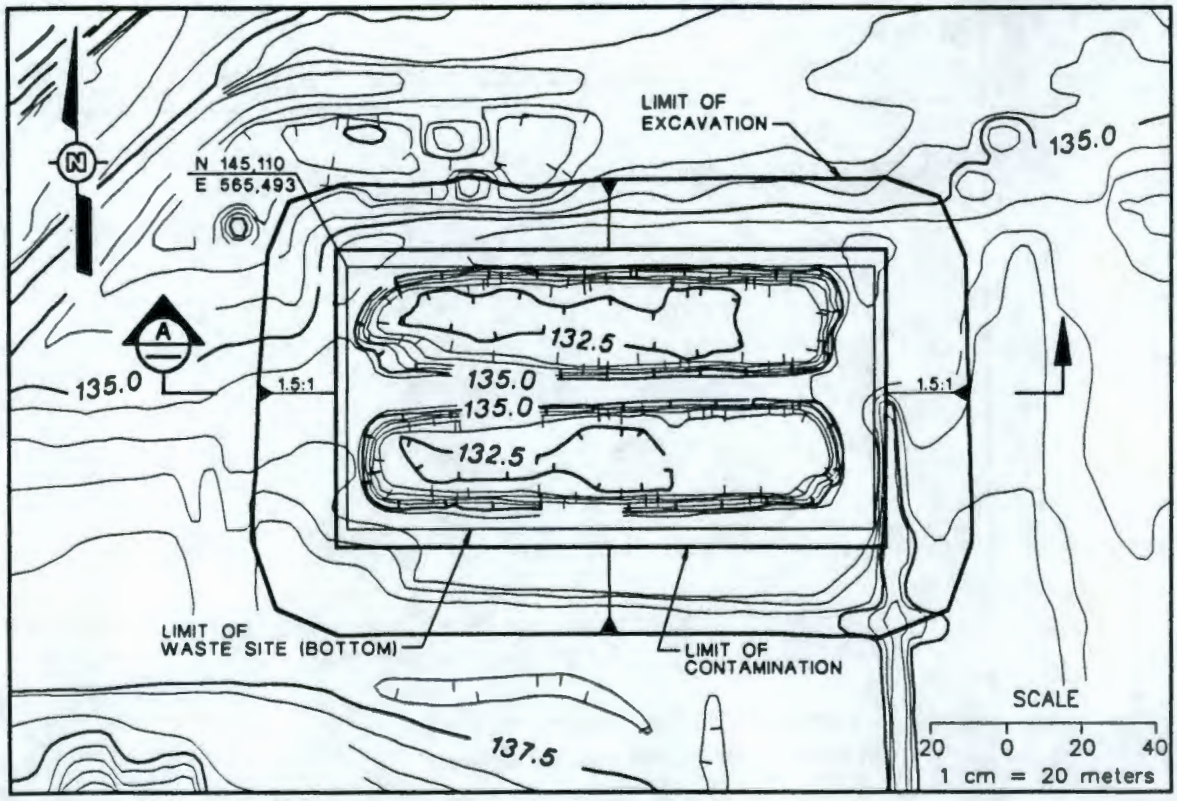
Reference Point: Northwest corner [9]

ELEVATIONS:

Surface: 435 ft (132.5 m) [4]
Groundwater: 384 ft (116.9 m) [8]

9413296.0764

Figure A-4 IRM Site: 116-D-7



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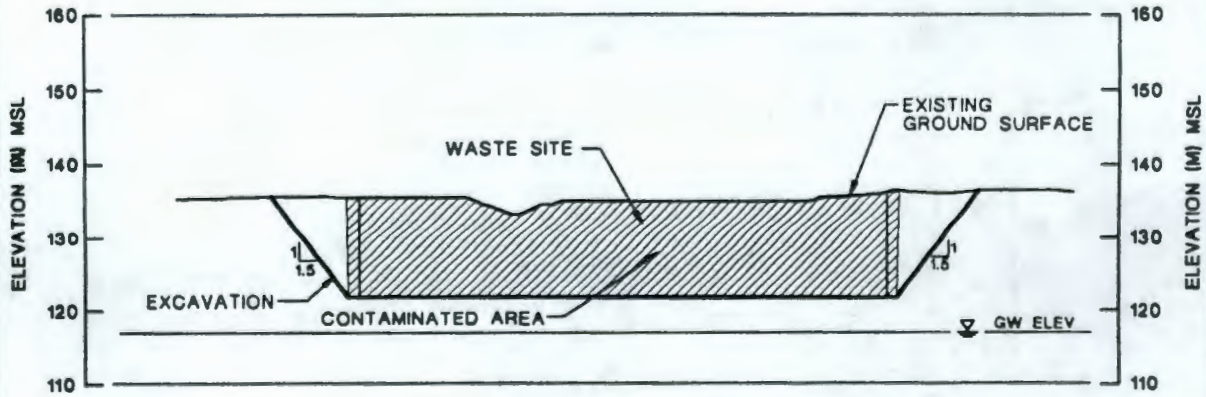


A SECTION

VERTICAL
EXAGGERATION = 2x

EXTENT OF CONTAMINATION

SURFACE AREA = 11,753 sq. meters
VOLUME = 125,760 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 22,514 sq. meters
VOLUME = 217,989 cu. meters

9413296.0765

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-DR-1 and 2
SITE NAME: 107-DR Liquid Waste Disposal Trench No. 1 and 2

WASTE SITE DIMENSIONS:

Length - Varies, see attached figure [3]
Width - Varies, see attached figure [3]
Depth - 20 ft (6.1 m) [1,2]
Slopes - 1.0 H : 1.0 V
Orientation - N/A

116-DR-1 and 116-DR-2 are assumed to have been enlarged to make one trench [2].

CONTAMINATED VOLUME DIMENSIONS:

Trench was filled to grade with liquids, side slopes, and substrate are contaminated from 6 ft (1.8 m) to 25 ft (7.6 m) below surface [10].

Length - Varies, see attached figure [10]
Width - Varies, see attached figure [10]
Depth - 19 ft (5.8 m) from 6 ft (1.8 m) to 25 ft (7.6 m)

EXCAVATED VOLUME DIMENSIONS:

See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing:	A.	152,341	B.	152,341	C.	152,338	D.	152,300	E.	152,270
Easting:		573,963		573,998		574,029		574,073		574,055

Northing:	F.	152,315	G.	152,315
Easting:		574,027		573,963

Reference Point: Point A is located at the northwest corner of the trench. The points proceed clockwise through Point G. All points indicate a trench bottom coordinate [9].

9413296.0766

Volume Estimate
100-DR-1 Operable Unit

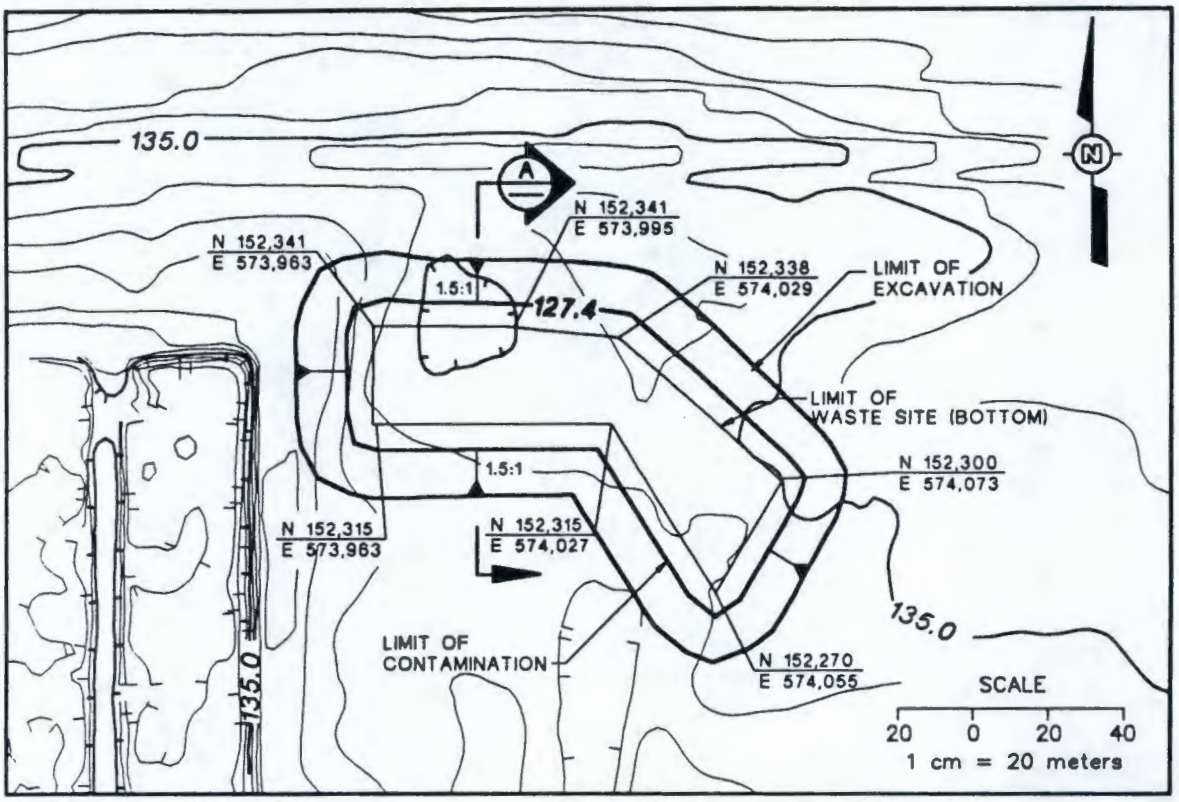
SITE NUMBER: 116-DR-1 and 2 (continued)
SITE NAME: 107-DR Liquid Waste Disposal Trench No. 1 and 2

ELEVATIONS:

Surface: 443 ft (135.0 m) [4]
Groundwater: 383 ft (116.8 m) [8]

9413296.0767

Figure A-5 IRM Site: 116-DR-1 and 116-DR-2



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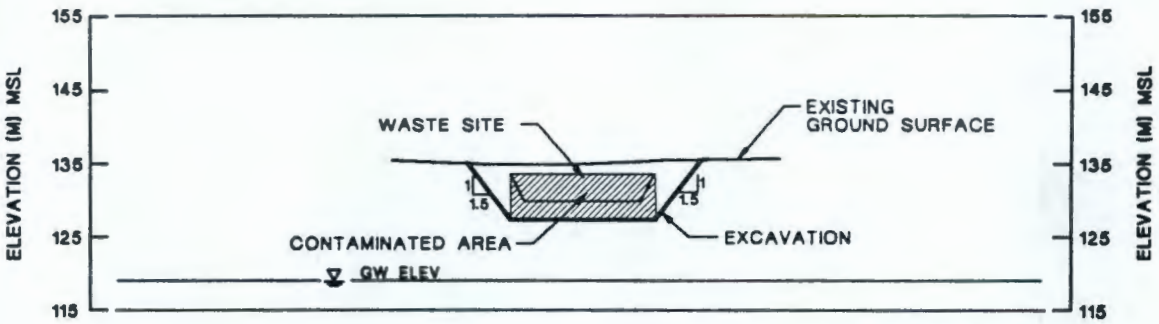


VERTICAL
EXAGGERATION = 2x

A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 4,215 sq. meters
VOLUME = 24,447 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 9,717 sq. meters
VOLUME = 57,846 cu. meters

116DR1-2

9413296.0768

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-D-9
SITE NAME: 117-D Seal Pit Crib

WASTE SITE DIMENSIONS:

Length - 10 ft (3.1 m) [1,2]
Width - 10 ft (3.1 m) [1,2]
Depth - 10 ft (3.1 m) [1,2]
Slopes - Vertical
Orientation - North-South [3]

A large steel vent cap is located in the center of the site [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

Length - N/A [10]
Width - N/A [10]
Depth - N/A [10]

EXCAVATED VOLUME DIMENSIONS:

N/A

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 151,536 [9]
Easting: 573,844 [9]

Reference Point: Center of crib [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0769

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 116-DR-9
SITE NAME: 107-DR Retention Basin

WASTE SITE DIMENSIONS:

Length - 600 ft (182.9 m) [1,2,3]
Width - 273 ft (83.2 m) [1,2,3]
Depth - 20 ft (6.1 m) [1,2]
Slopes - Vertical
Orientation - North-South lengthwise [3]

CONTAMINATED VOLUME DIMENSIONS:

Contamination extends 60 ft (18.3 m) to the south, 30 ft (9.1 m) to the north, east, and west [10].

Length - 690 ft (210.3 m) [10]
Width - 333 ft (101.5 m) [10]
Depth - 40 ft (12.2 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 690 ft (210.3 m) by 333 ft (101.5 m) at a depth of 52 ft (15.8 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,336 [9]
Easting: 573,848 [9]

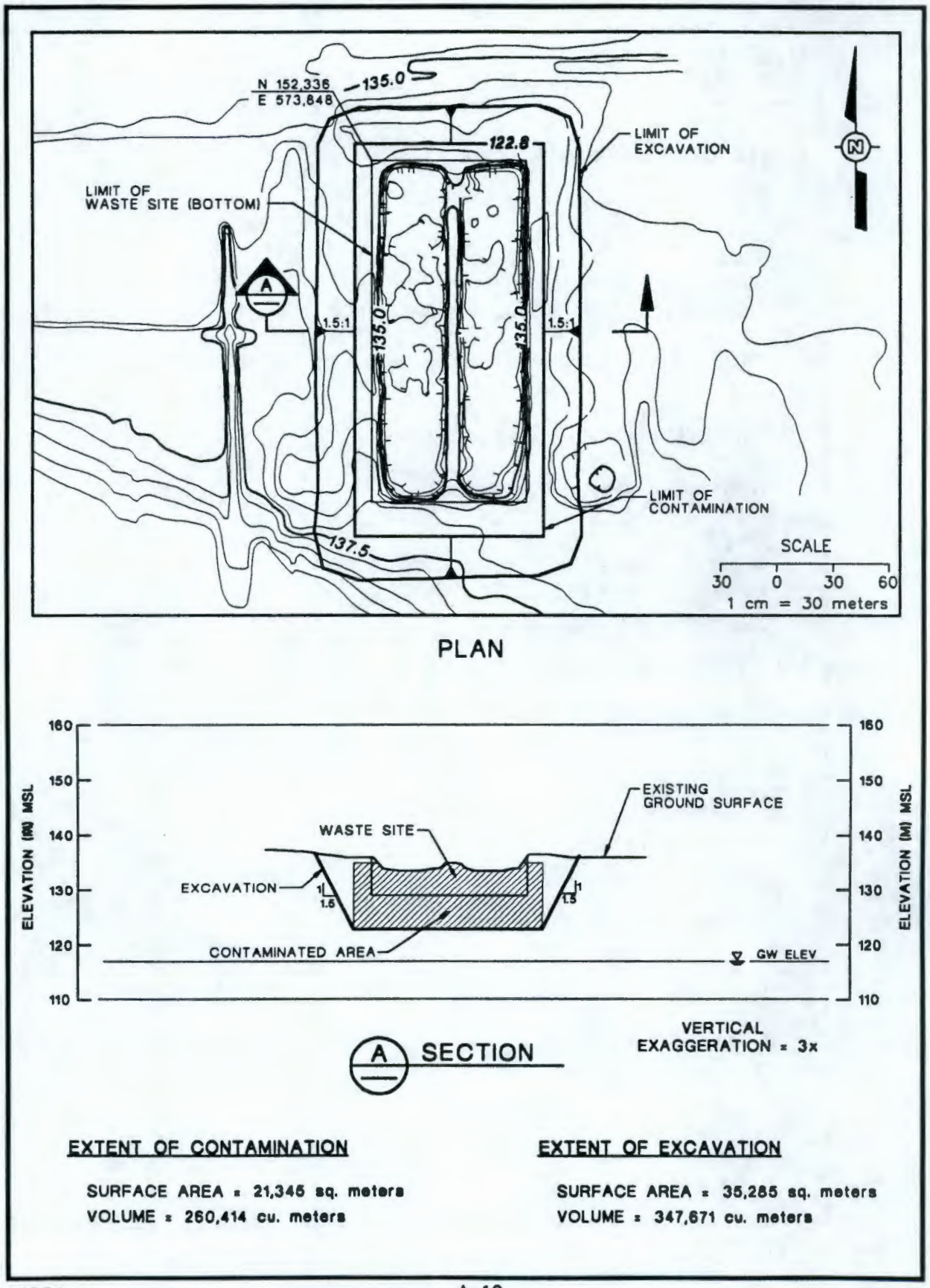
Reference Point: Northwest corner [9]

ELEVATIONS:

Surface: 443 ft (135.0 m) [4]
Groundwater: 384 ft (116.9 m) [8]

9413296.0770

Figure A-6 IRM Site: 116-DR-9



EXTENT OF CONTAMINATION

SURFACE AREA = 21,345 sq. meters
VOLUME = 260,414 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 35,285 sq. meters
VOLUME = 347,671 cu. meters

9413296.0771

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 132-D-1
SITE NAME: 115-D Demolished Gas Recirculation Building

WASTE SITE DIMENSIONS:

Length - 168 ft (51.2 m) [1]
Width - 98 ft (29.9 m) [1]
Depth - 11 ft (3.4 m) [1]
Slopes - Vertical
Orientation - North-South lengthwise [5]

The building was demolished in situ and buried 3 ft (1.0 m) below surface [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

Length - N/A [10]
Width - N/A [10]
Depth - N/A [10]

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 151,523 [9]
Easting: 573,785 [9]

Reference Point: Northwest corner [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 132-D-2
SITE NAME: 117-D Filter Building

WASTE SITE DIMENSIONS:

Length - 59 ft (18.0 m) [1]
Width - 39 ft (11.9 m) [1]
Depth - 27 ft (8.2 m) [1]
Slopes - Vertical
Orientation - North-South lengthwise [3,5]

The site was demolished in situ and buried 3.0 ft (1.0 m) below surface [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

Length - N/A [10]
Width - N/A [10]
Depth - N/A [10]

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 151,521 [9]
Easting: 573,745 [9]

Reference Point: Northeast corner [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0773

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER: 132-D-3
SITE NAME: Effluent Pumping Station

WASTE SITE DIMENSIONS:

Length - 20 ft (6.1 m) [1]
Width - 20 ft (6.1 m) [1]
Depth - 32 ft (9.8 m) [1]
Slopes - Vertical
Orientation - North-South

The site was demolished in situ, and covered with 3.0 ft (1.0 m) of backfill [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

Length - N/A [10]
Width - N/A [10]
Depth - N/A [10]

EXCAVATED VOLUME DIMENSIONS:

N/A

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 151,551 [9]
Easting: 573,776 [9]

Reference Point: Northeast corner [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 107-D/107-D Sludge Disposal Trench No. 1

WASTE SITE DIMENSIONS:

Length - 105 ft (32.0 m) along the bottom,125 ft (38.1 m) at top of trench [3]
Width - 30 ft (9.1 m) along the bottom, 50 ft (15.2 m) at top of trench [3]
Depth - 10 ft (3.1 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - North-South lengthwise [3]

Site was backfilled with 6 ft (1.8 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 6 ft (1.8 m) below surface and extends to 19 ft (5.8 m) below surface [10].

Length - 125 ft (38.1 m) [10]
Width - 50 ft (15.2 m) [10]
Depth - 13 ft (4.0 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 125 ft (38.1 m) by 50 ft (15.2 m) at a depth of 19 ft (5.8 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,285 [9]
Easting: 573,977 [9]

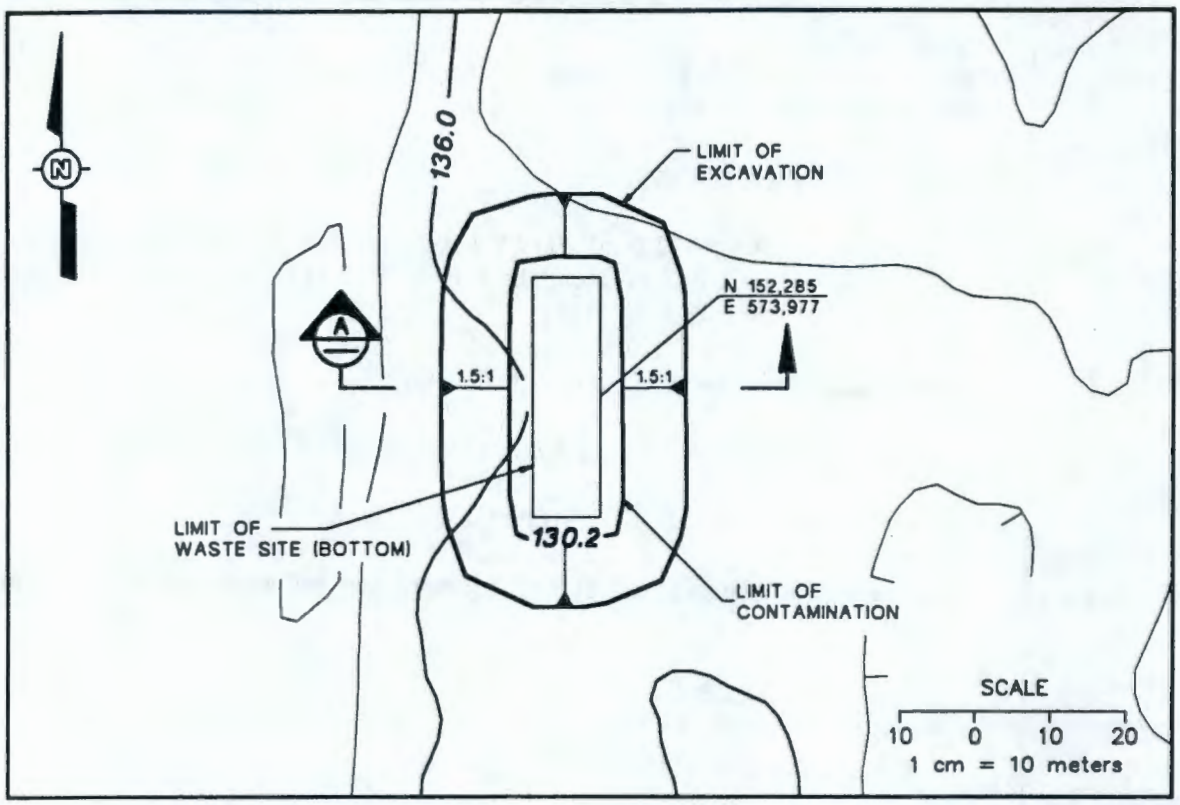
Reference Point: Center of east side of top of trench [9]

ELEVATIONS:

Surface: 443 ft (135.0 m) [4]
Groundwater: 383 ft (116.8 m) [8]

9413296.0775

Figure A-7 IRM Site: 107-D/DR Sludge Disposal Trench No. 1



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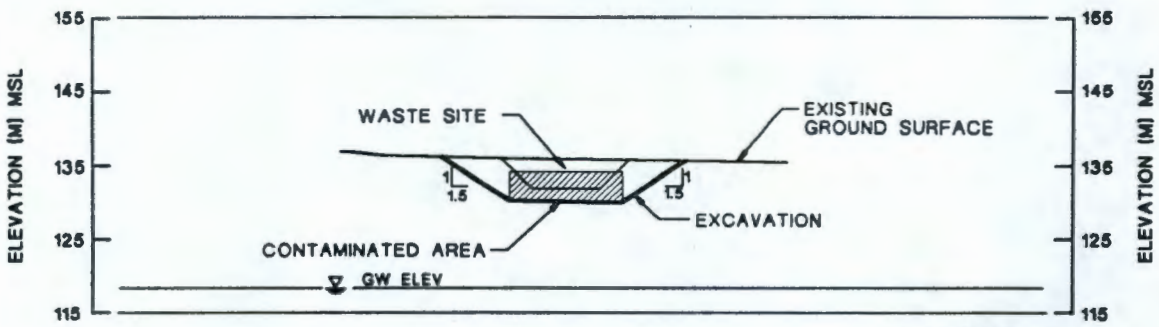


VERTICAL
EXAGGERATION = 1x

A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 652 sq. meters
VOLUME = 2,316 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,635 sq. meters
VOLUME = 6,141 cu. meters

9413296.0776

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 107-D/107-DR Sludge Trench No. 2

WASTE SITE DIMENSIONS:

Length - 105 ft (32.0 m) along the bottom, 125 ft (38.1 m) at top of trench [3]
Width - 30 ft (9.1 m) along the bottom, 50 ft (15.2 m) at top of trench [3]
Depth - 10 ft (3.1 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - North-South lengthwise [3]

Site was backfilled with 6 ft (1.8 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 6 ft (1.8 m) below surface and extends to 19 ft (5.8 m) below surface [10].

Length - 125 ft (38.1 m) [10]
Width - 50 ft (15.2 m) [10]
Depth - 13 ft (4.0 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 125 ft (38.1 m) by 50 ft (15.2 m) at a depth of 19 ft (5.8 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,312 [9]
Easting: 573,825 [9]

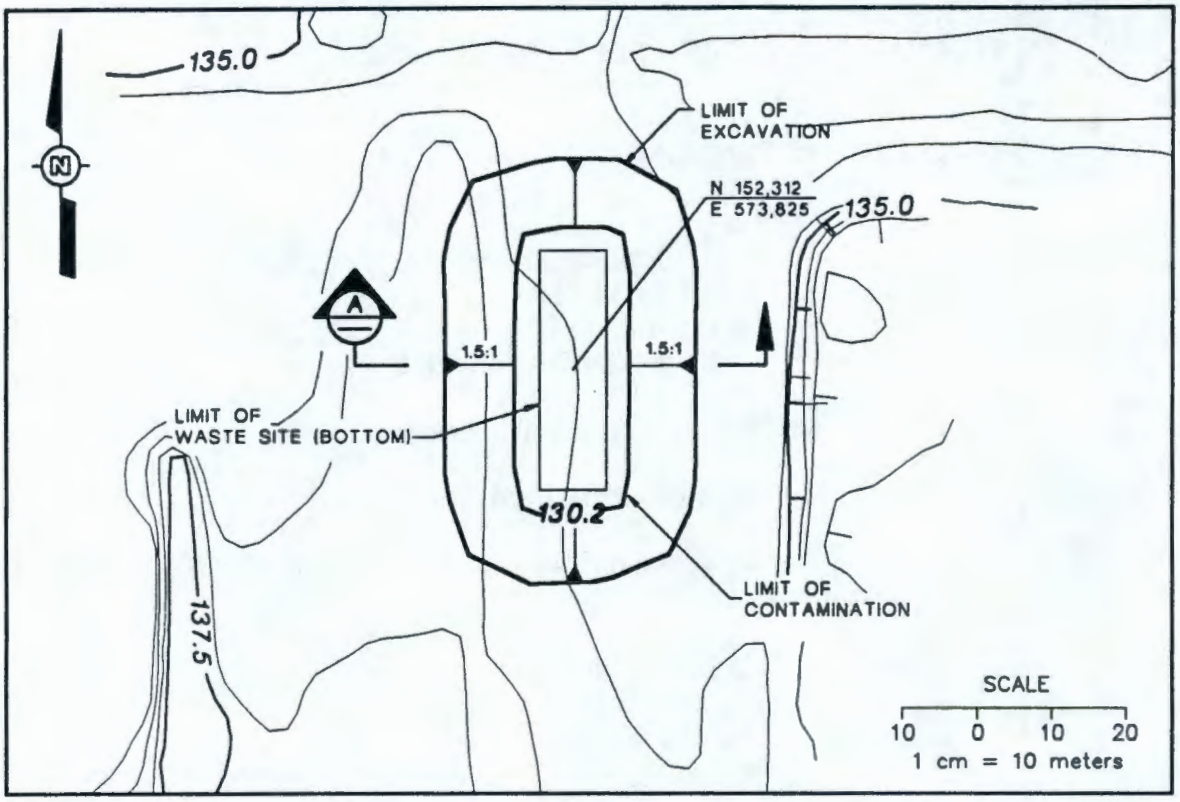
Reference Point: Center of trench [9]

ELEVATIONS:

Surface: 443 ft (135.0 m) [4]
Groundwater: 384 ft (116.9 m) [8]

9413296.0777

Figure A-8 IRM Site: 107-D/DR Sludge Trench No. 2



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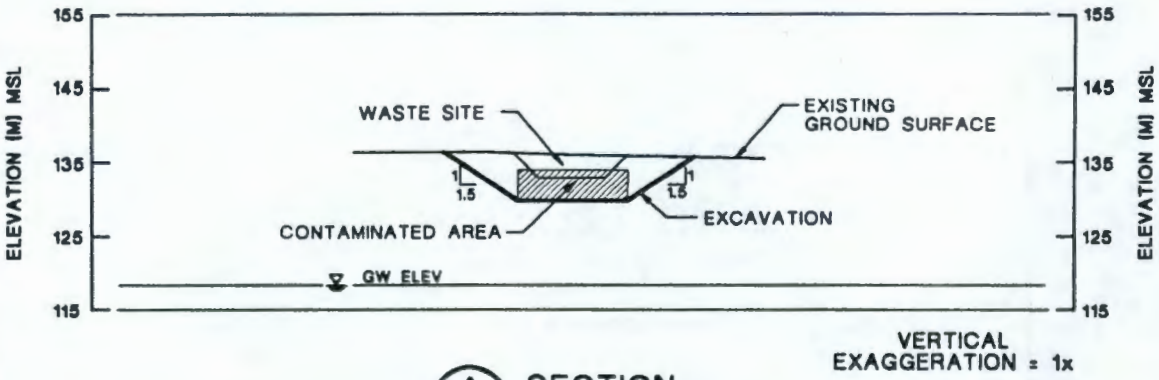


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 572 sq. meters
VOLUME = 2,316 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,739 sq. meters
VOLUME = 6,731 cu. meters

9413296.0778

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 107-D/107-DR Sludge Trench No. 3

WASTE SITE DIMENSIONS:

Length - 105 ft (32.0 m) along the bottom, 125 ft (38.1 m) at top of trench [3]
Width - 30 ft (9.1 m) along the bottom, 50 ft (15.2 m) at top of trench [3]
Depth - 10 ft (3.1 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - East-West lengthwise [3]

Site was backfilled with 6 ft (1.8 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 6 ft (1.8 m) below surface and extends to 19 ft (5.8 m) below surface [10].

Length - 125 ft (38.1 m) [10]
Width - 50 ft (15.2 m) [10]
Depth - 13 ft (4.0 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 125 ft (38.1 m) x 50 ft (15.2 m) at a depth of 19 ft (5.8 m) [10].

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,267 [9]
Easting: 573,734 [9]

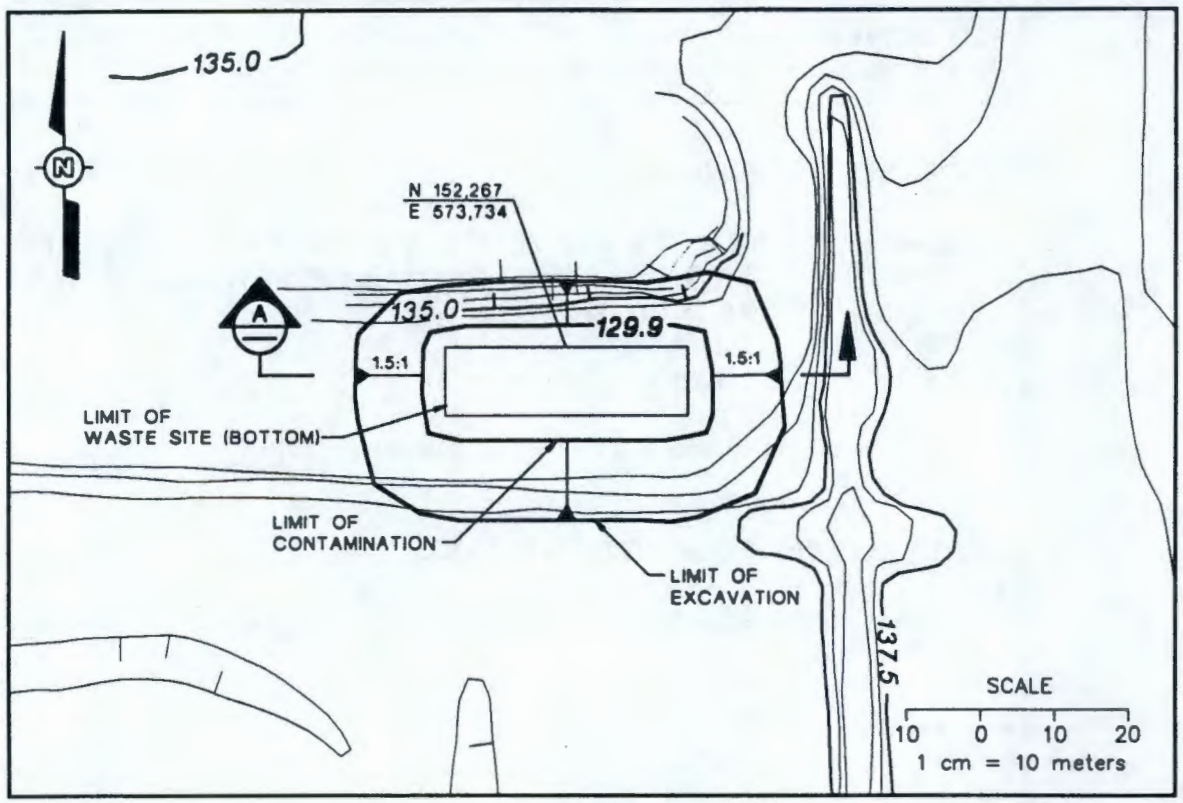
Reference Point: Center of north side of top of trench [9]

ELEVATIONS:

Surface: 443 ft (135 m) [4]
Groundwater: 384 ft (117.0 m) [8]

9413296.0779

Figure A-9 IRM Site: 107-D/DR Sludge Trench No. 3



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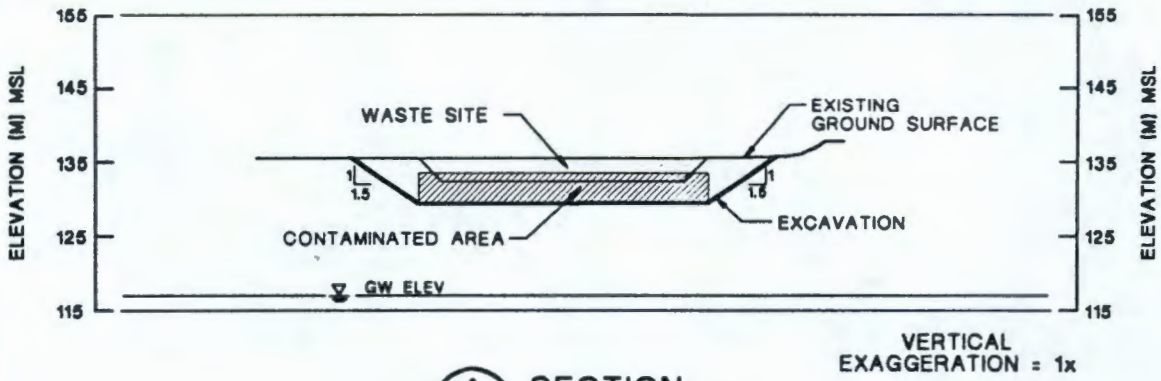


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 579 sq. meters
VOLUME = 2,316 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,675 sq. meters
VOLUME = 6,495 cu. meters

9413296.0780

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 107-D/107-DR Sludge Trench No. 4

WASTE SITE DIMENSIONS:

Length - 85 ft (25.9 m) along the bottom, 105 ft (32 m) at top of trench [3]
Width - 20 ft (6.1 m) along the bottom, 40 ft (12.2 m) at top of trench [3]
Depth - 10 ft (3.1 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - East-West lengthwise [3]

Site was backfilled with 6 ft (1.8 m) of clean cover.

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 6 ft (1.8 m) below surface and extends to 19 ft (5.8 m) below surface [10].

Length - 105 ft (32 m) [10]
Width - 40 ft (12.2 m) [10]
Depth - 13 ft (4.0 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 105 ft (32.0 m) by 40 ft (12.2 m) at a depth of 19 ft (5.8 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,357 [9]
Easting: 573,645 [9]

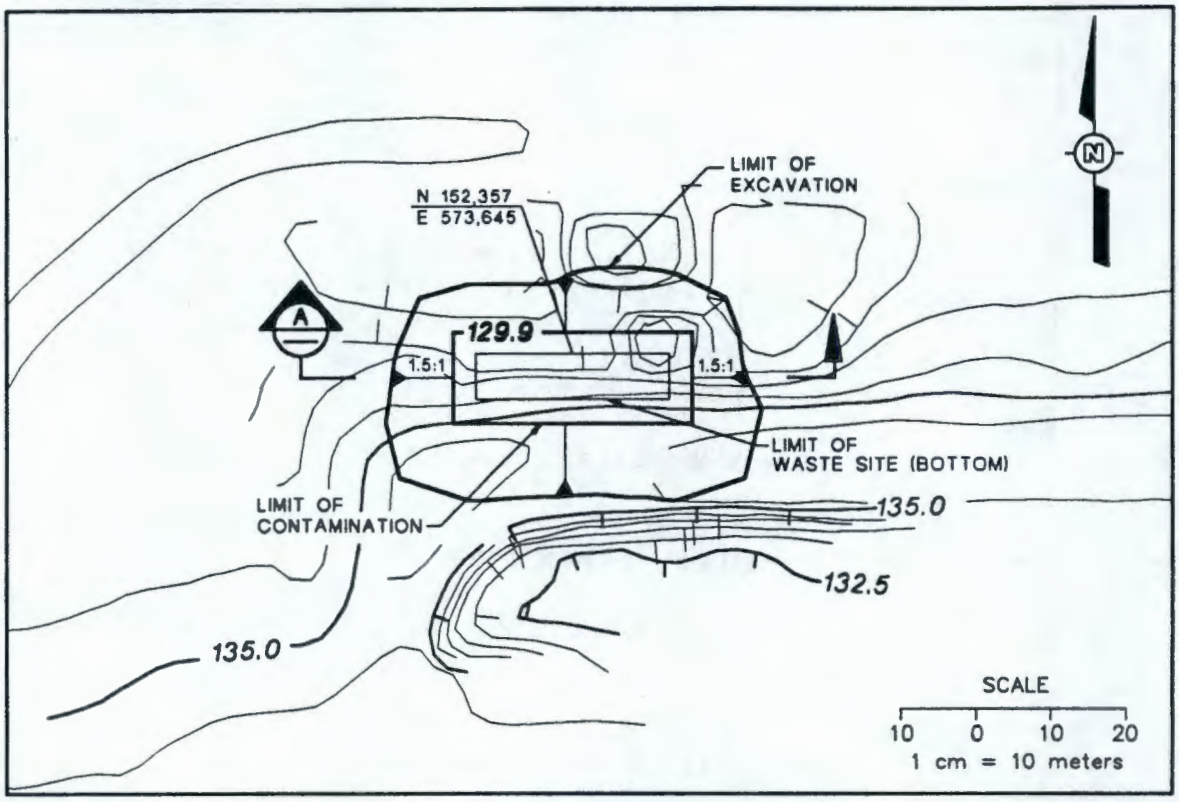
Reference Point: Center of north side of trench [9]

ELEVATIONS:

Surface: 443 ft (135.0 m) [4]
Groundwater: 384 ft (116.9 m) [8]

9413296.0781

Figure A-10 IRM Site: 107-D/DR Sludge Trench No. 4



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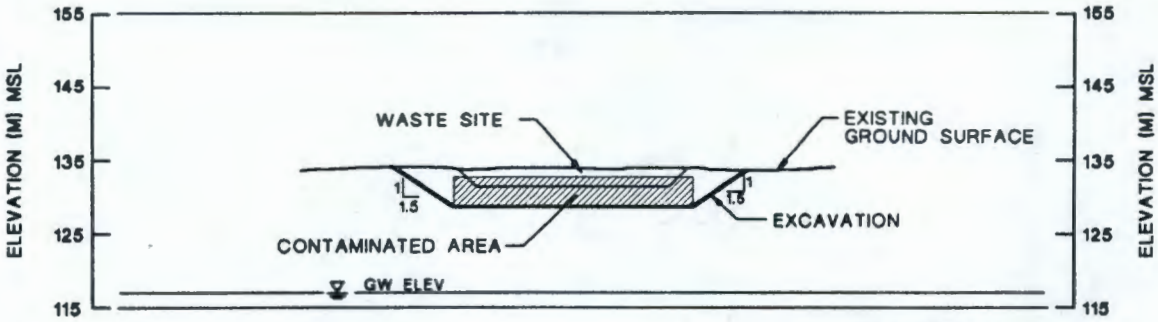


VERTICAL EXAGGERATION = 1x

A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 390 sq. meters
VOLUME = 1,561 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,338 sq. meters
VOLUME = 4,615 cu. meters

9413296.0782

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 107-D/107-DR Sludge Trench No. 5

WASTE SITE DIMENSIONS:

Length - 50 ft (15.2 m) along the bottom, 90 ft (27.4 m) at top of trench [3]
Width - 20 ft (6.1 m) along the bottom, 60 ft (18.3 m) at top of trench [3]
Depth - 10 ft (3.1 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - East-West lengthwise [3]

Site was backfilled with 6 ft (1.8 m) of clean cover.

CONTAMINATED VOLUME DIMENSIONS:

Contamination begins at 6 ft (1.8 m) below surface and extends to 19 ft (5.8 m) below surface [10].

Length - 90 ft (27.4 m) [10]
Width - 60 ft (18.3 m) [10]
Depth - 13 ft (4.0 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 90 ft (27.4 m) by 60 ft (18.3 m) at a depth of 19 ft (5.8 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

Northing: 152,205 [9]
Easting: 573,976 [9]

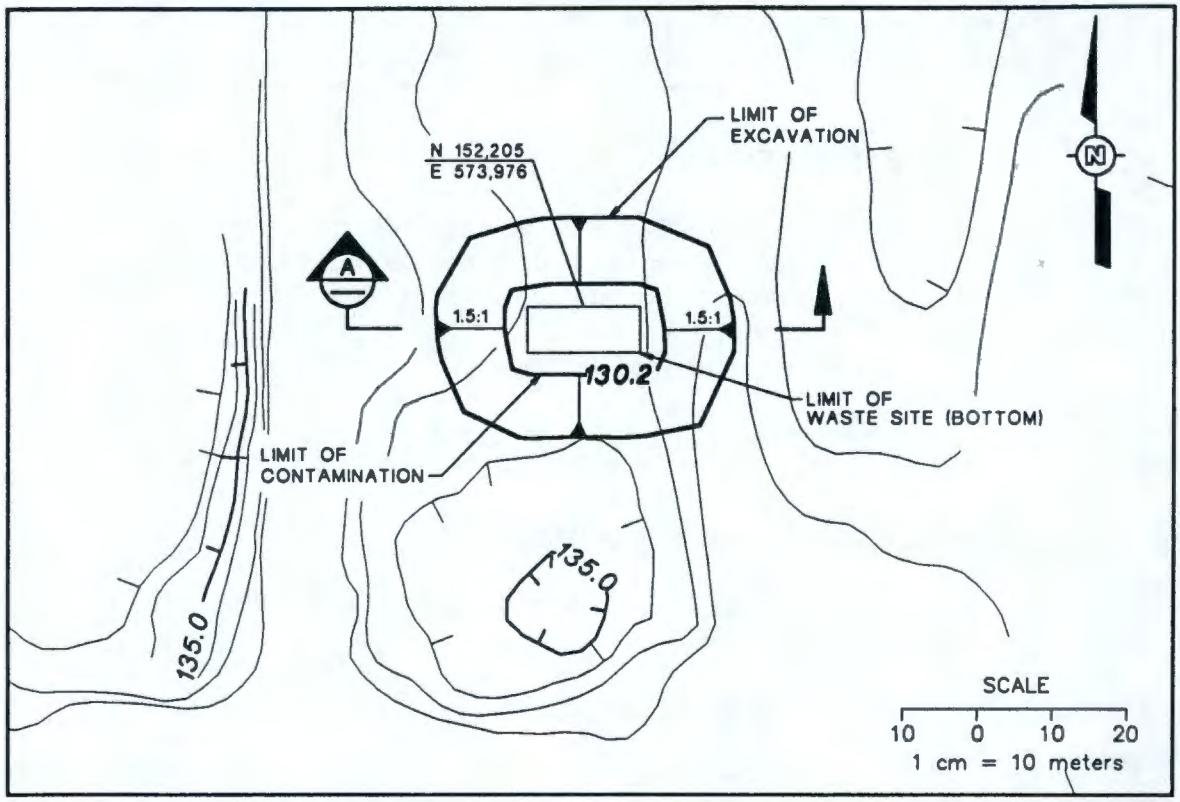
Reference Point: Center of north side of top of trench [8]

ELEVATIONS:

Surface: 446 ft (136 m) [4]
Groundwater: 383 ft (116.8 m) [7]

9413296.0783

Figure A-11 IRM Site: 107-D/DR Sludge Trench No. 5



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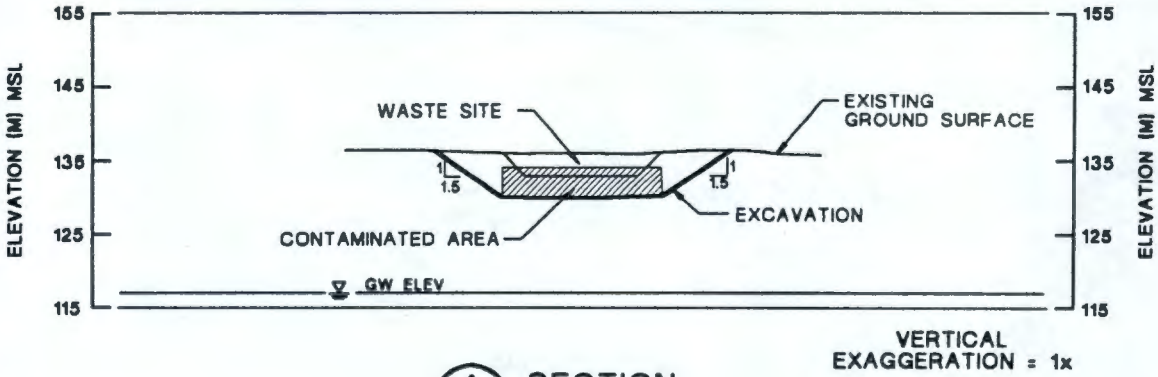


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 501 sq. meters
VOLUME = 2,005 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,018 sq. meters
VOLUME = 3,493 cu. meters

9413296.0784

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 4-A Burial Ground

WASTE SITE DIMENSIONS:

Length - 150 ft (45.7 m) along the bottom, 190 ft (57.9 m) at surface [3]
Width - 20 ft (6.1 m) along the bottom, 60 ft (18.3 m) at surface [3]
Depth - 20 ft (6.1 m) [assumed]
Slopes - 1.0 H : 1.0 V
Orientation - North-South lengthwise [3]

Assume backfilled with 5 ft (1.5 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination is volume of trench. Contamination begins at 5 ft (1.5 m) below surface and extends to 25 ft (7.6 m) below surface [10].

Length - 150 ft (45.7 m) along the bottom, 190 ft (57.9 m) at surface [10]
Width - 20 ft (6.1 m) along the bottom, 60 ft (18.3 m) at surface [10]
Depth - 20 ft (6.1 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 150 ft (45.7 m) x 20 ft (6.1 m) at a depth of 25 ft (7.6 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

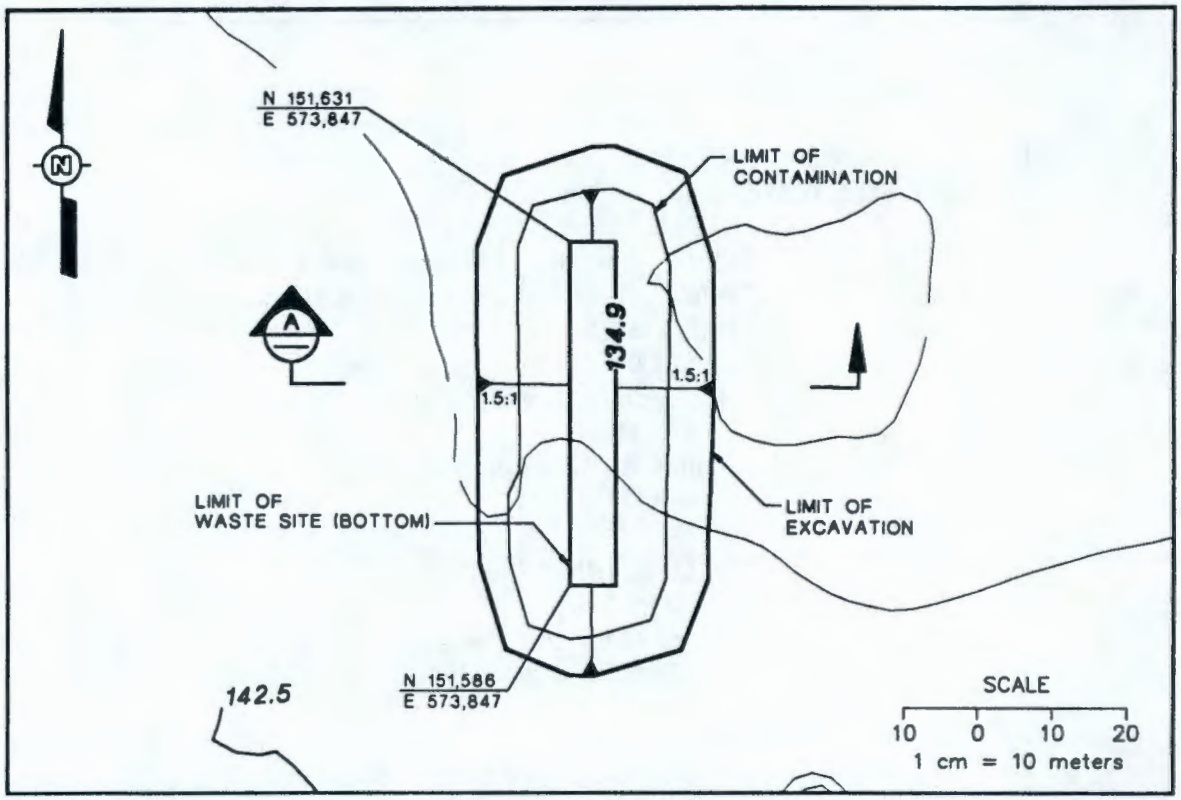
Northing:	151,586 [9]	Northing:	151,631 [9]
Easting:	573,847 [9]	Easting:	573,847 [9]
Reference Point:	Southwest corner of surface [9]	Reference Point:	Northwest corner of surface [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413276.0785

Figure A-12 IRM Site: 4A Burial Ground



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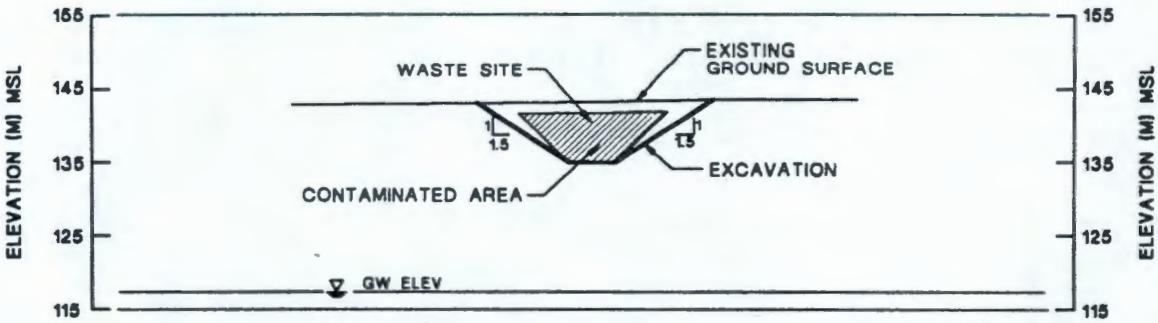


VERTICAL EXAGGERATION = 1x

A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 1,059 sq. meters
VOLUME = 4,564 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,959 sq. meters
VOLUME = 8,656 cu. meters

9413296.0786

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 4-B Burial Ground

WASTE SITE DIMENSIONS:

Length - 81 ft (24.7 m) along the bottom, 105 ft (32 m) at surface [3]
Width - 24 ft (7.3 m) at the surface [3]
Depth - 12 ft (3.7 m) [10]
Slopes - 1.0 H : 1.0 V
Orientation - Long Axis Oriented S 38° W.

Assume a 'V' trench with 24 ft (3.7 m) width at the surface. Site was backfilled with 5 ft (1.5 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination is volume of trench. Contamination begins at 5 ft (1.5 m) below surface and extends to 17 ft (5.2 m) below surface [10].

Length - 81 ft (24.7 m) along the bottom, 105 ft (32 m) at surface [10]
Width - 24 ft (7.3 m) at the surface [10]
Depth - 12 ft (3.7 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 81 ft (24.7 m) long at a depth of 17 ft (5.2 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

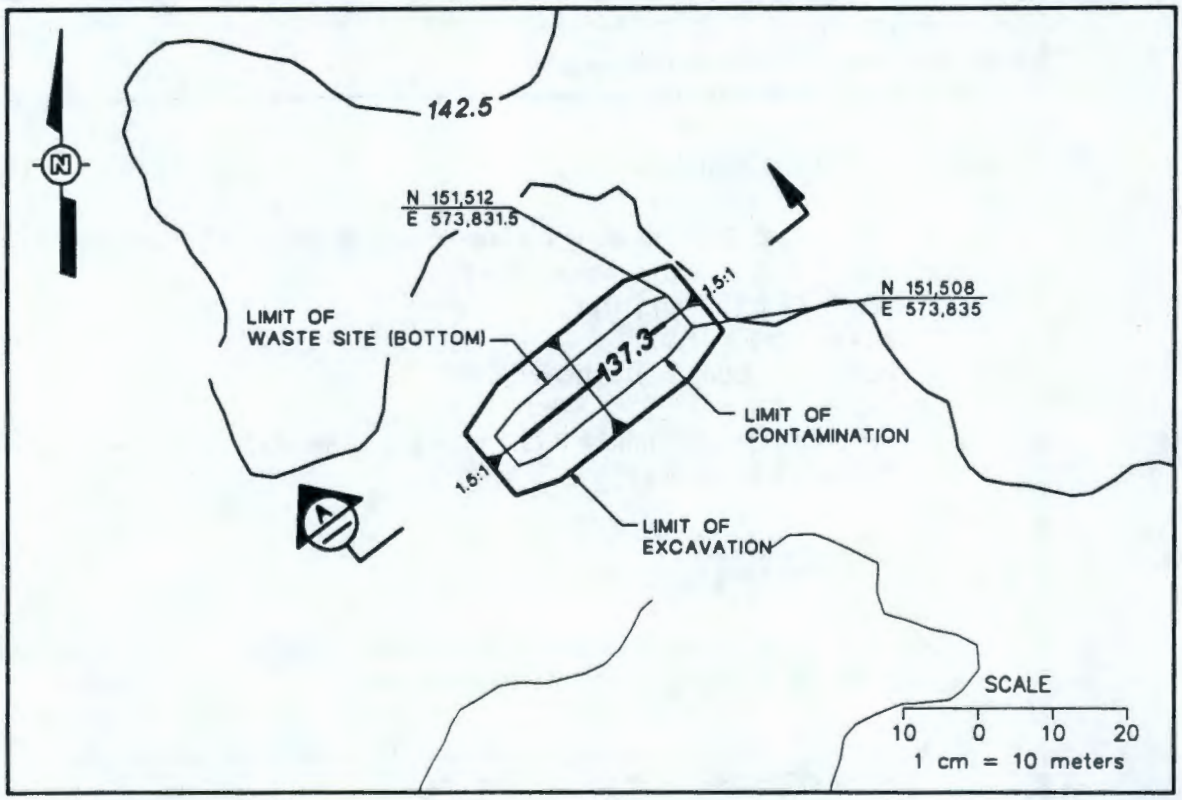
Northing:	151,512 [9]	Northing:	151,508 [9]
Easting:	573,831.5 [9]	Easting:	573,835 [9]
Reference Point:	Northwest corner at surface [9]	Reference Point:	Northeast corner at surface [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [8]

9413296.0787

Figure A-13 IRM Site: 4B Burial Ground



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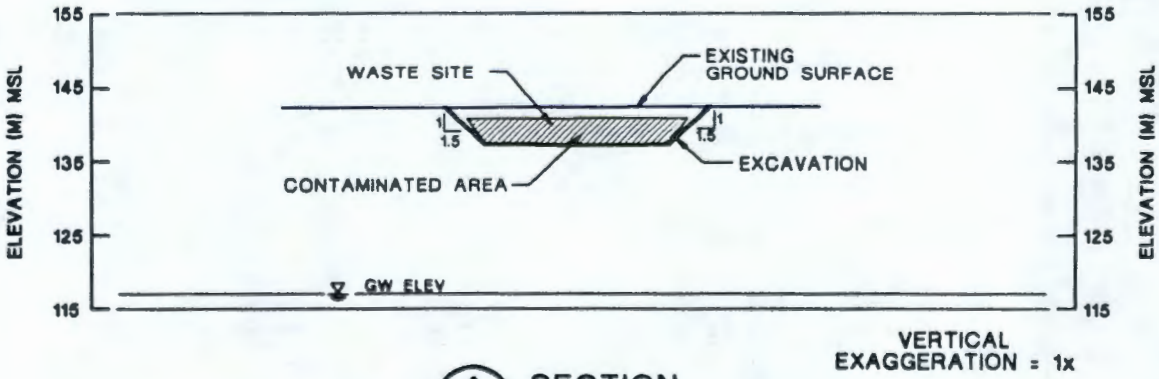


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 215 sq. meters
VOLUME = 350 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 523 sq. meters
VOLUME = 1,206 cu. meters

9413296.0788

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: 18 Burial Ground

WASTE SITE DIMENSIONS:

Length - 40 ft (12.2 m) along the bottom, 80 ft (24.4 m) at the surface [3].
Width - 40 ft (12.2 m) at the surface [3]
Depth - 20 ft (6.1 m) [10]
Slopes - 1:0 H : 1.0 V
Orientation - North-South lengthwise [3]

Assume a 'V' trench with 40 ft (12.2 m) width at the surface. Site was backfilled with 5 ft (1.5 m) of clean cover [10].

CONTAMINATED VOLUME DIMENSIONS:

Contamination is volume of trench. Contamination begins at 5 ft (1.5 m) below surface and extends to 25 ft (7.6 m) below surface [10].

Length - 40 ft (12.2 m) along the bottom, 80 ft (24.4 m) at the surface [10]
Width - 40 ft (12.2 m) at the surface [10]
Depth - 20 ft (6.1 m) [10]

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 40 ft (12.2 m) long at a depth of 25 ft (7.6 m) [10]. See attached figure for excavation top dimensions.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

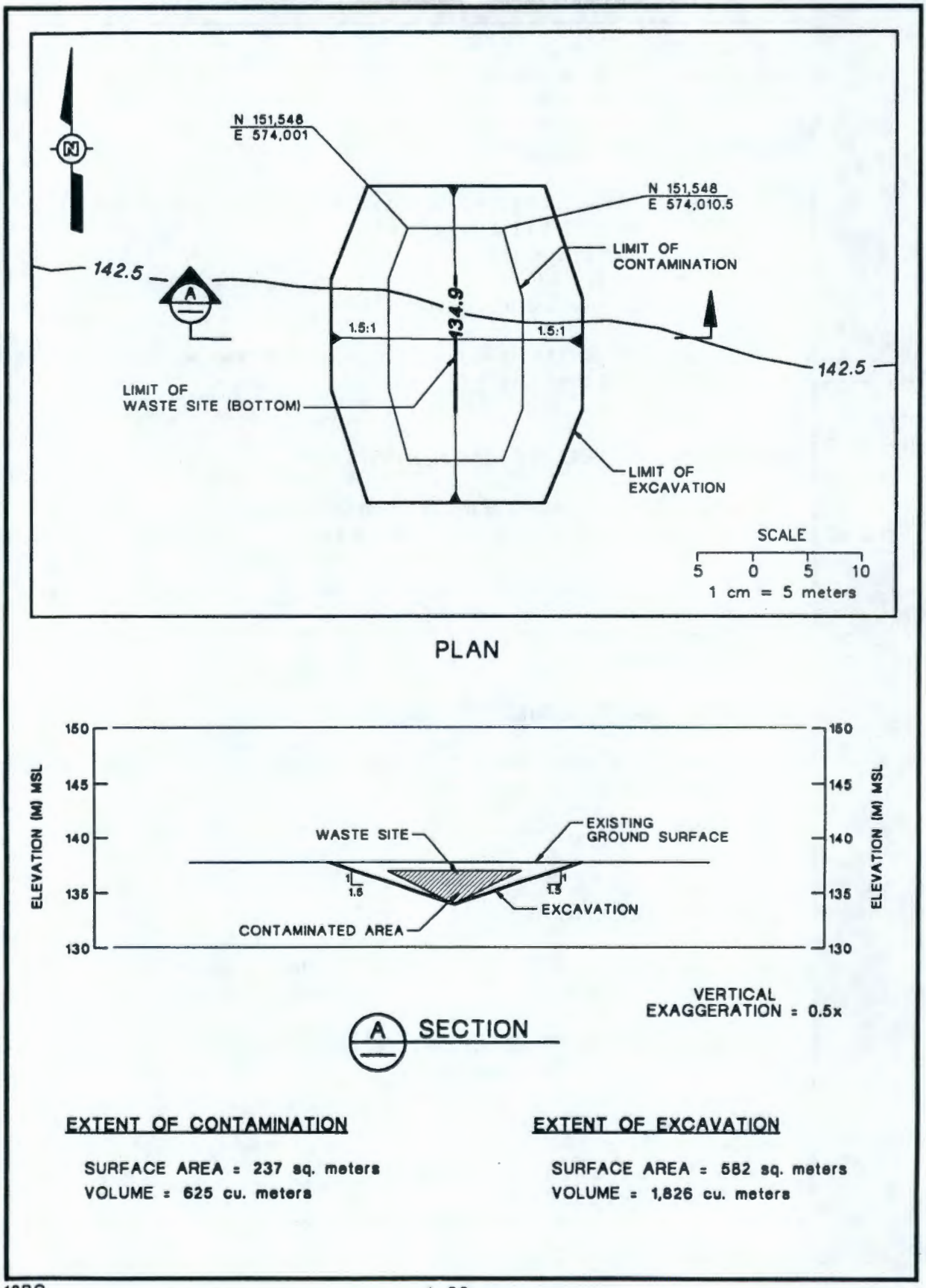
Northing:	151,548 [9]	Northing:	151,548 [9]
Easting:	574,001 [9]	Easting:	574,011.5 [9]
Reference Point:	Northwest corner at surface [9]	Reference Point:	Northeast corner at surface [9]

ELEVATIONS:

Surface: 468 ft (142.5 m) [4]
Groundwater: 385 ft (117.3 m) [7]

9413296.0789

Figure A-14 IRM Site: 18 Burial Ground



18BG

9413296.0790

Volume Estimate
100-DR-1 Operable Unit

SITE NUMBER:
SITE NAME: Effluent Pipelines (soil and sludge)

WASTE SITE DIMENSIONS:

Length - 12,124 ft (3,695.4 m) [3]
Width - 5 ft (1.5 m) diameter [3]
Depth - Varies [11]
Slopes - Varies
Orientation - Varies

Length - 1,068 ft (325.5 m) [3]
Width - 42 in. (1.07 m) [3]
Depth - Varies [11]
Slopes - Varies
Orientation - Varies

Reinforced concrete box 6 ft x 9 in. (2.06 m) x 6 ft x 9 in. (2.06 m) x 30 ft (9.1 m) long.

CONTAMINATED VOLUME DIMENSIONS:

Soil around pipe. No contamination along length of pipe.

Sludge inside pipe. All pipes have contaminated sludge along bottom. Volume of sludge is insignificant, the volume calculated will be that of pipe void.

EXCAVATED VOLUME DIMENSIONS:

Depends on depth of pipe. Base of excavation is 2 ft (0.61 m) on each side of the pipe and begins 3 in. below invert of pipe.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

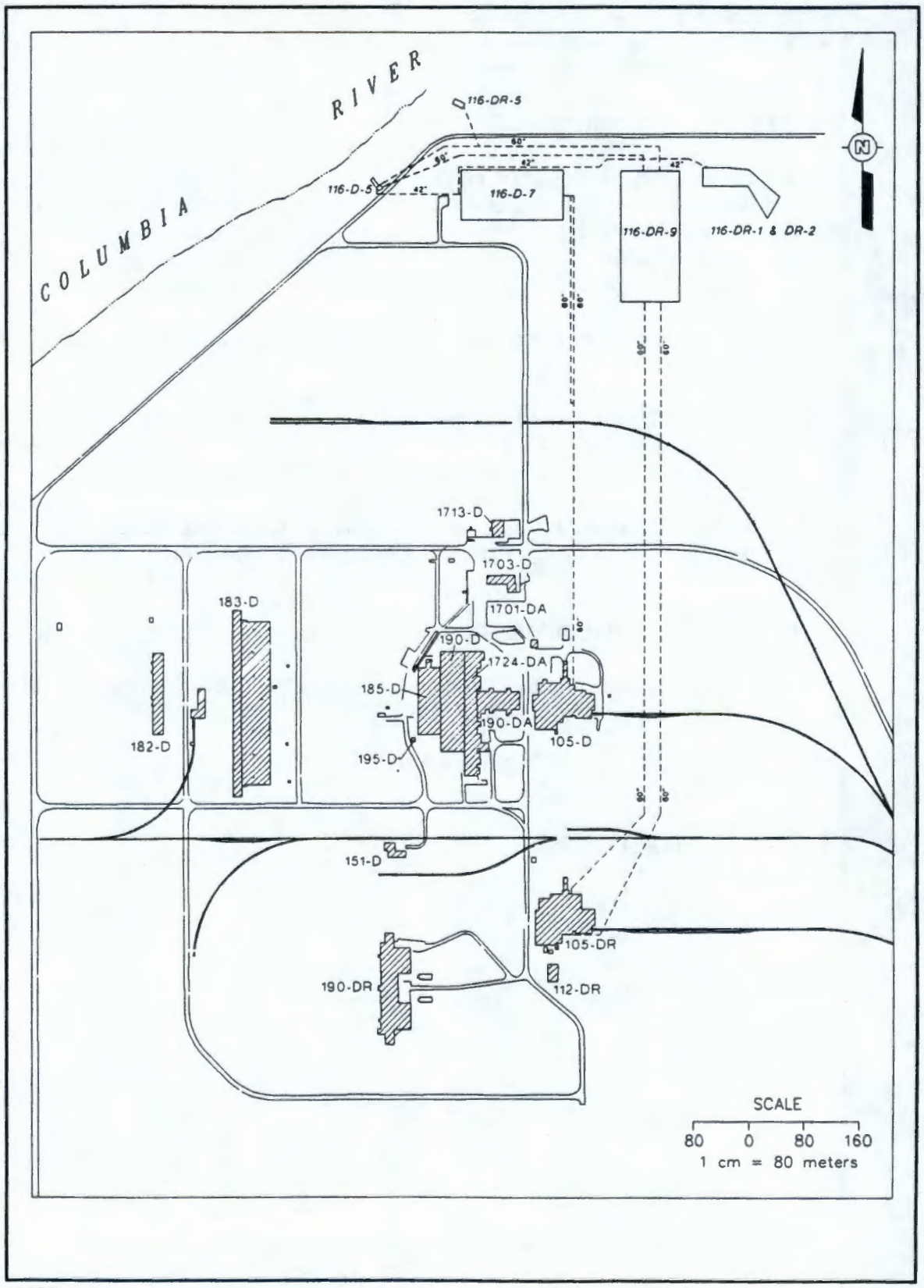
See figure.

ELEVATIONS:

See figure.

9413296.0791

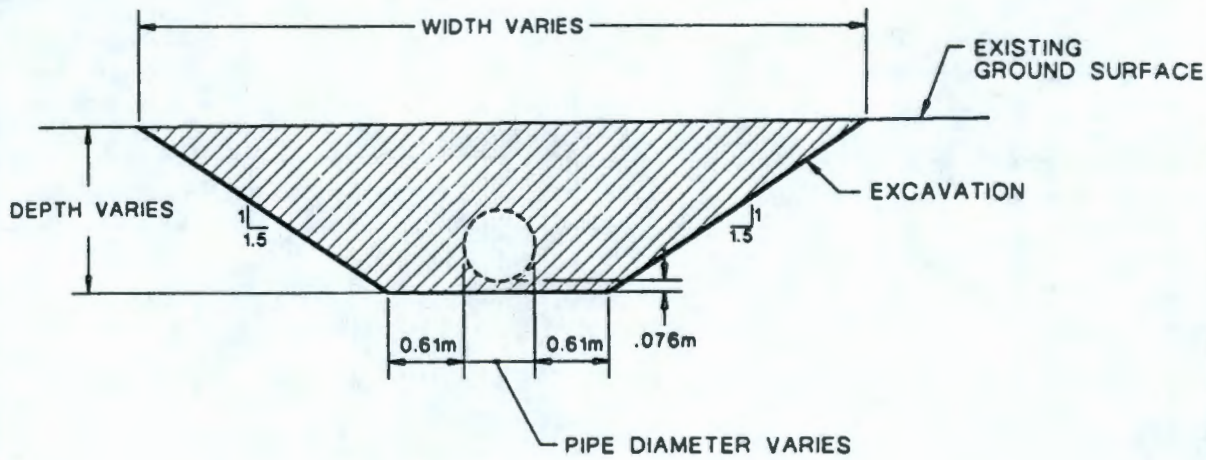
Figure A-15 IRM Site: 100 D/DR Pipelines



100DPLN

9413296.0792

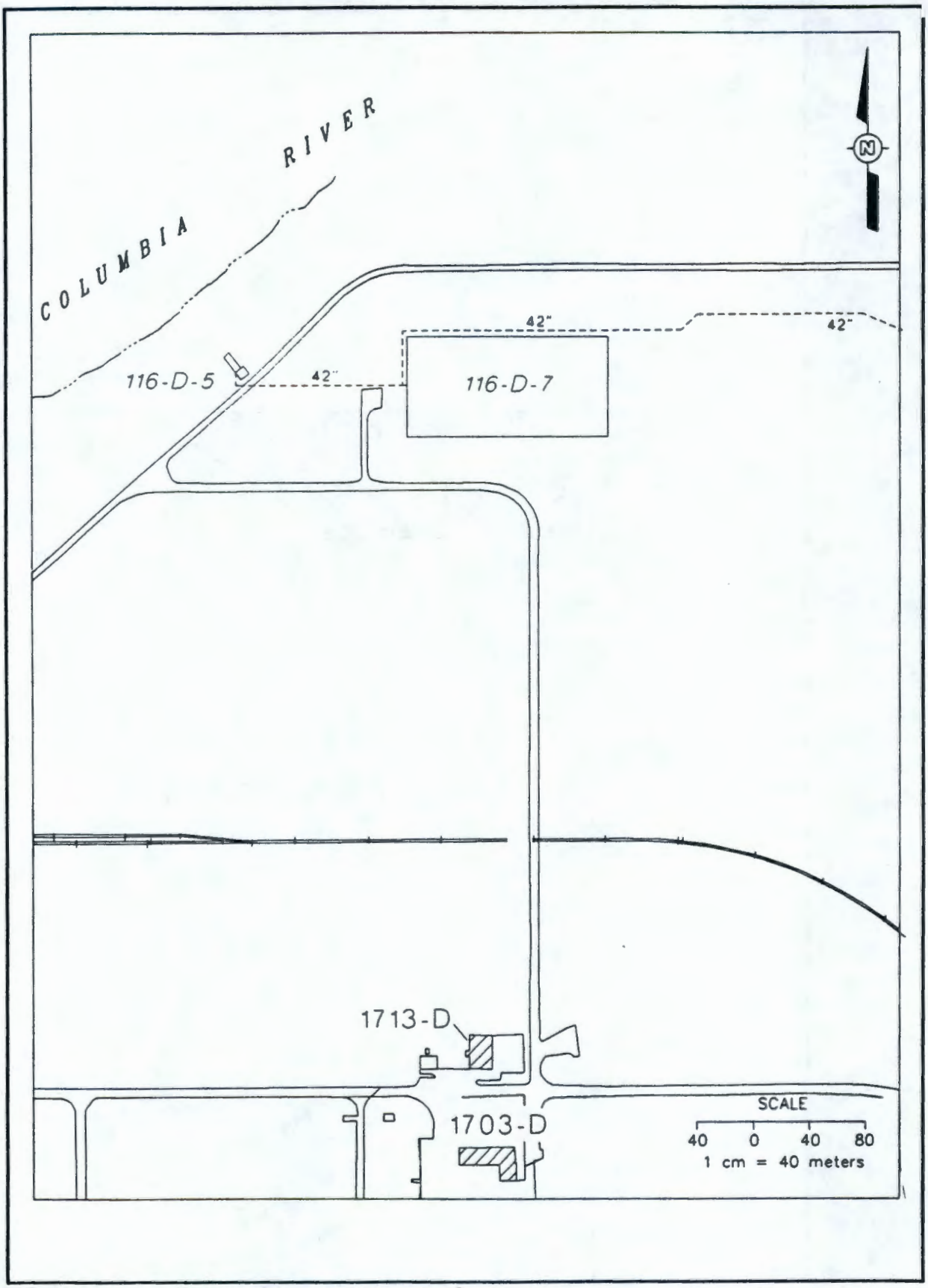
Figure A-16 Typical Pipeline Excavation Cross Section



TYPICAL CROSS SECTION

9413296.0793

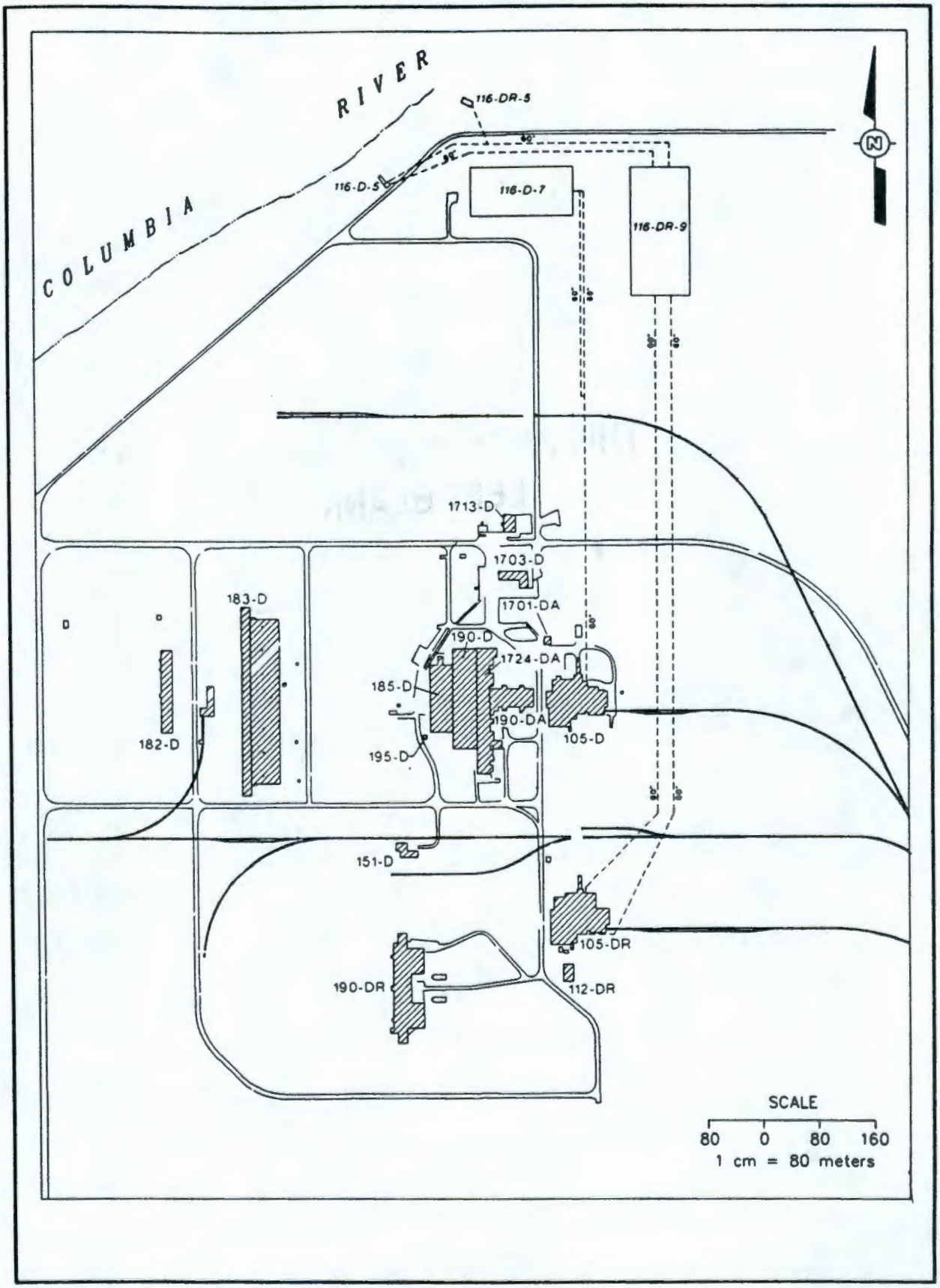
Figure A-17 100 D/DR 42 inch Pipelines



PLN42D

9413296.0794

Figure A-18 100 D/DR 60 inch Pipelines



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APPENDIX B

100-DR-1 OPERABLE UNIT WASTE SITE COST ESTIMATES

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1.0 COST ESTIMATE SUMMARIES

This appendix has two primary purposes. The first is to describe the cost models developed to support the source operable unit focused feasibility study reports. The second is to document the cost estimates developed for each waste site using the cost models.

1.1 DESCRIPTION OF COST MODELS

A cost model defines the remedial alternative activities and provides a method in which to estimate the associated cost. Each cost model is developed using the MCACES[1] software package.

The focused feasibility study cost models are based on the Environmental Restoration cost models used for developing the fiscal year planning baselines. The Environmental Restoration cost models were modified for the source operable unit focused feasibility studies to include all costs associated with the remedial alternatives. Project Time and Cost, Inc., supported both the baseline and focused feasibility study cost estimating activities. The fourteen cost models associated with the source operable unit focused feasibility studies are presented in the *100 Area Source Operable Unit Focused Feasibility Study Cost Models* (WHC 1994).

All cost models were developed based on a common work breakdown structure. There are three main elements within the structure; Offsite Analytical Services (ANA), Fixed Price Contractor (SUB), and Westinghouse Hanford Company (WHC).[2] Each of the three main elements is defined further by additional levels. Table B-1 describes each element and level of a cost model. The work breakdown structure discussion is applicable for each cost model.

1.2 WASTE SITE COST ESTIMATES

Cost estimates were developed for each waste site addressed by the focused feasibility study based on the applicable cost model. The present worth for each estimate is based on a 5% discount rate and a disposal fee of $70/cubic yard. Due to current uncertainty as to the actual disposal fee, a sensitivity analysis is presented based on $700/cubic yard and $7,000/cubic yard besides $70/cubic yard. A matrix of the waste site, cost estimate table, and cost comparison figure is presented on Table B-2.

[1] MCACES: Micro Computer Aided Cost Estimating System.

[2] The cost model terminology has not been updated to reflect the current change in the environmental restoration primary contractor.

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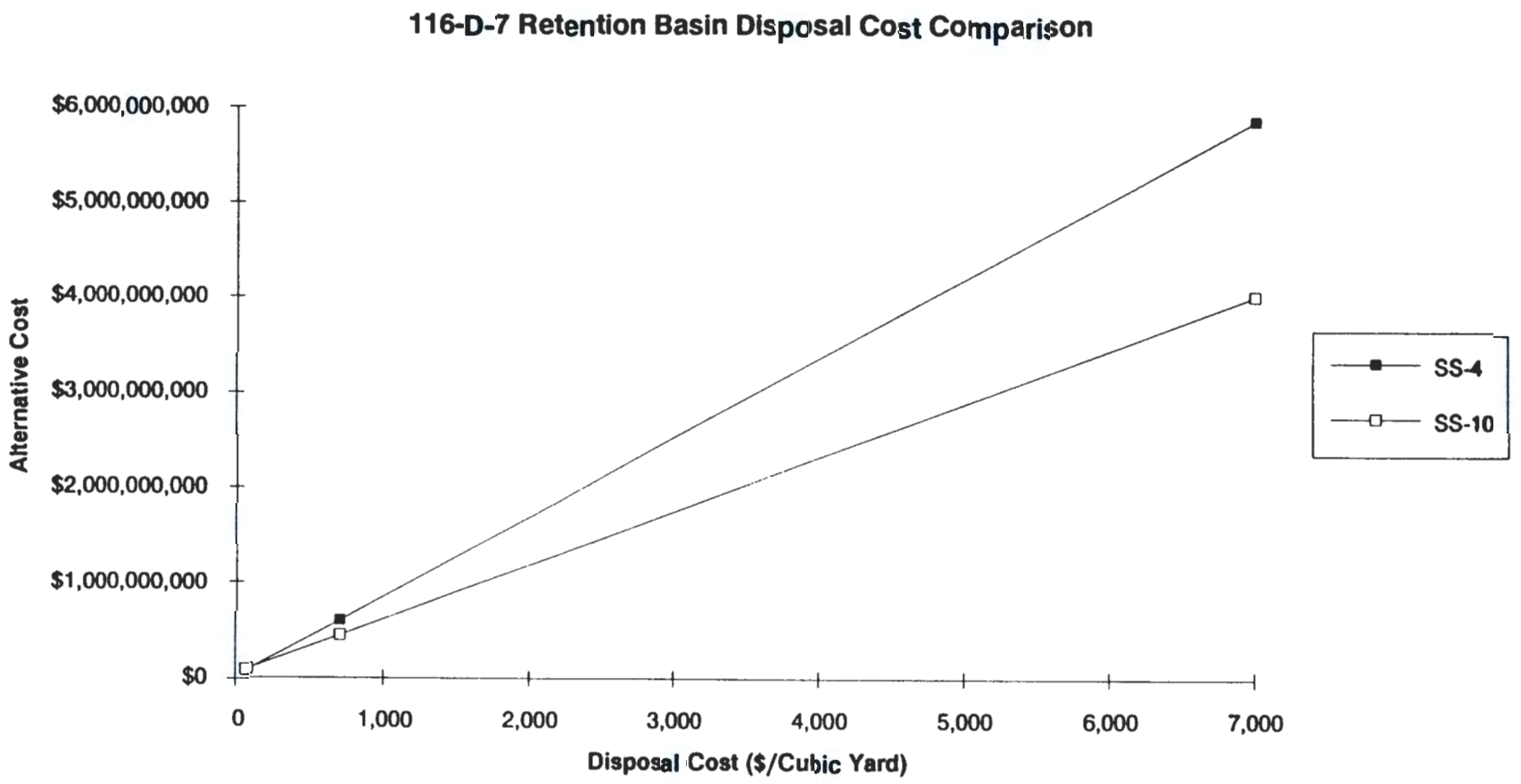


Figure B-1 116-D-7 Retention Basin Disposal Cost Comparison

Figure B-2 116-DR-9 Retention Basin Disposal Cost Comparison

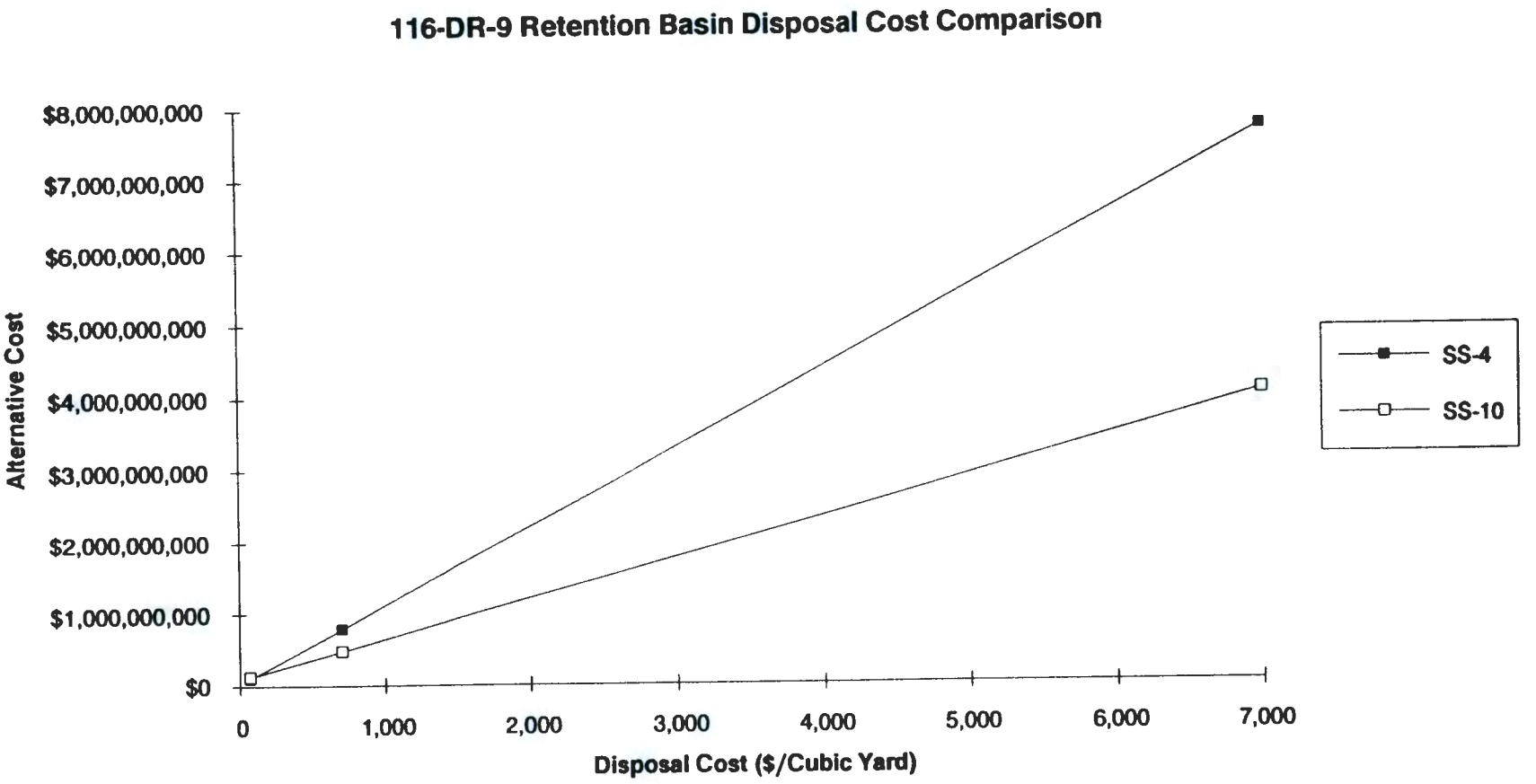


Figure B-3 116-DR-1&2 Process Effluent Trench Disposal Cost Comparison

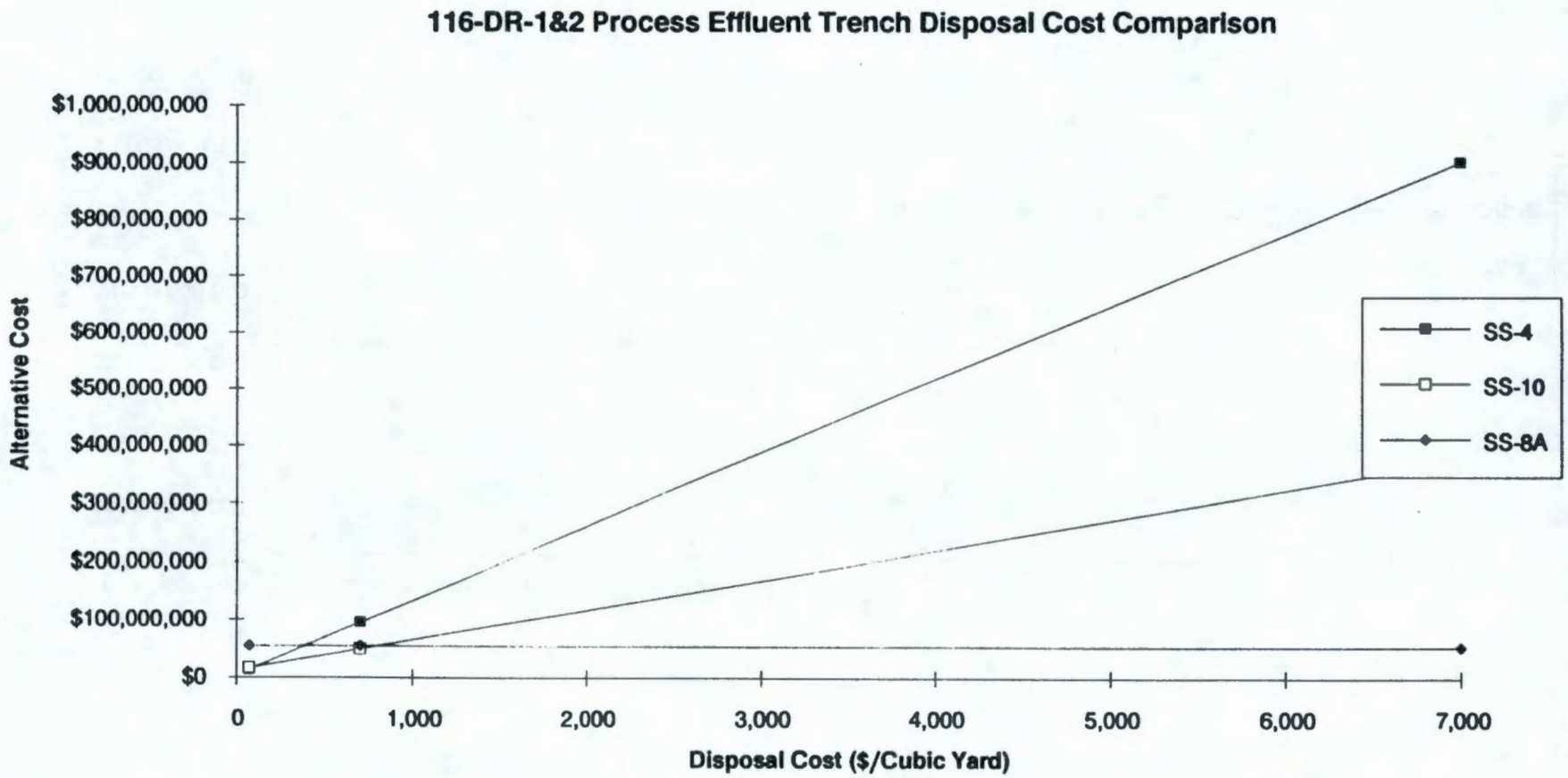


Figure B-4 107-D/DR Sludge Trench No. 1 Disposal Cost Comparison

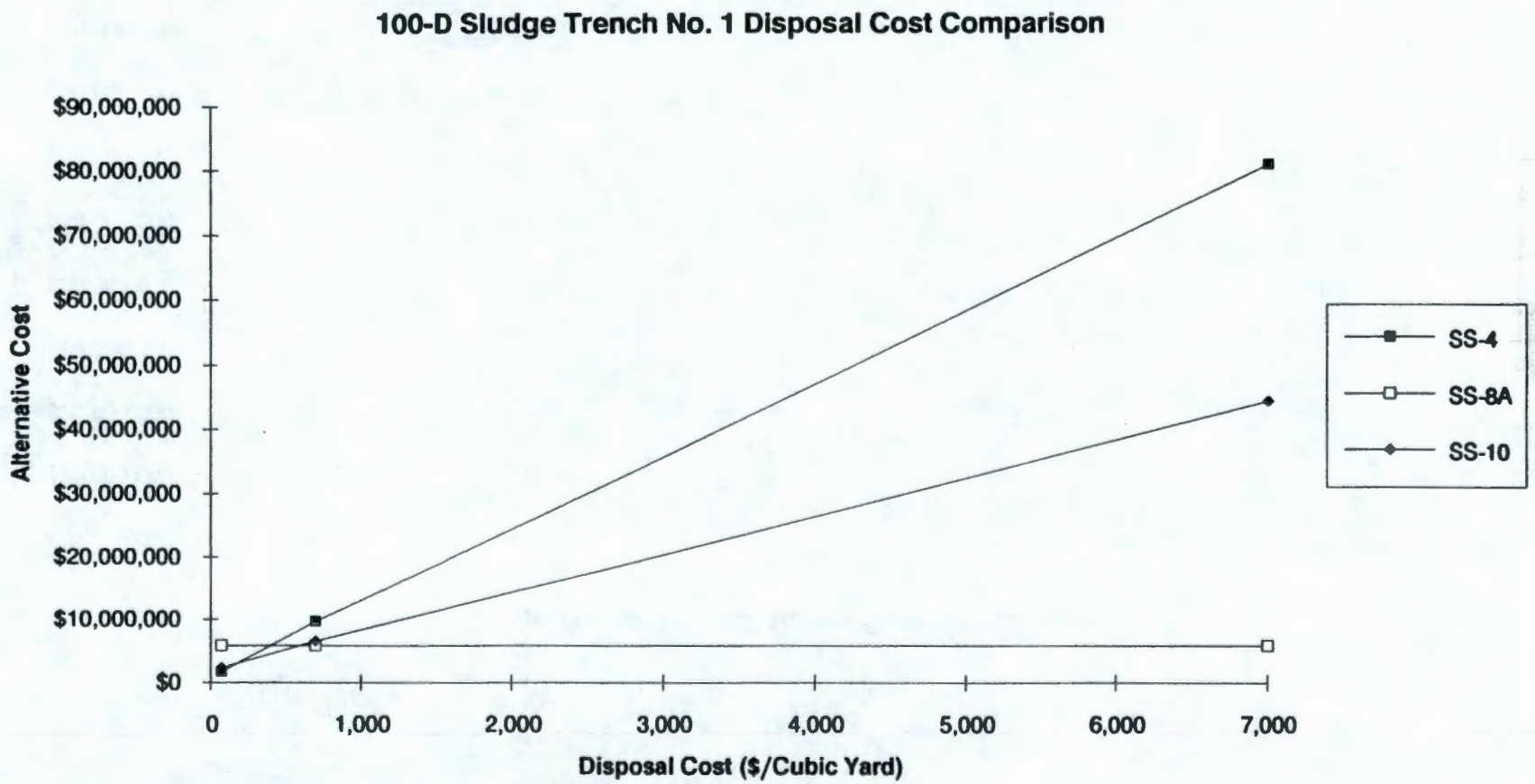


Figure B-5 107-D/DR Sludge Trench No. 2 Disposal Cost Comparison

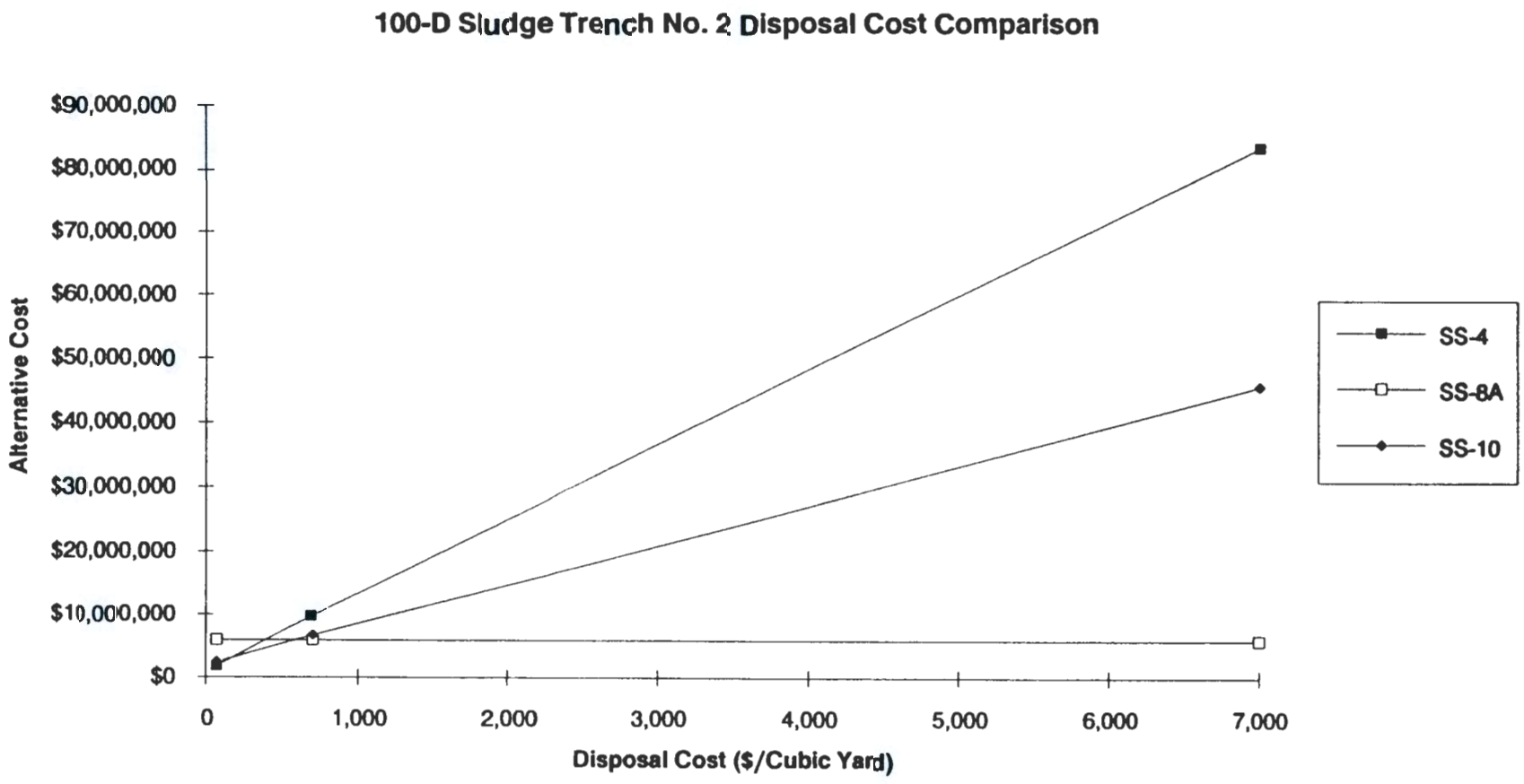


Figure B-6 107-D/DR Sludge Trench No. 3 Disposal Cost Comparison

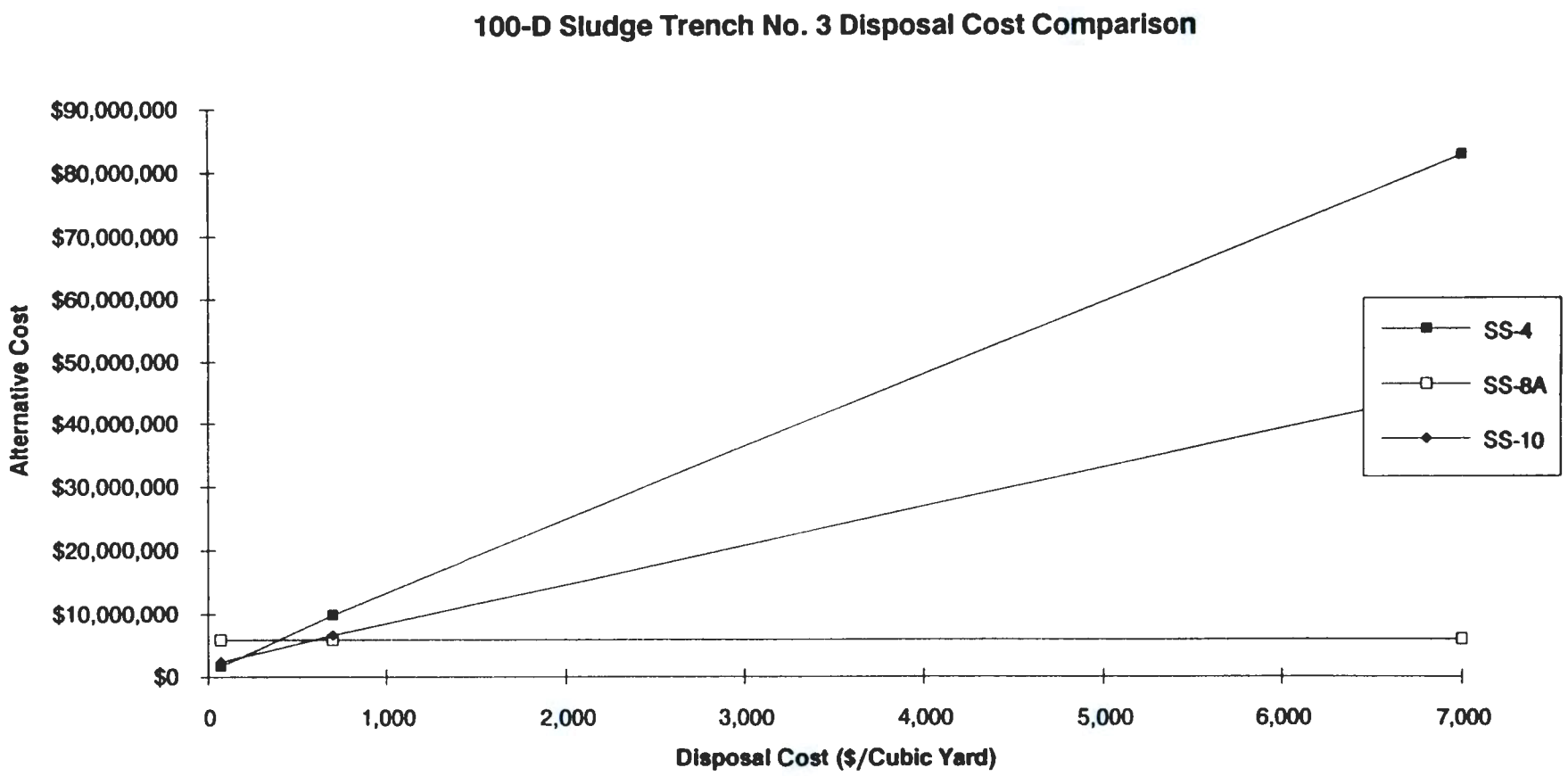


Figure B-7 107-D/DR Sludge Trench No. 4 Disposal Cost Comparison

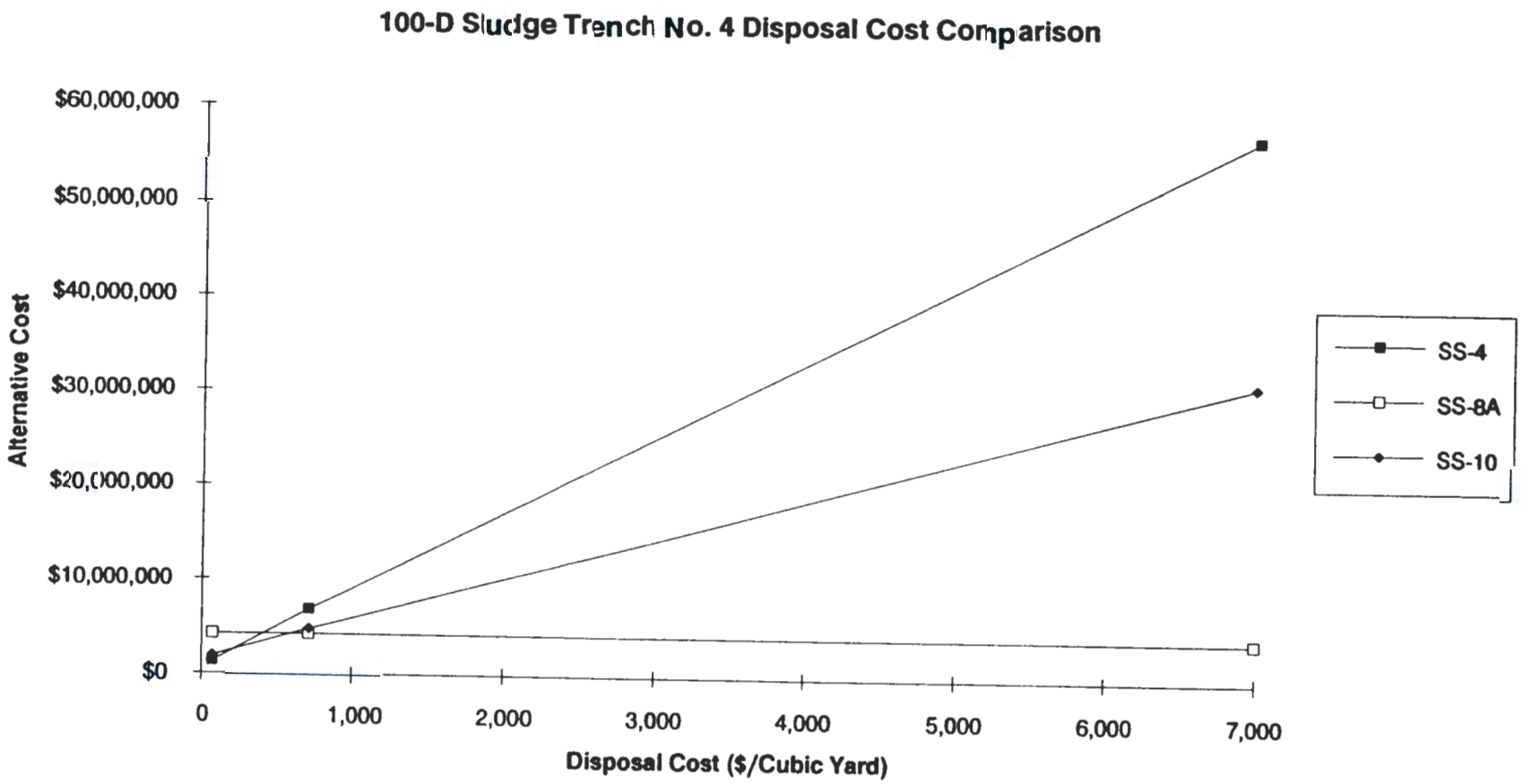
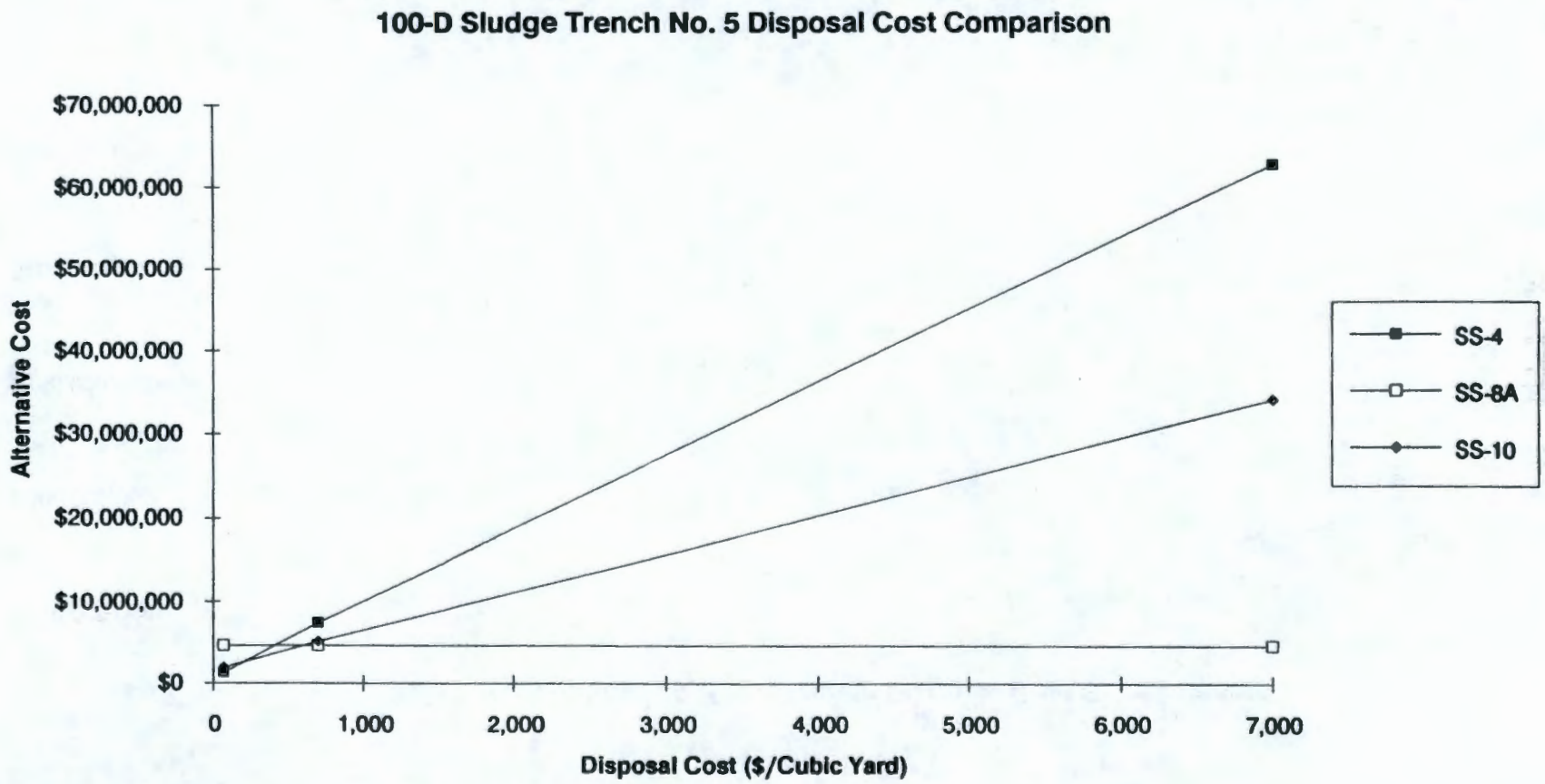


Figure B-8 107-D/DR Sludge Trench No. 5 Disposal Cost Comparison



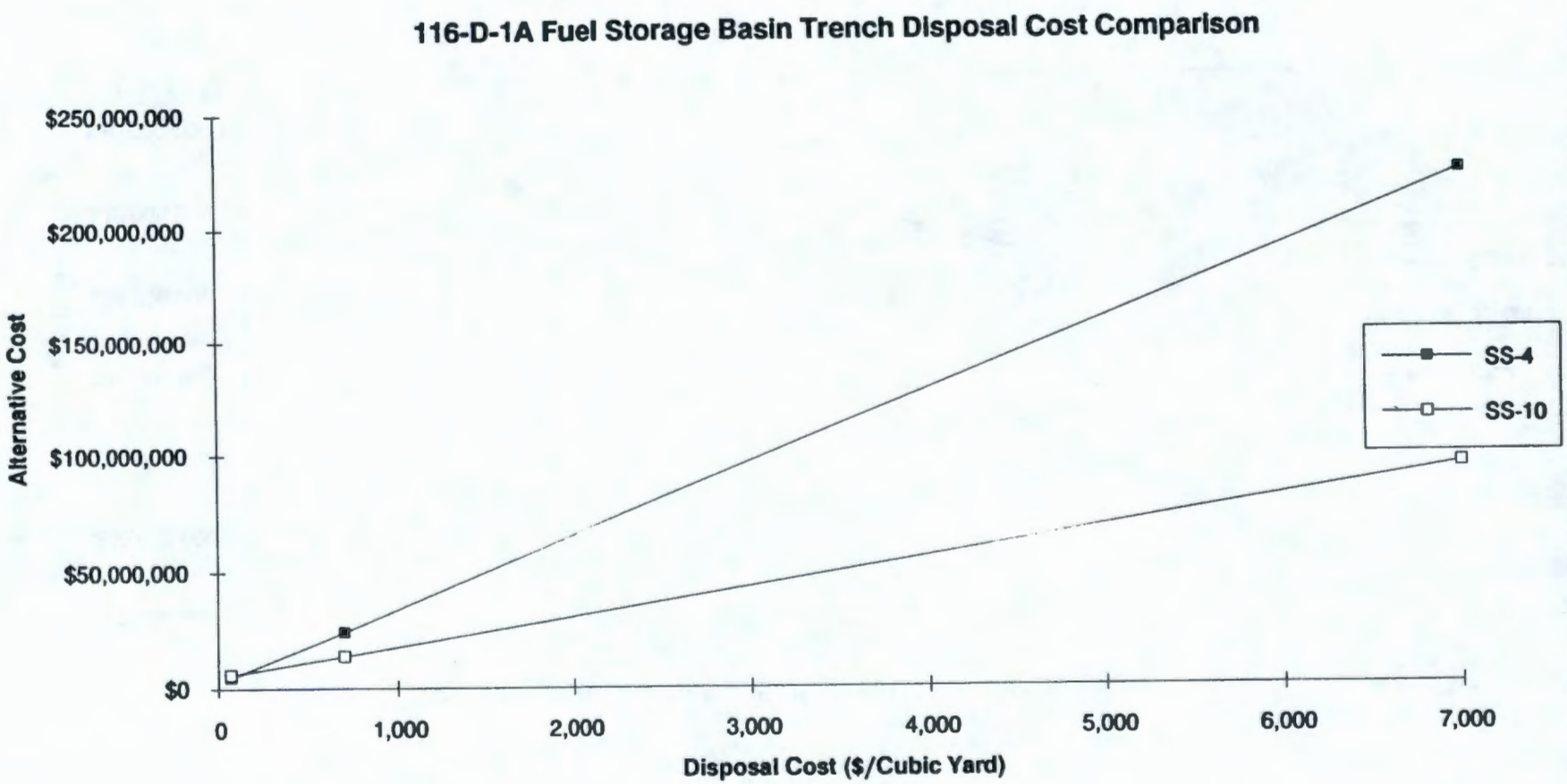
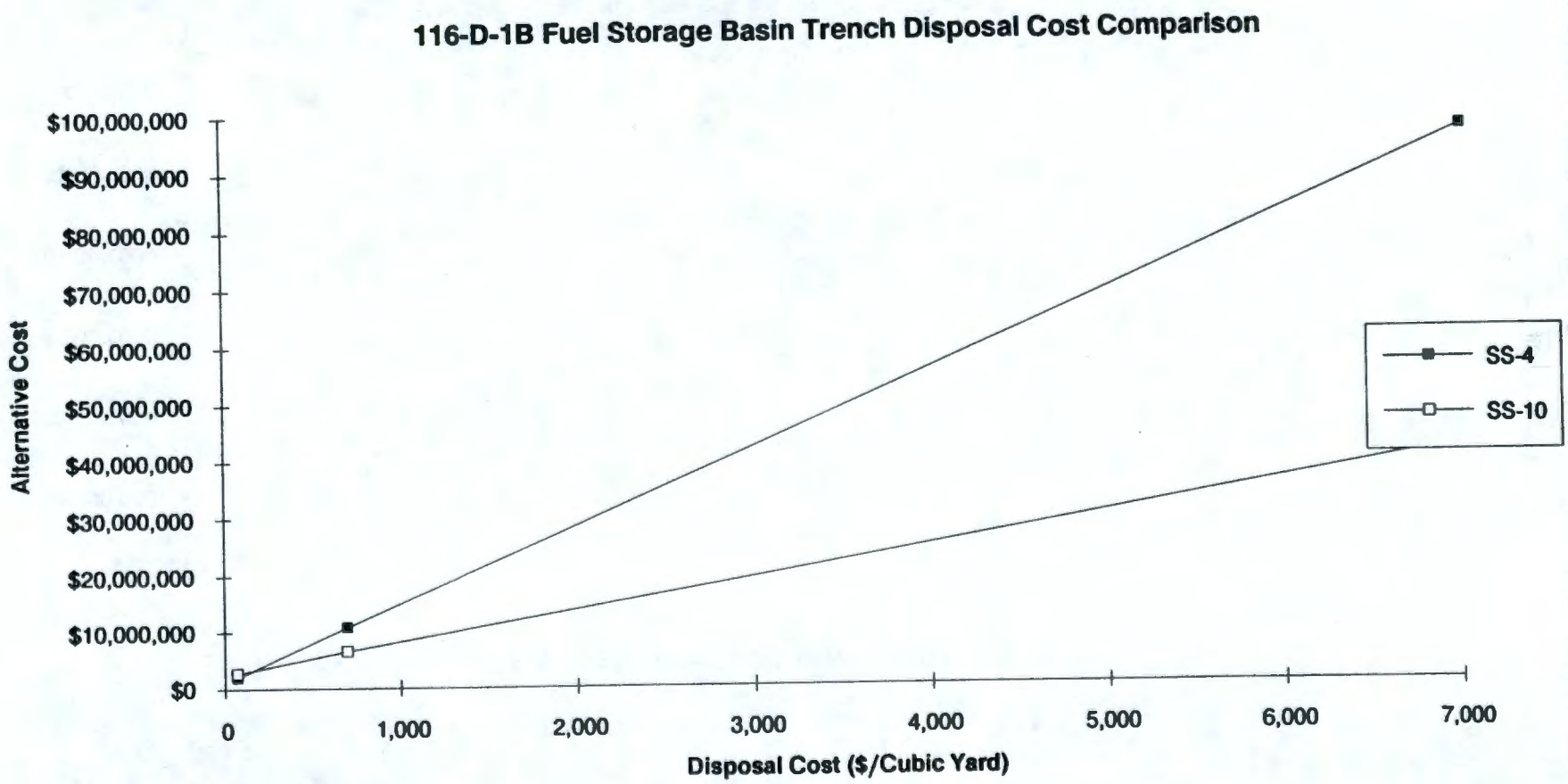


Figure B-9 116-D-1A Fuel Storage Basin Trench Disposal Cost Comparison

Figure B-10 116-D-1B Fuel Storage Basin Trench Disposal Cost Comparison



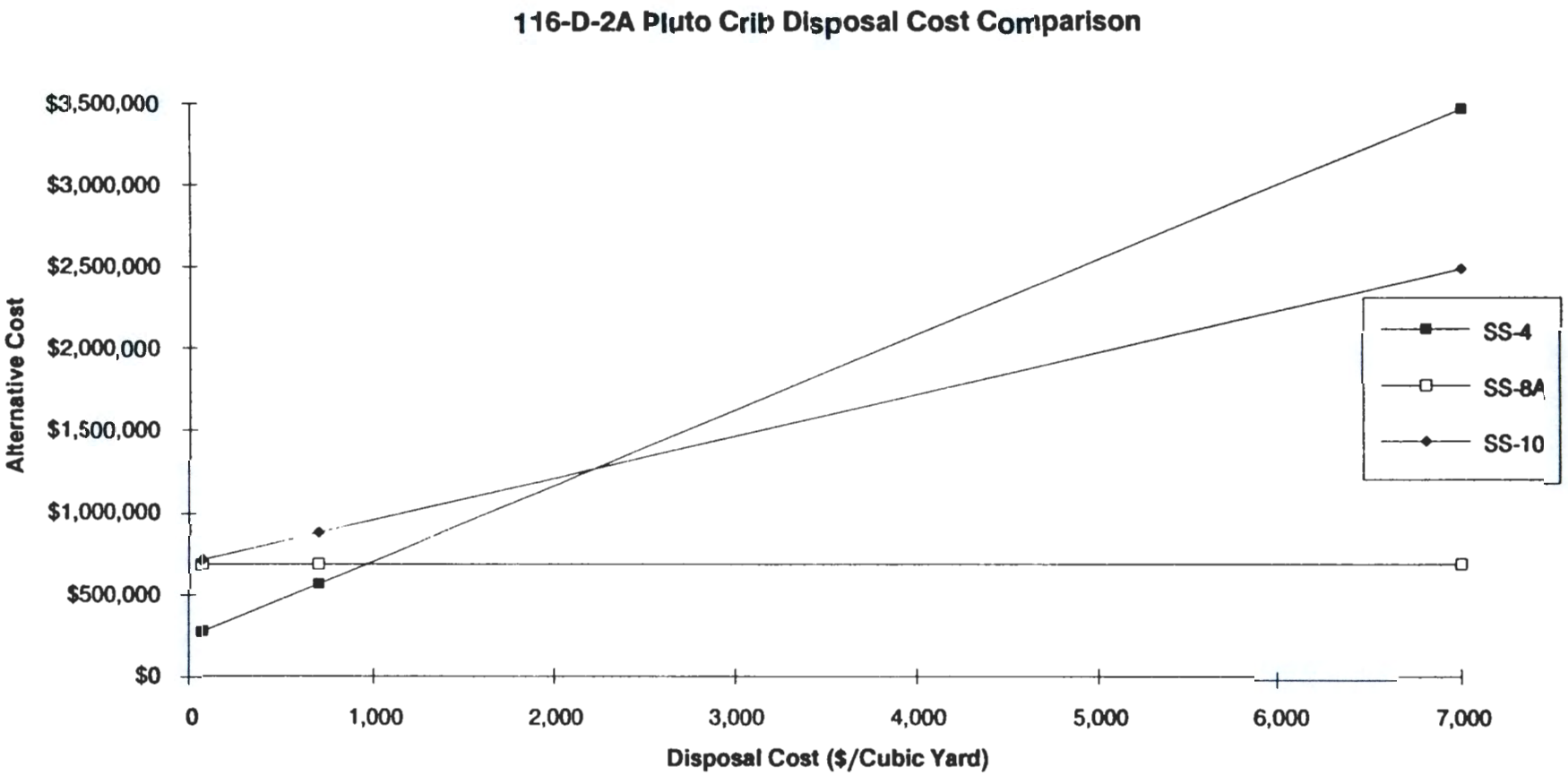


Figure B-11 116-D-2A Pluto Crib Disposal Cost Comparison

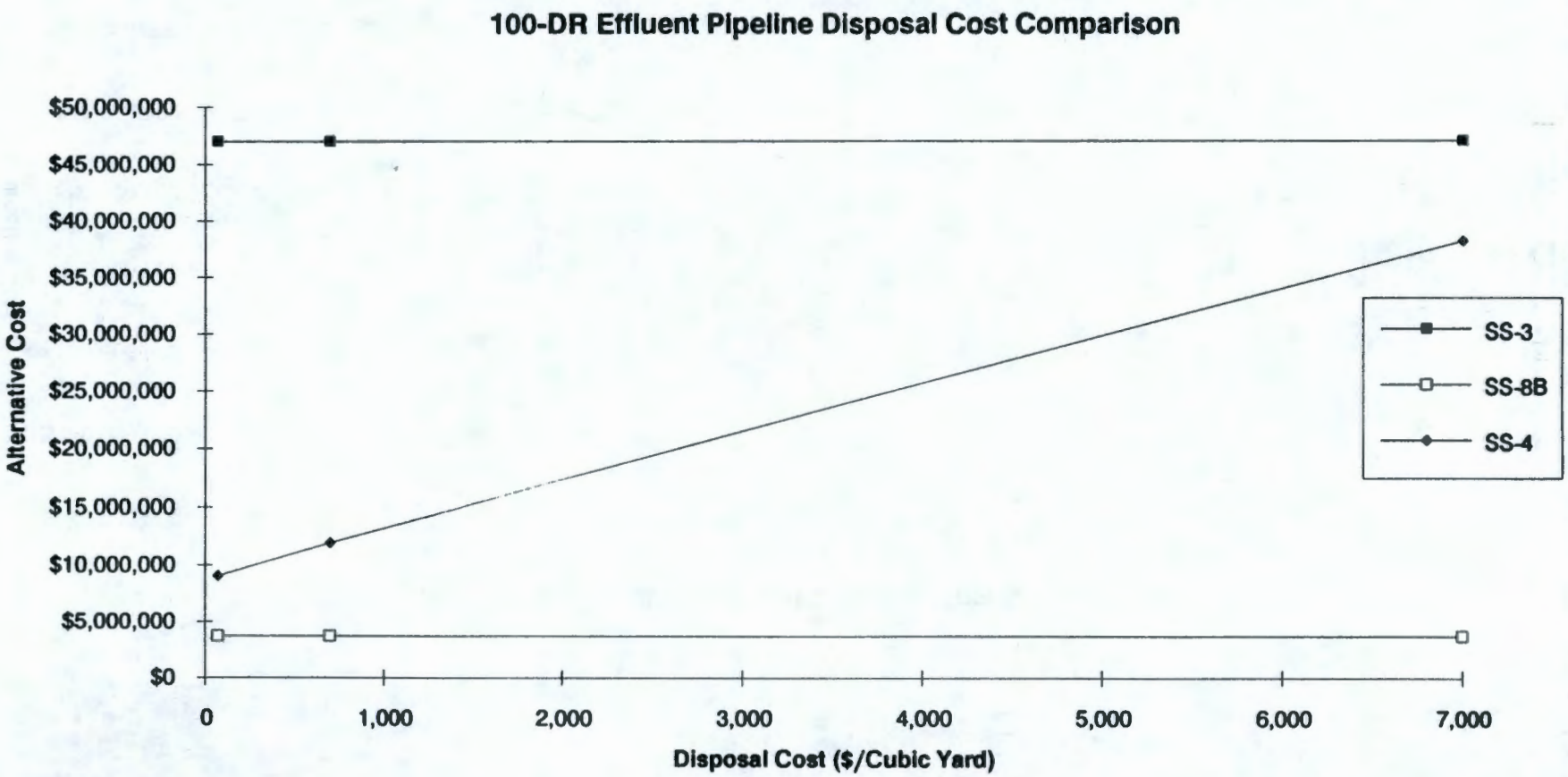


Figure B-12 100-DR Effluent Pipeline Disposal Cost Comparison

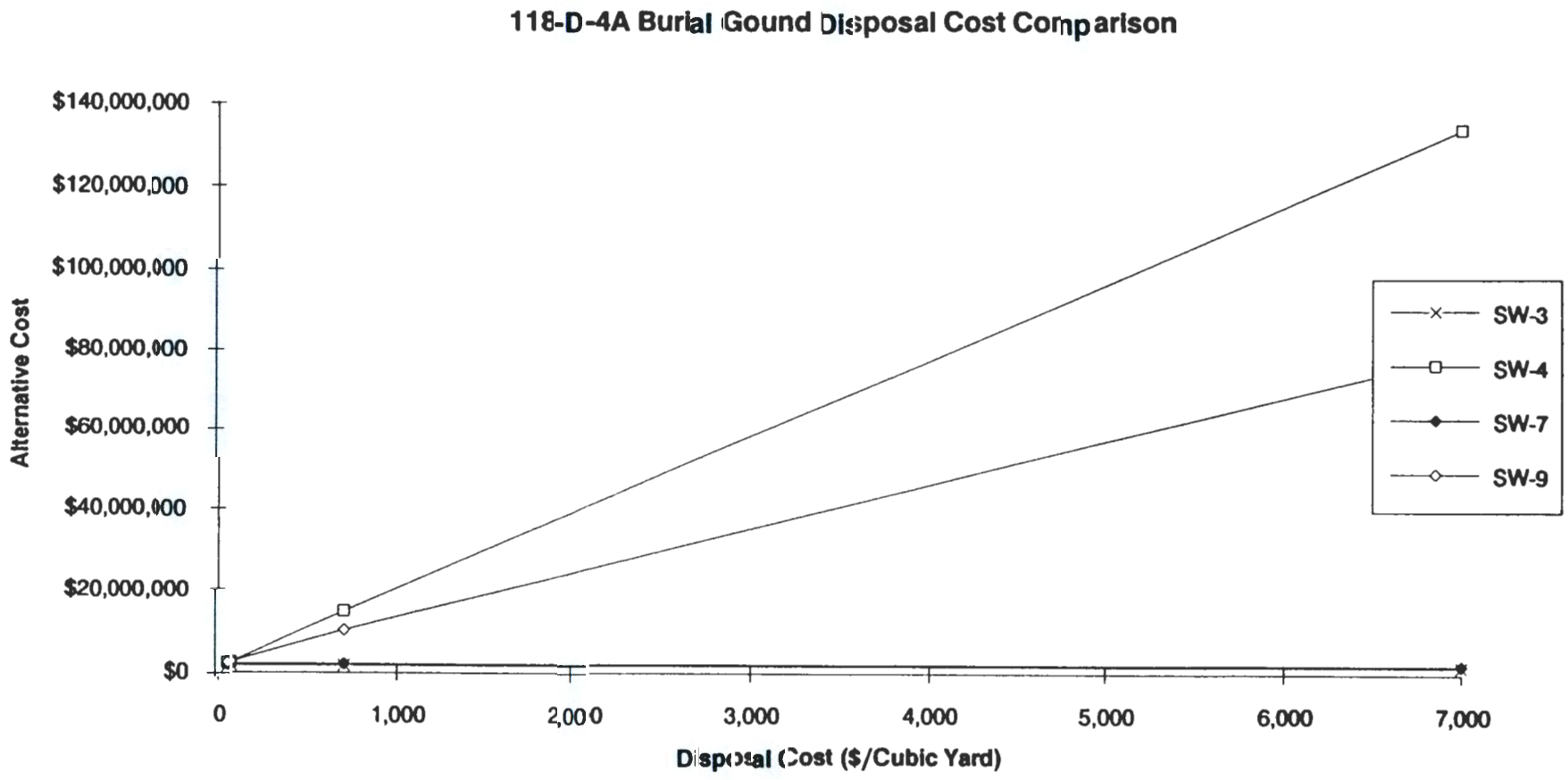


Figure B-13 118-D-4A Burial Ground Disposal Cost Comparison

Figure B-14 118-D-4B Burial Ground Disposal Cost Comparison

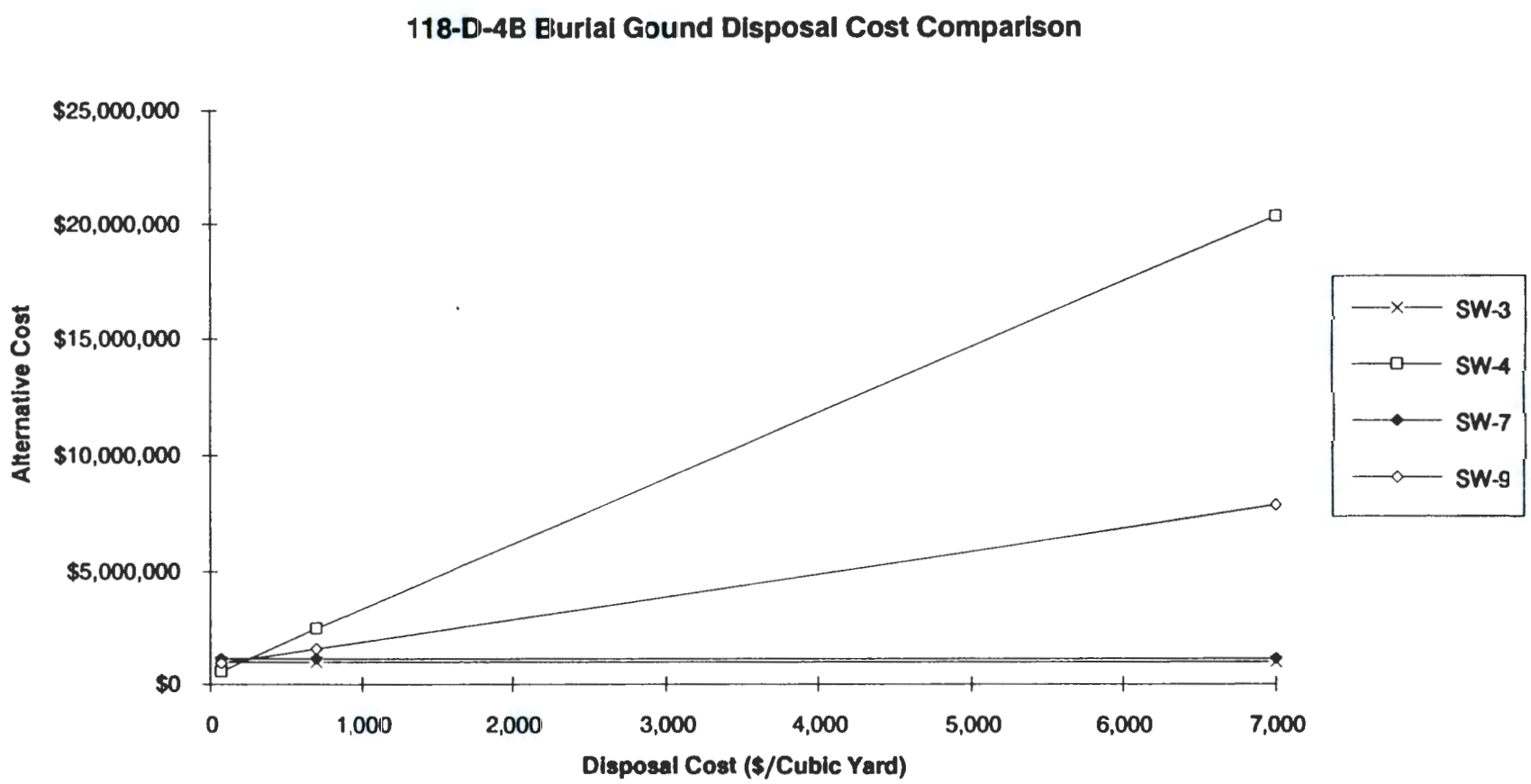


Figure B-15 118-D-18 Burial Ground Disposal Cost Comparison

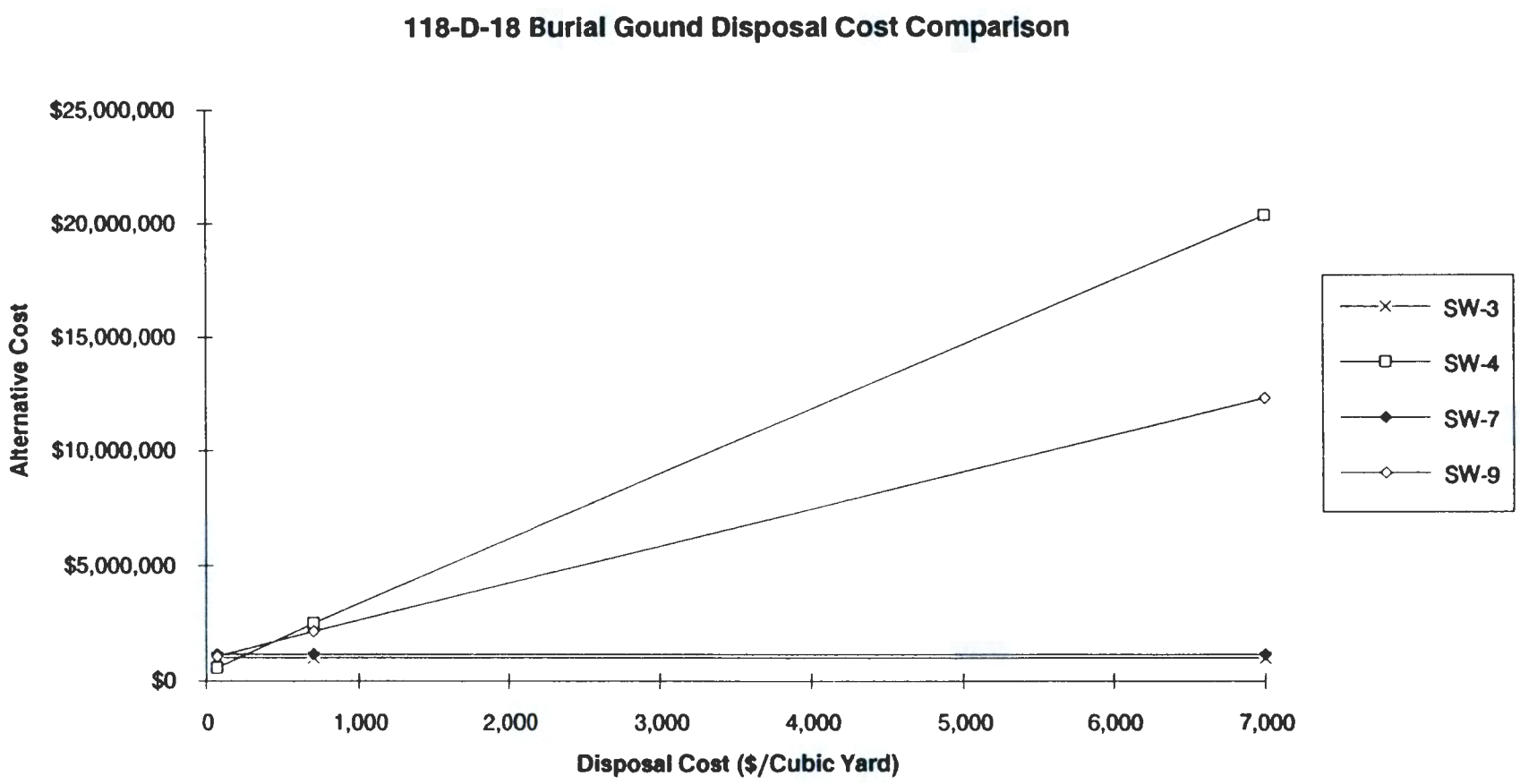


Table B-1 Cost Model Work Breakdown Structure Discussion (page 1 of 4)

ELEMENTS AND LEVELS	DESCRIPTION
ANA: Offsite Analytical Services	This element represents the offsite contractor performing laboratory analysis of samples.
ANA:02 Monitoring, Sampling, & Analysis	This level includes the laboratory analysis of samples. 10% of routine samples and all quality control samples were assumed to be analyzed using level III and level V analysis. Site certification samples were assumed to be analyzed using level IV and V analysis.
SUB: Fixed Price Contractor	This element represents the activities performed by the fixed price contractor supporting the Department of Energy's prime environmental restoration contractor.
SUB:01 Mobilization & Preparatory	This level includes mobilization of personnel and equipment, preparation for temporary facilities, and construction of temporary facilities.
SUB:02 Monitoring, Sampling & Analysis	This level includes in situ monitoring and field sampling for onsite or offsite analysis. Assumptions for sampling include one regular sample per 32 cubic yards removed (one per container) and one quality control sample per twenty regular samples. Site certification samples were assumed to be taken at one per 2,500 square feet of bottom area with a minimum of four samples. Additional activities included treatment process sampling which was assumed to be at a rate of one sample per 1,000 cubic yards of feed material.

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Table B-1 Cost Model Work Breakdown Structure Discussion (page 2 of 4)

ELEMENTS AND LEVELS	DESCRIPTION
SUB:08 Solids Collection & Containment	This level includes excavation, capping, dynamic compaction, and personnel training. The excavation activity includes excavation of non-contaminated soil, excavation of contaminated soil, and demolition of solid waste materials. The capping activity includes all steps necessary to construct the appropriate cap layers. The dynamic compaction activity includes the physical compaction and dust suppression. Personnel training included the standard 40-hour course, a fundamentals of radiation safety course, and an 8-hour supervisor course.
SUB:13 Physical Treatment	This level includes both soil washing and solid waste compaction activities such as mobilization/setup, personnel training, operation, system maintenance, demobilization, and pre- and post-treatment plan submittals. Assumptions include a swell factor of 25% for the material being hauled from the excavation. 90% of the contaminated material was assumed to be compactible.
SUB:14 Thermal Treatment	This level includes thermal desorption mobilization/setup, personnel training, system operation, demobilization, and pre- and post-treatment plan submittals. It is assumed that 5% of contaminated soil is organically contaminated and will be thermally treated should organics be present. An additional assumption includes a swell factor of 25% for the material being hauled from the excavation.
SUB:15 Stabilization/Fixation	This level inlcudes in situ vitrification mobilization/setup, personnel training, system operation, demobilization, and pre- and post-construction submittals.

Table B-1 Cost Model Work Breakdown Structure Discussion (page 3 of 4)

ELEMENTS AND LEVELS	DESCRIPTION
SUB:18 Disposal (Other than Commercial)	This level includes transport to the disposal facility and disposal fees/taxes. Assumptions include a 60% swell factor for demolition waste and a 25% swell factor for soils. Reduction in volume is achieved and quantified based on the treatment process. A disposal fee of $70/cubic yard was assumed based on current estimates for initial construction, operations/maintenance, and anticipated expansion of the environmental restoration disposal facility.
SUB:20 Site Restoration	This level includes activities such as load/haul borrow materials, spread/compact borrow and stockpiled materials, revegetation, and irrigation. Assumptions include the availability of on-site borrow materials at no additional charge.
SUB:21 Demobilization	This level includes the demobilization of temporary facilities. Note: Because multiple sites will be cleaned up within an operable unit and a cost for mobilization between sites is already included, no allowance for demobilization is made. Only the cost for removal of temporary utilities, fencing, and decontamination facilities are included.
WHC: Westinghouse Hanford Company	This element represents activities performed by the prime contractor.
WHC:02 Monitoring, Sampling, & Analysis	This level includes mobile laboratory support, quality assurance/safety oversight, and health physics support. 90% of routine soil and solid waste samples were assumed to be analyzed using level III analysis. Routine sampling was assumed to occur at one sample per every 32 cubic yards removed(one per container.)
WHC:08 Solids Collection & Containment	This level includes personnel protection services including equipment, maintenance, and laundry services.

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Table B-1 Cost Model Work Breakdown Structure Discussion (page 4 of 4)

ELEMENTS AND LEVELS	DESCRIPTION
Subcontractor Material Procurement Rate	The materials procurement rate reflects the activities associated with procurement or direct materials, inventories and, subcontracts.
Project Management/Construction Management	This cost accounts for project management, construction management, and office support personnel.
General & Administrative/Common Support Pool	The general and administrative costs consist of indirect costs of activities which benefit the company and can not be identified to a specific end cost objective. The common support pool provides for site-wide services of which the company pays a proportional share.
Contingency	A contingency value is calculated for the various waste site groups based on an evaluation of the various levels, the relative importance of the factor to successful completion of the action, and the probability that the factor will change.
Total, Capital, Annual Operations and Maintenance	The total represents the costs associated with the remedial action. The total cost includes capital and operations and maintenance of a cap. These costs are accounted for through the year 2018.
Present Worth	Present worth is calculated using a 5% discount rate over the life of the activity.

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Table B-2 Waste Site Cost Presentation Matrix

Waste Site	Cost Summary Table	Cost Comparison Figure
116-D-7	Table B-3	Figure B-1
116-DR-9	Table B-4	Figure B-2
116-DR-1/2	Table B-5	Figure B-3
107-D/DR #1	Table B-6	Figure B-4
107-D/DR #2	Table B-7	Figure B-5
107-D/DR #3	Table B-8	Figure B-6
107-D/DR #4	Table B-9	Figure B-7
107-D/DR #5	Table B-10	Figure B-8
116-D-1A	Table B-11	Figure B-9
116-D-1B	Table B-12	Figure B-10
116-D-2A	Table B-13	Figure B-11
Effluent Pipelines	Table B-14	Figure B-12
118-D-4A	Table B-15	Figure B-13
118-D-4B	Table B-16	Figure B-14
118-D-18	Table B-17	Figure B-15

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Table B-3 Cost Summary for 116-D-7 Retention Basin

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	614,660	1,587,170
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	89,570	78,050
SUB:02	Monitoring, Sampling & Analysis	407,140	985,630
SUB:08	Solids Collection & Containment	2,452,840	3,525,920
SUB:13	Physical Treatment	-	12,757,810
SUB:14	Thermal Treatment	-	-
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	32,736,010	23,182,110
SUB:20	Site Restoration	3,953,090	3,728,450
SUB:21	Demobilization	18,740	16,470
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	923,060	1,962,000
WHC:08	Solids Collection & Containment	97,430	204,700
Subcontractor Materials Procurement Rate		396,570	442,740
Project Management/Construction Management		6,161,170	7,032,580
General & Administration/Common Support Pool		12,045,090	13,748,700
Contingency		21,562,330	25,623,370
Total		81,457,710	94,875,700
Capital		81,457,710	82,273,340
Annual Operations & Maintenance		0	6,001,124
Present Worth		76,818,633	87,688,233

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-4 Cost Summary for 116-DR-9 Retention Basin

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	896,730	2,791,230
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	98,320	86,895
SUB:02	Monitoring, Sampling & Analysis	655,060	1,687,645
SUB:08	Solids Collection & Containment	1,488,360	2,701,331
SUB:13	Physical Treatment	-	24,631,614
SUB:14	Thermal Treatment	-	-
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	42,082,870	23,978,104
SUB:20	Site Restoration	5,429,140	4,582,906
SUB:21	Demobilization	19,930	17,686
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	1,138,810	3,252,496
WHC:08	Solids Collection & Containment	117,830	367,196
Subcontractor Materials Procurement Rate		497,740	576,862
Project Management/Construction Management		7,729,210	9,282,410
General & Administration/Common Support Pool		15,110,600	18,147,112
Contingency		27,095,250	34,078,290
Total		102,359,830	126,181,775
Capital		102,359,830	101,704,269
Annual Operations & Maintenance		0	7,649,221
Present Worth		95,988,999	113,522,862

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-5 Cost Summary for 116-DR-1/116-DR-2 Process Effluent

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	239,970	-	454,680
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	60,360	58,540	66,990
SUB:02	Monitoring, Sampling & Analysis	182,380	78,290	252,650
SUB:08	Solids Collection & Containment	390,200	204,620	444,290
SUB:13	Physical Treatment	-	-	3,646,000
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	23,132,550	-
SUB:18	Disposal (Other than Commercial)	4,691,150	-	2,166,970
SUB:20	Site Restoration	892,390	508,880	676,730
SUB:21	Demobilization	14,910	15,040	15,100
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	325,010	1,843,970	510,700
WHC:08	Solids Collection & Containment	33,410	302,730	50,650
Subcontractor Materials Procurment Rate		454,890	1,751,850	530,620
Project Management/Construction Management		1,056,710	4,184,470	1,254,110
General & Administration/Common Support Pool		2,065,860	8,180,640	2,451,780
Contingency		3,538,470	13,688,940	4,632,870
Total		13,945,720	53,950,510	17,154,130
Capital		13,945,720	30,952,940	13,669,340
Annual Operations & Maintenance		0	7,418,571	3,484,790
Present Worth		13,284,777	48,791,225	16,347,588
SS-3/SW-3: Containment SS-10/SW-9: Removal/Treatment/Disposal		SS-4/SW-4: Removal/Disposal SS-8A/SS-8B/SW-7: In Situ Treatment		

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Table B-6 Cost Summary for 107-D/DR Sludge Trench #1

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	54,730	-	84,200
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	53,010	50,910	58,770
SUB:02	Monitoring, Sampling & Analysis	20,430	8,990	27,260
SUB:08	Solids Collection & Containment	45,340	26,980	50,180
SUB:13	Physical Treatment	-	-	428,840
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	6,200	-
SUB:18	Disposal (Other than Commercial)	463,360	-	262,490
SUB:20	Site Restoration	127,430	-	109,500
SUB:21	Demobilization	13,910	13,970	13,890
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	56,460	200,060	98,800
WHC:08	Solids Collection & Containment	3,870	30,810	8,440
Subcontractor Materials Procurement Rate		52,810	186,990	69,420
Project Management/Construction Management		125,490	446,900	169,140
General & Administration/Common Support Pool		245,340	873,700	330,660
Contingency		429,140	1,461,980	633,290
Total		1,691,310	5,761,940	2,344,870
Capital		1,691,310	3,526,040	2,076,040
Annual Operations & Maintenance		0	2,235,900	268,830
Present Worth		1,613,327	5,494,069	2,242,807

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-7 Cost Summary for 107-D/DR Sludge Trench #2

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	54,730	-	84,200
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	52,930	50,880	58,720
SUB:02	Monitoring, Sampling & Analysis	22,070	10,370	29,110
SUB:08	Solids Collection & Containment	49,220	30,350	54,230
SUB:13	Physical Treatment	-	-	436,620
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	2,425,230	-
SUB:18	Disposal (Other than Commercial)	476,830	-	270,280
SUB:20	Site Restoration	132,560	93,660	114,200
SUB:21	Demobilization	13,890	13,960	13,870
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	58,900	205,630	101,880
WHC:08	Solids Collection & Containment	4,220	31,650	8,790
Subcontractor Materials Procurement Rate		54,570	191,580	71,320
Project Management/Construction Management		129,780	458,000	173,850
General & Administration/Common Support Pool		253,710	895,380	339,880
Contingency		443,160	1,498,270	650,070
Total		1,746,550	5,904,950	2,407,030
Capital		1,746,550	3,614,830	2,130,290
Annual Operations & Maintenance		0	2,290,120	276,740
Present Worth		1,665,934	5,630,268	2,302,000

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-8 Cost Summary for 107-D/DR Sludge Trench #3

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	54,730	-	84,200
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	52,970	50,840	58,720
SUB:02	Monitoring, Sampling & Analysis	21,420	9,810	28,360
SUB:08	Solids Collection & Containment	47,670	28,980	52,600
SUB:13	Physical Treatment	-	-	433,300
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	2,402,630	-
SUB:18	Disposal (Other than Commercial)	471,410	-	267,040
SUB:20	Site Restoration	130,520	91,920	112,280
SUB:21	Demobilization	13,900	13,950	13,880
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	56,460	203,770	101,290
WHC:08	Solids Collection & Containment	3,870	31,370	8,790
Subcontractor Materials Procurement Rate		53,870	189,660	70,530
Project Management/Construction Management		127,810	453,440	172,020
General & Administration/Common Support Pool		249,870	886,470	336,300
Contingency		436,730	1,483,370	643,550
Total		1,721,210	5,846,220	2,382,880
Capital		1,721,210	3,578,700	2,109,470
Annual Operations & Maintenance		0	2,267,520	273,410
Present Worth		1,641,802	5,574,331	2,279,000

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-9 Cost Summary for 107-D/DR Sludge Trench #4

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	46,310	-	71,570
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	52,020	49,910	57,840
SUB:02	Monitoring, Sampling & Analysis	15,440	7,170	20,250
SUB:08	Solids Collection & Containment	34,990	22,170	38,440
SUB:13	Physical Treatment	-	-	348,180
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	1,699,930	-
SUB:18	Disposal (Other than Commercial)	323,760	-	183,620
SUB:20	Site Restoration	99,060	72,610	86,610
SUB:21	Demobilization	13,760	13,820	13,760
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	45,950	144,670	83,880
WHC:08	Solids Collection & Containment	2,810	21,660	7,030
Subcontractor Maintenance Procurement Rate		39,350	136,190	54,660
Project Management/Construction Management		94,070	325,220	134,140
General & Administration/Common Support Pool		183,920	635,810	262,250
Contingency		323,500	1,063,920	504,020
Total		1,274,960	4,193,090	1,866,250
Capital		1,274,960	2,628,510	1,678,190
Annual Operations &Maintenance		0	1,564,580	188,060
Present Worth		1,216,748	3,999,853	1,786,929

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-10 Cost Summary for 107-D/DR Sludge Trench #5

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	50,520	-	75,780
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	52,150	50,000	57,990
SUB:02	Monitoring, Sampling & Analysis	12,520	3,490	17,900
SUB:08	Solids Collection & Containment	27,500	13,360	31,340
SUB:13	Physical Treatment	-	-	367,550
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	1,912,170	-
SUB:18	Disposal (Other than Commercial)	356,970	-	202,430
SUB:20	Site Restoration	95,690	66,420	82,010
SUB:21	Demobilization	13,780	13,830	13,780
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	41,880	160,330	83,520
WHC:08	Solids Collection & Containment	2,110	24,480	7,030
Subcontractor Maintenance Procurement Rates		40,780	150,330	56,430
Project Management/Construction Management		96,510	359,160	138,000
General & Administration/Common Support Pool		188,670	702,160	269,790
Contingency		332,880	1,174,950	519,310
Total		1,311,940	4,630,670	1,922,860
Capital		1,311,940	2,853,640	1,715,420
Annual Operations & Maintenance		0	1,777,030	207,440
Present Worth		1,251,974	4,416,602	1,840,851

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-11 Cost Summary for 116-D-1A Fuel Storage Basin Trench

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	134,720	202,080
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	48,220	54,020
SUB:02	Monitoring, Sampling & Analysis	90,500	109,850
SUB:08	Solids Collection & Containment	197,440	210,690
SUB:13	Physical Treatment	-	1,110,490
SUB:14	Thermal Treatment	-	-
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	1,296,360	591,070
SUB:20	Site Restoration	327,910	265,790
SUB:21	Demobilization	13,220	13,210
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	195,830	261,770
WHC:08	Solids Collection & Containment	16,880	21,450
Subcontractor Maintenance Procurement Rates		144,080	171,920
Project Management/Construction Management		349,570	421,540
General & Administration/Common Support Pool		683,410	824,110
Contingency		1,189,370	1,575,460
Total		4,687,520	5,833,480
Capital		4,687,520	4,883,100
Annual Operations & Maintenance		0	950,380
Present Worth		4,466,689	5,565,137

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-12 Cost Summary for 116-D-1B Fuel Storage Basin Trench

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	67,360	101,040
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	52,940	58,820
SUB:02	Monitoring, Sampling & Analysis	22,680	31,090
SUB:08	Solids Collection & Containment	47,840	53,780
SUB:13	Physical Treatment	-	569,520
SUB:14	Thermal Treatment	-	-
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	557,520	254,750
SUB:20	Site Restoration	136,920	110,390
SUB:21	Demobilization	13,890	13,900
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	66,060	113,390
WHC:08	Solids Collection & Containment	3,870	9,140
Subcontractor Materials Procurement Rate		60,720	79,730
Project Management/Construction Management		144,370	194,180
General & Administration/Common Support Pool		282,230	379,620
Contingency		495,170	728,660
Total		1,951,570	2,698,020
Capital		1,951,570	2,288,570
Annual Operations & Maintenance		0	409,450
Present Worth		1,861,172	2,579,151

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-13 Cost Summary for 116-D-2A Pluto Crib

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	16,840	-	29,470
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	53,120	45,040	53,600
SUB:02	Monitoring, Sampling & Analysis	1,540	960	1,670
SUB:08	Solids Collection & Containment	6,590	6,040	7,560
SUB:13	Physical Treatment	-	-	171,110
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	225,280	-
SUB:18	Disposal (Other than Commercial)	16,960	-	10,090
SUB:20	Site Restoration	19,870	18,640	19,480
SUB:21	Demobilization	13,110	13,120	13,210
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	10,030	22,110	41,410
WHC:08	Solids Collection & Containment	280	1,550	3,870
Subcontractor Materials Procurement Rate		8,120	22,560	20,200
Project Management/Construction Management		19,440	53,300	51,330
General & Administration/Common Support Pool		38,010	104,190	100,350
Contingency		73,410	174,350	193,640
Total		277,310	687,150	716,990
Capital		277,310	597,530	707,750
Annual Operations & Maintenance		0	89,620	9,240
Present Worth		266,639	660,573	692,246

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-14 Cost Summary for 100 DR Pipelines

Cost Element		SS-3	SS-4	SS-8B
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	-	218,920	-
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	27,900	48,030	17,580
SUB:02	Monitoring, Sampling & Analysis	-	353,030	-
SUB:08	Solids Collection & Containment	13,414,400	1,190,940	1,786,770
SUB:13	Physical Treatment	-	-	-
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	-	-
SUB:18	Disposal (Other than Commercial)	-	169,140	-
SUB:20	Site Restoration	1,539,900	1,652,420	-
SUB:21	Demobilization	8,680	11,160	8,630
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	583,020	621,440	68,580
WHC:08	Solids Collection & Containment	14,250	87,930	5,450
Subcontractor Maintenance Procurement Rates		1,094,330	250,000	18,130
Project Management/Construction Management		2,502,370	657,610	285,770
General & Administration/Common Support Pool		4,892,140	1,285,640	558,680
Contingency		8,186,180	2,487,580	934,860
Total		32,263,170	9,033,850	3,684,470
Capital		32,263,170	9,033,850	3,684,470
Annual Operations & Maintenance		670,720	0	0
Present Worth		38,143,751	8,606,125	3,509,926

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-15 Cost Summary for 118-D-4A Burial Ground

Cost Element		SW-3	SW-4	SW-7	SW-9
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	12,630	-	12,630
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	50190	53490	75820	60410
SUB:02	Monitoring, Sampling & Analysis	-	30430	-	30420
SUB:08	Solids Collection & Containment	447140	75620	500890	75610
SUB:13	Physical Treatment	-	-	-	87220
SUB:14	Thermal Treatment	-	-	-	278830
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	767640	-	446340
SUB:20	Site Restoration	49460	173970	49490	172910
SUB:21	Demobilization	14,030	14,010	14,040	14,010
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	28220	52580	50490	66960
WHC:08	Solids Collection & Containment	740	6330	3170	11400
Subcontractor Materials Procurement Rate		40940	81410	46740	85100
Project Management/Construction Management		94610	188320	111090	199380
General & Administration/Common Support Pool		184960	368170	217190	389790
Contingency		309490	675100	363430	714480
Total		1219770	2499700	1432340	2645500
Capital		1219770	2499700	1432340	2508630
Annual Operations & Maintenance		22357	0	25044	136870
Present Worth		1,451,296	2,383,260	1,689,485	2,532,877

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-16 Cost Summary for 118-D-4B Burial Ground

Cost Element		SW-3	SW-4	SW-7	SW-9
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	12,630	-	12,630
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	46,280	48,790	59,100	55,690
SUB:02	Monitoring, Sampling & Analysis	-	3,980	-	3,980
SUB:08	Solids Collection & Containment	231,780	12,990	256,110	12,980
SUB:13	Physical Treatment	-	-	-	43,790
SUB:14	Thermal Treatment	-	-	-	208,920
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	63,470	-	36,990
SUB:20	Site Restoration	27,840	37,150	27,860	37,040
SUB:21	Demobilization	13,470	13,360	13,480	13,350
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	19,390	16,600	37,960	21,420
WHC:08	Solids Collection & Containment	490	1,060	2,530	1,900
Subcontractor Materials Procurement Rate		23,310	13,120	26,030	30,130
Project Management/Construction Management		54,380	31,580	63,460	69,930
General & Administration/Common Support Pool		106,320	61,730	124,060	136,710
Contingency		177,910	117,090	207,600	253,620
Total		701,190	433,530	818,180	939,070
Capital		701,190	433,530	818,180	915,930
Annual Operations & Maintenance		12,618	0	14,001	23,140
Present Worth		832,107	415,216	961,905	907,466

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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Table B-17 Cost Summary for 118-D-18 Burial Ground

Cost Element		SW-3	SW-4	SW-7	SW-9
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	12,630	-	12,630
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	46,710	48,630	59,570	55,560
SUB:02	Monitoring, Sampling & Analysis	-	6,090	-	6,090
SUB:08	Solids Collection & Containment	252,360	17,970	280,020	17,970
SUB:13	Physical Treatment	-	-	-	46,700
SUB:14	Thermal Treatment	-	-	-	213,630
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	110,720		64,390
SUB:20	Site Restoration	29,900	45,760	29,940	45,610
SUB:21	Demobilization	13,530	13,330	13,550	13,330
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	19,970	19,040	40,390	24,490
WHC:08	Solids Collection & Containment	490	1,410	2,740	2,530
Subcontractor Materials Procurement Rate		25,000	17,700	27,960	33,820
Project Management/Construction Management		58,200	42,100	68,130	78,620
General & Administration/Common Support Pool		113,770	82,300	133,190	153,700
Contingency		190,380	154,530	222,870	284,560
Total		750,320	572,190	878,370	1,053,630
Capital		750,320	572,190	878,370	1,022,860
Annual Operations & Maintenance		11,589	0	12,806	30,770
Present Worth		865,700	547,269	1,003,895	1,016,567

SS-3/SW-3: Containment
SS-4/SW-4: Removal/Disposal
SS-8A/SS-8B/SW-7: In Situ Treatment
SS-10/SW-9: Removal/Treatment/Disposal

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