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100-BC-1 OPERABLE UNIT FOCUSED FEASIBILITY STUDY

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EXECUTIVE SUMMARY

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

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

The objective of this focused feasibility study is to provide decision makers with sufficient information to allow appropriate and timely selection of interim remedial measures for candidate waste sites associated with the 100-BC-1 Operable Unit. The interim remedial measure candidate waste sites are determined in the Limited Field Investigation (DOE-RL 1993b). Site profiles are developed for each of these waste sties. 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 focused feasibility study results for the 100-BC-1 interim remedial measures candidate waste sites is as follows:

- Waste sites require no additional alternative development.

- Sites that directly plug into the waste site group alternative include 116-B-11, 116-B-1, 116-C-1, 116-B-13, 116-B-14, 116-B-4, 116-B-12, 118-B-5, 118-B-7, 118-B-10, 132-B-4, 132-B-5, and the pipelines. The site-specific detailed analysis was conducted, referencing the waste site group analysis as appropriate. A waste site detailed analysis summary is presented in Table ES-1.

- Waste site 116-B-5 is considered a special crib due to its unique waste stream, therefore, must be addressed individually as no group profile was developed. However, it is apparent that the 116-B-5 alternatives are consistent with the dummy decontamination crib/french drain group.

- Retention basin 116-C-5 contains organic contamination and therefore will deviate from the waste group by the addition of a thermal desorption treatment unit.

- Outfall structures 116-B-7, 132-B-6, and 132-C-2 have recently been designated as an expedited response action and will be addressed concurrently with the river pipelines.

- Decontamination and decommissioning facilities 132-B-4 and 132-B-5, were remediated prior to the development of the remedial investigation/feasibility study, therefore these sites were considered no interim action sites.

- 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. 100-BC-1 Operable Unit Remedial Alternatives

Technologies	116-B-11 116-C-5 Retention Basins		100-B/C Pipelines				116-B-1 116-C-1 Process Effluent Trenches			116-B-13 116-B-14 Sludge Trenches			116-B-4 116-B-5 Cribs				118-B-5 118-B-7 118-B-10 Burial Grounds			
	SS 4	SS 10	SS 3	SS 4	SS 8B	SS 10	SS 4	SS 8A	SS 10	SS 4	SS 8A	SS 10	SS 3	SS 4	SS 8A	SS 10	SW 3	SW 4	SW 7	SW 8
No Interim Action																				
Access Restrictions			•		•			•			•		•		•		•		•	
Removal	•	•		•		•	•		•	•		•		•		•		•		•
Soil Washing												•								•
Thermal Desorption		•				•			•			•				•			•	
Compaction		•				•			•	•		•				•				•
Disposal	•	•		•		•	•		•					•		•		•		•
RCRA Barrier			•								•		•				•		•	
Groundwater Monitoring			•		•			•			•		•		•		•		•	
Surface Water Controls			•		•			•					•		•		•		•	
Grouting					•						•									
In Situ Vitrification								•							•					

Table ES-2. Comparative Analysis Summary.

Evaluation Criteria	Waste Site Groups	Retention Basin 116-B-11		Retention Basin 116-C-5		Pipelines 100 B/C				Process Effluent Trenches 116-B-1			Process Effluent Trenches 116-C-1			Sludge Trenches 116-B-13			Sludge Trenches 116-B-14			Dummy Decontamination Crib/French Drain 116-B-4				Crib 116-B-5			
	Alternatives[b]	SS-4	SS-10	SS-4	SS-10	SS-3	SS-4	SS-8B	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-3	SS-4	SS-8A	SS-10	SS-3	SS-4	SS-8A	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 $)		48.1	55.5	56.2	75.2	54.6	32.9	8.9	40.0	2.99	10.40	3.83	15.70	54.80	17.90	0.826	2.580	1.350	0.720	1.910	1.200	0.454	0.283	0.715	0.707	0.823	1.080	3.280	1.600

Evaluation Criteria	Waste Site Groups	Burial Grounds 118-B-5				Burial Grounds 118-B-7				Burial Grounds 118-B-10			
	Alternatives[b]	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 $)		1.350	1.790	1.570	2.010	0.594	0.222	0.682	0.738	1.030	0.958	1.200	1.370

Key:

- Best
- Better
- Good
- Fair
- Poor

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ARAR - applicable or relevant and appropriate requirement

[a]Comparative Analysis Summary is based on Tables 6-1 through 6-7 in the *100-BC-1 Focused Feasibility Study Report*. Comparisons are made between relevant alternatives for each individual waste site group only.

[b]Alternatives are summarized as follows:

- 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

ACRONYMS

ARAR	applicable, or relevant and appropriate requirements
ARCL	allowable residual contamination level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
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
PRG	preliminary remediation goals
QRA	qualitative risk assessment
RI	remedial investigation

CONTENTS

1.0 INTRODUCTION 1-1
1.1 FOCUSED FEASIBILITY STUDY APPROACH 1-1
1.2 PURPOSE AND SCOPE 1-4

2.0 WASTE SITE INFORMATION 2-1
2.1 OPERABLE UNIT BACKGROUND 2-1
2.2 100 AREA AGGREGATE STUDIES 2-1
2.3 LIMITED FIELD INVESTIGATION 2-3
2.4 DEVELOPMENT OF WASTE SITE PROFILES 2-5
2.4.1 Site Descriptions 2-5
2.4.2 Refined COPC 2-6
2.4.3 Waste Site Profiles 2-8

3.0 APPLICATION OF THE PLUG-IN APPROACH 3-1
3.1 GROUP IDENTIFICATION 3-1
3.2 EVALUATION OF ALTERNATIVE CRITERIA 3-1
3.3 EXAMPLE APPLICATION OF THE PLUG-IN APPROACH (116-B-1) . . . 3-2
3.3.1 Identification of Appropriate Group 3-2
3.3.2 Evaluation of the Alternative Criteria 3-3

4.0 ALTERNATIVE DEVELOPMENT 4-1

5.0 DETAILED ANALYSIS OF ALTERNATIVES 5-1
5.1 EVALUATION CRITERIA DESCRIPTION 5-1
5.2 SITE-SPECIFIC DETAILED ANALYSIS 5-3
5.2.1 116-C-5 Retention Basin 5-3

6.0 COMPARATIVE ANALYSIS 6-1

7.0 REFERENCES 7-1

APPENDICES:

A 100-BC-1 OPERABLE UNIT WASTE SITE VOLUME ESTIMATES A-1
B 100-BC-1 OPERABLE UNIT WASTE SITE COST ESTIMATES B-1

FIGURES:

1-1 Hanford Past-Practice Strategy 1F-1
1-2 100 Area Source Operable Unit FFS Process 1F-2
1-3 Analogous Waste Sites 1F-3
2-1 Hanford Site Map 2F-1
2-2 100-BC Operable Unit Map 2F-2

TABLES:

2-1. IRM Recommendations from the 100-BC-1 LFI 2T-1
2-2. 100-BC-1 Site Description 2T-2a
2-3. Potential Preliminary Remediation Goals 2T-3
2-4. Reduced Infiltration Concentrations 2T-4
2-5. 116-B-11 Retention Basin Refined Contaminants of Potential Concern 2T-5
2-6. 116-C-5 Retention Basin Refined Contaminants of Potential Concern 2T-6
2-7. 116-B-1 Process Effluent Trench Refined Contaminants of Potential Concern . . . 2T-7
2-8. 116-C-1 Process Effluent Trench Refined Contaminants of Potential Concern . . . 2T-8
2-9. 116-B-5 Crib Refined Contaminants of Potential Concern 2T-9
2-10. 116-B-4 French Drain Refined Contaminants of Potential Concern 2T-10
2-11. 100 B/C Pipeline Sludge Refined Contaminants of Potential Concern 2T-11
2-12. 100 B/C Pipeline Soil Refined Contaminants of Potential Concern 2T-12
2-13. 100-BC-1 Waste Site Profile 2T-13
3-1. Comparison of Waste Sites and Alternatives 3T-1
5-1. 100-BC-1 Site-Specific Alternative Costs 5T-1
5-2. 100-BC-1 Site-Specific Alternative Durations 5T-2
6-1. Comparative Analysis - 116-B-11 Retention Basin 6T-1
6-2. Comparative Analysis - 116-C-5 Retention Basin 6T-2
6-3. Comparative Analysis - 100 B/C Pipelines 6T-3
6-4. Comparative Analysis - 116-B-1 and 116-C-1 Process Effluent Trenches 6T-4
6-5. Comparative Analysis - 116-B-13 and 116-B-14 Sludge Trenches 6T-5
6-6. Comparative Analysis - 116-B-4 Dummy Decontamination Crib/French Drain and 116-B-5 Crib 6T-6
6-7. Comparative Analysis - 118-B-5, 118-B-7, and 118-B-10 Burial Grounds 6T-7

1.0 INTRODUCTION

This *100-BC-1 Operable Unit Focused Feasibility Study* (FFS) is prepared in support of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial investigation/feasibility study (RI/FS) activities for the 100-BC-1 Operable Unit. The *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE-RL 1994a), (Process Document), is a required reference document to this operable unit-specific FFS, which together provide a complete detailed analysis of remedial alternatives.

The CERCLA approach for the RI/FS 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 on operable units 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 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 activities which must be integrated to bring an operable unit from field investigation through the record of decision. This chart provides a graphical description of the entire process of characterization activities, risk assessments, treatability studies, and FS for the high and low priority waste sites within an operable unit and for the operable unit as a whole. The pathway taken to this FFS is highlighted on Figure 1-1.

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 in 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 <u>*waste site groups*</u>, then the detailed analysis phase was implemented for the remedial alternatives (previously developed in the *100 Area Feasibility Study Phases 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 (DOE-RL 1994a). The

results of the group-specific FFS (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 Waste Site Groups and Associated Group Profiles

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

- retention basins
- outfall structures
- 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 that 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 waste 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 to ascertain the applicability of the subject alternative. For example, the no interim action alternative may be applicable to a waste 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 for each waste site within an operable unit. Development of individual waste site profiles are documented in Section 2.0.

5) Identify Representative Group

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

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 5.0.

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.

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-BC-1 Operable Unit sites, in accordance with Steps 4 through 6, is documented in this report.

1.2 PURPOSE AND SCOPE

In accordance with Steps 4, 5, and 6, this report presents:

- The 100-BC-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 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 analysis of alternatives for sites that deviate from the representative group alternatives (Section 5.0)
- A comparative analysis of alternatives for all individual waste sites (Section 6.0).

Note that the scope of this document is limited to 100-BC-1 Operable Unit IRM candidate waste sites as determined in the LFI report (DOE-RL 1993b). Impacted groundwater beneath the 100 Area is being addressed in a separate FFS report for the 100-BC-5 Operable Unit. In addition, waste sites that are not considered candidates for IRM, accordingly, they are being addressed under the RI/FS 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 Feasibility Study Phases 1 and 2* (DOE-RL 1993a).

Although the outfall structures were originally on the IRM pathway, they 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-B-7, 132-B-6, 132-C-2 outfall structures are therefore removed from the IRM pathway and are not addressed further in this FFS.

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 candidate waste sites associated with the 100-BC-1 Operable Unit.

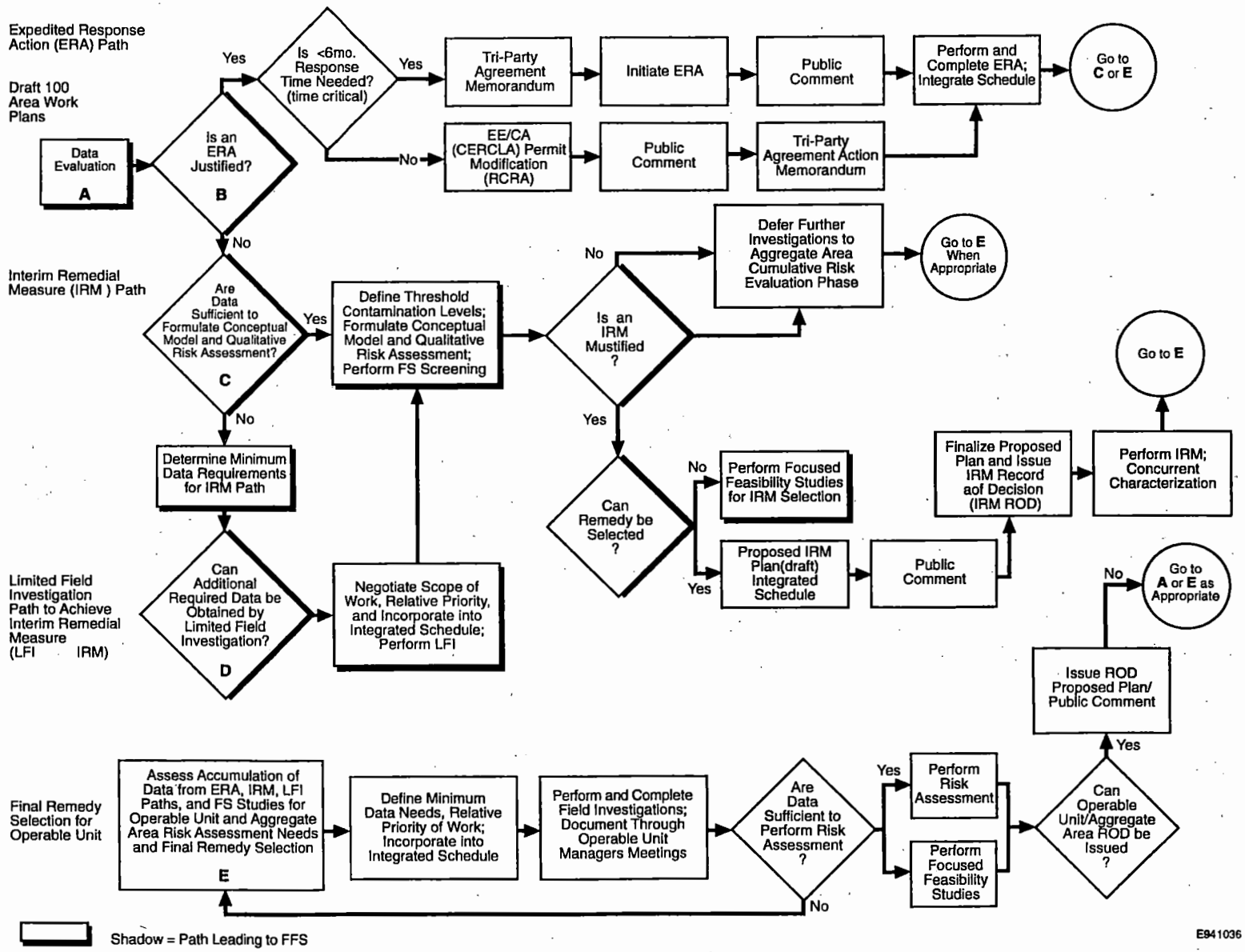

Figure 1-1 Hanford Past-Practice Strategy

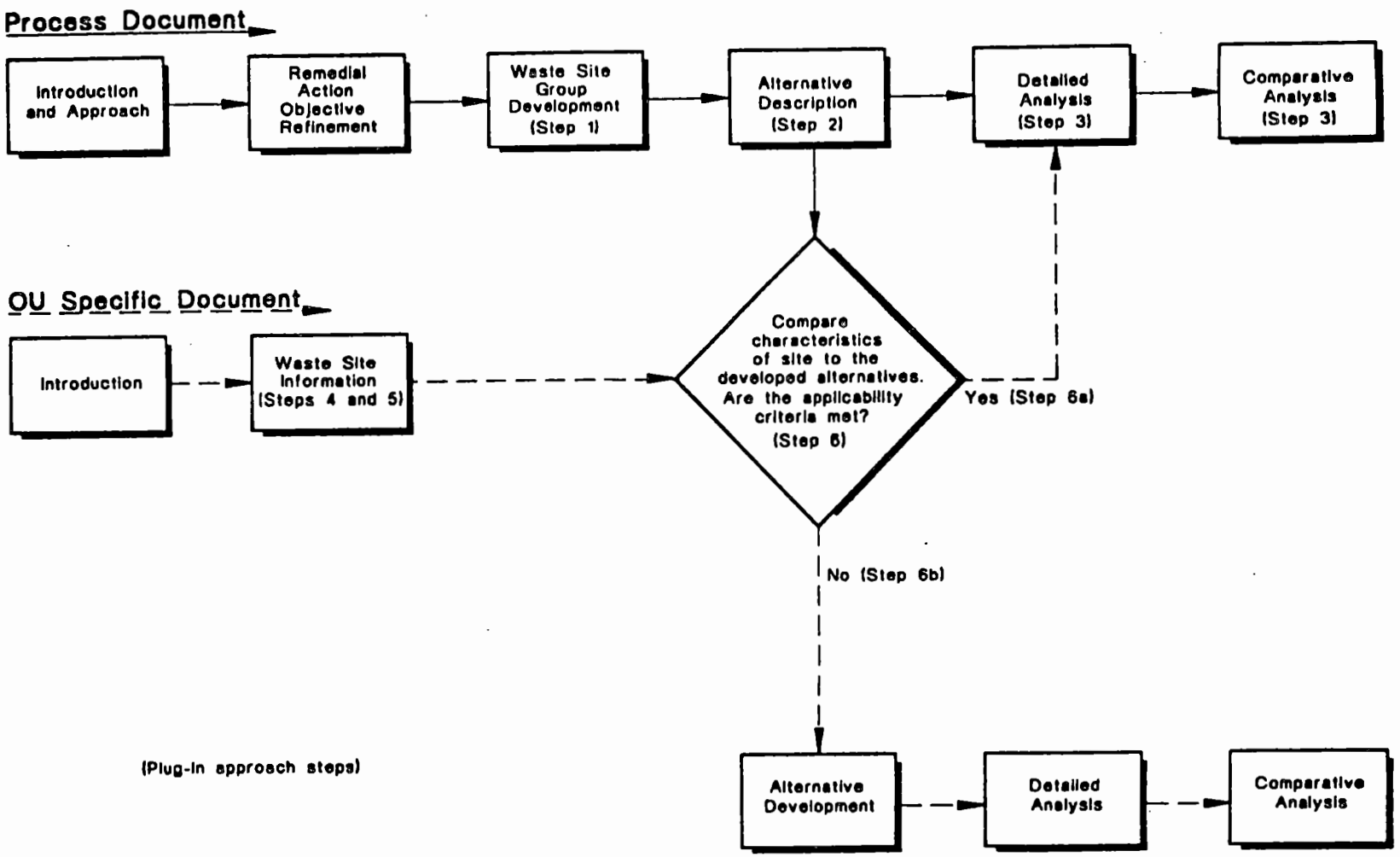

Figure 1-2 100 Area Source Operable Unit FFS Process

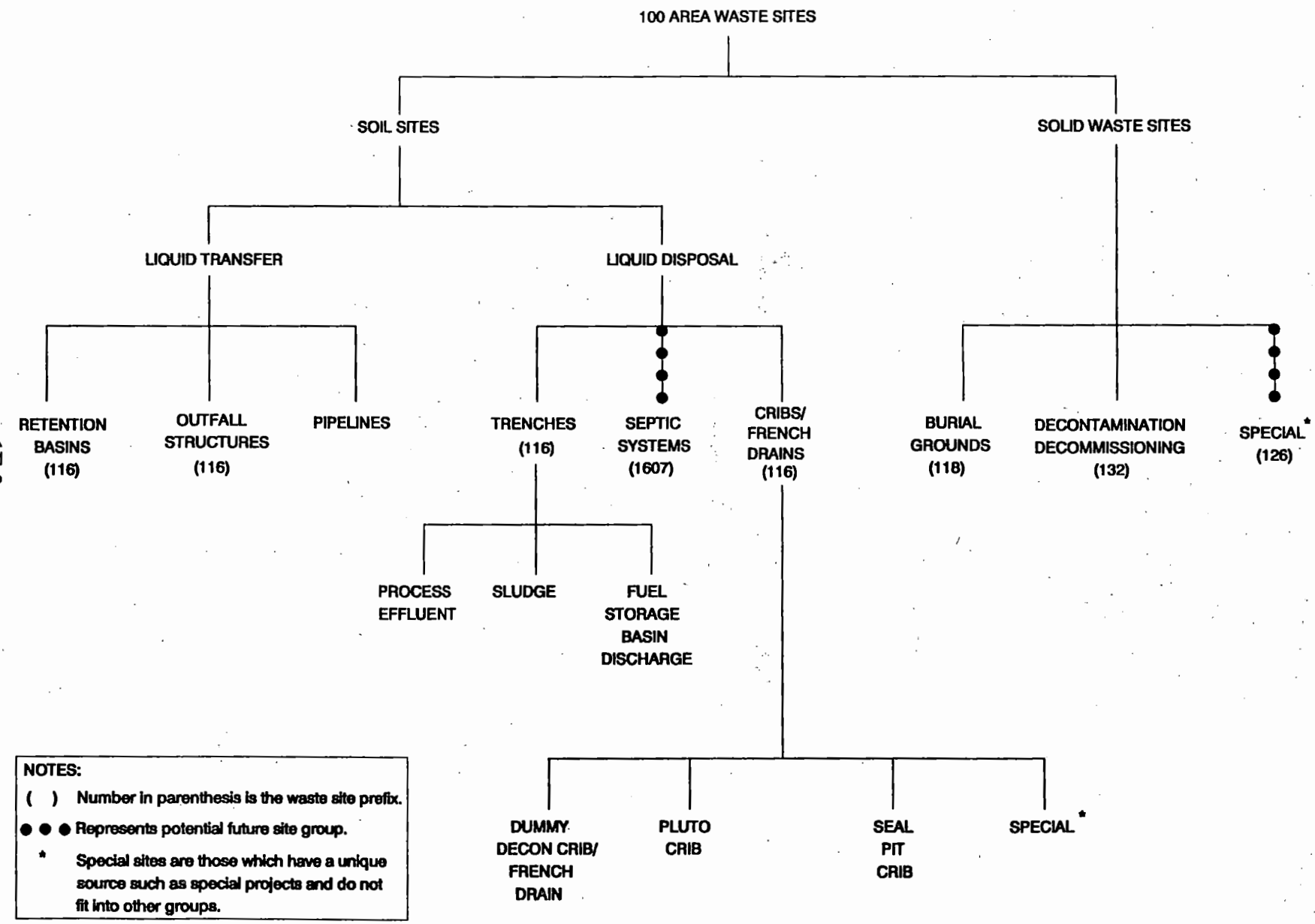

Figure 1-3 Analogous Waste Sites

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2.0 WASTE SITE INFORMATION

2.1 OPERABLE UNIT BACKGROUND

The 100-BC-1 Operable Unit is located in the north-central part of the Hanford Site along the southern shoreline of the Columbia River. The operable unit is about 45 km (28 mi) northwest of the city of Richland and encompasses about 1.8 km^2 (0.7 mi^2). It lies predominantly within Section 11.0, the southern portion of Section 2.0, and the western portion of Section 12.0 of Township 13N, Range 25E. It is bound by North American Datum 1983 metric Washington State plane north/south coordinates N144300 and N145650 and east/west coordinates E564500 and E566680 (Figure 2-1).

The 100-BC-1 Operable Unit is one of three operable units associated with the 100 B/C Area at the Hanford Site. Two of the 100 B/C Area operable units are source operable units and one is a groundwater operable unit. The 100-BC-1 Operable Unit generally includes liquid and sludge disposal waste sites generally associated with operation of the B Reactor (Figure 2-2). The 100-BC-2 Operable Unit includes the C Reactor and its associated facilities, the burial grounds south of the C Reactor, and the solid waste facilities northeast of B Reactor. The 100-BC-5 Operable Unit includes the groundwater below the source operable unit plus the adjacent groundwater, surface water, sediments, and aquatic biota impacted by the 100 B/C 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, but also the 100-BC-1 Operable Unit specifically. A LFI and QRA were performed for the 100-BC-1 Operable Unit (DOE-RL 1993e and WHC 1993, respectively). In addition, aggregate area management 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 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 100 Area topics such as river impact, shoreline, ecological, and cultural resources. Each operable unit work plan provides detailed information on 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 applicable to the Process Document.

- **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.

- **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; mapping activities of vegetation on the site and efforts to survey 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 Management Plan* (Fitzner and Weiss, 1992)
  - *Biological Assessment of Threatened and Endangered Species* (Fitzner et al. 1992)
  - *Biological Assessment for State Candidate and Monitor Species* (Stegan 1992).

Cultural Resources. The Hanford Cultural Resources Laboratory conducted an archaeological survey during fiscal year 1991 for 100 Area Reactor compounds (Chatters et al. 1992). A summary of Hanford Site cultural resources can be found in Cushing (1994). The following is an excerpt from Cushing (1994) on the 100 B and 100 C Areas.

"The 100-B Reactor is listed as a National Historic Civil Engineering Landmark and is listed on the National Register of Historic Places. Additional buildings from the Manhattan Project and early Cold War era stand in this area. Historic and prehistoric archaeological resources exist in the vicinity of 100-B and 100-C Areas, at least on the basis of the level of reconnaissance that has been done there. Only three sites can be identified from area literature (Rice 1968a, 1980). All lie partially within the 100-B and 100-C Areas. A fourth archaeological site and the remains of the early 20th-century town of Haven lie on the opposite bank of the Columbia River. The archaeological site appears to contain artifact deposits about 3500-2500 years old but has not been tested. One archaeological site near 100B/C (45BN446) was evaluated in 1994 and the state historic preservation officer has determined that it is eligible for listing on the National Register. The other two sites have not been tested to determine National Register eligibility. Numerous sites related to hunting and religious activities are located at the west end of Gable Butte, due south of the 100-B and 100-C Areas. These sites are part of the proposed Gable Mountain/Gable Butte Traditional Cultural Property nomination. Test excavations conducted in 1991 at one hunting site in Gable Butte revealed large quantities of deer and mountain sheep bone and projectile points dating from 500 to 1500 years old."

2.3 LIMITED FIELD INVESTIGATION

The 100-BC-1 LFI (DOE-RL 1993c) is an integral part of the RI/FS 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 *Remedial Investigation/Feasibility Study Work Plan for the 100-BC-1 Operable Unit* (DOE-RL 1992b), and the *Hanford Past-Practice Strategy* (DOE-RL 1991). The HPPS emphasized initiating and completing waste site cleanup through interim actions.

The LFI was conducted to assess the applicability of IRM for reducing human health and environmental risks within the 100-BC-1 Operable Unit. The primary purpose of the LFI is to collect sufficient data in order to recommend those waste sites that should remain candidates on the IRM pathway and those waste 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 are also used to evaluate remedial alternatives in this FFS.

A QRA is performed as part of the LFI, and determines the principal risk drivers in the operable unit. The purpose of the 100-BC-1 QRA (WHC 1993) is to provide a qualitative evaluation of human health and environmental exposure scenarios to provide sufficient information that will 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 substitute a baseline risk assessment.

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-BC-1 Operable Unit. Ecological scenarios were evaluated using biological receptors which live in or near the Columbia River.

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 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.

A frequent-use scenario is evaluated in the year 2018 to ascertain potential future risks associated with each waste site after additional radionuclide decay. For the current occasional-use scenario, the effect of radiation shielding by the upper 2 m (6 ft) of soil on the external exposure risk at each waste site is evaluated.

The results of this assessment 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 RI/FS process. The LFI for the 100-BC-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 site (DOE-RL 1993a).

To determine IRM candidacy, the 100-BC-1 high-priority waste sites were evaluated using the following criteria:

- A site poses medium or high risk to human health under the occasional-use scenario, or has an environmental hazard quotient >1
- 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 and sites that have been decontaminated and decommissioned are IRM candidate sites regardless of the above criteria. The results of the IRM candidacy evaluation are presented in Table 2-1. Outfall structures 116-B-7, 132-B-6, and 132-C-2 have recently been designated as an expedited response action and will be addressed concurrently with the river pipelines.

The conclusions drawn during the LFI assessment were used solely to determine IRM candidacy for high-priority sites within the 100-BC-1 Operable Unit. 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 must be developed for each IRM candidate waste 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-BC-1 Operable Unit IRM candidate waste sites. Where site-specific data is unavailable, the analogous facility approach is implemented.

The analogous facility approach allows conditions from a waste site, or sites, with data to be assumed for waste sites without data as long as the sites are analogous (i.e., within the same waste site 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 have 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 waste site is an important characteristic in determining 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 waste site by identifying size and structure. These characteristics are valuable to evaluating extent of contamination, as well as identifying media/material.

Descriptions of each IRM candidate waste site are presented in Table 2-2. Potential preliminary remediation goals are provided in Table 2-3 and reduced infiltration concentrations are presented in Table 2-4. Tables 2-3 and 2-4 were originally developed in the Process Document.

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 waste site. These refined COPC are the result of screening the COPC from the 100-BC-1 QRA (WHC 1993c) against the PRG defined in Appendix A of the Process Document (presented in Table 2-3). Tables 2-5 through 2-12 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 exposure scenario considering risk to human and ecological receptors, compliance with ARAR, protection of groundwater, local background concentrations (refer to Process Document), and levels of detection (Table 2-3). 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 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 of soil, plants are receptors in the first 3 m of soil, and protection of groundwater must be considered throughout the soil column.

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

- *Limited Field Investigation for the 100-BC-1 Operable Unit* (DOE-RL 1993b)
- *Radiological Characterization of the Retired 100 Areas* (Dorian and Richards, 1976)

These data sources were also used to perform the QRA, and constitute the basic data set for the 100 Area source operable units. The study by Dorian and Richards (1976) was fairly comprehensive with respect to the number of sites investigated; however, only

radiological data was taken, and sampling and analysis protocol was not equivalent to the current standards. The LFI data explored 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 criteria were used 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 to 3 ft [.91 m], 3 to 6 ft [.91 to 1.82 m], 6 to 10 ft [1.82 to 3.04 m], and below 10 ft [3.04 m] in 5-ft [1.52-m] intervals).

- Maximum concentrations from the LFI and Dorian and Richards (1976) for each interval were identified, and the historical data was decayed to 1992 for the 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 2-3.

- All constituents that exceed PRG are identified, and those exceeding 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:

- 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 previously.

- Data reported at an interval break, such as 15 ft (4.57 m) were reported in previous range (i.e., 10 to 15 ft [3.04 to 4.57 m]).

- Data reported which overlaps ranges were recorded in both ranges (i.e., data from 14.5 to 16 ft [4.47 to 4.88 m] is recorded in the 10 to 15 ft [3.04 to 4.57 m] and 15 to 20 ft [4.57 to 6.10 m] ranges).

- ^{63}Ni reported in Dorian and Richards (1976) 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 (1976) has been recorded as ^{238}U since ^{238}U is the major risk contributor of the uranium isotopes in the QRA.

Any constituent that has a concentration exceeding the appropriate PRG value at any given depth is considered a refined COPC. The screening process results in the identification of all refined COPC, which must be addressed by remedial action at the given IRM candidate waste site.

2.4.3 Waste Site Profiles

Based on data from the 100-BC-1 Operable Unit LFI (DOE-RL 1993c) and the refined COPC discussed in Section 2.4.2, a profile for each IRM candidate waste site was developed. The waste 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: 1) they contain the information for comparison to the group profiles and alternative criteria defined in the Process Document; and 2) they aid in development of a data base for determining costs and durations of 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 2-13.

- Extent of Contamination--The values for these parameters are based on volume estimates performed for each site (Appendix A). 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 alternatives. 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--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--The associated maximum concentration for that constituent is the highest concentration exceeding PRG detected in any of the IRM candidate waste 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 alternatives, organic contaminants may require that enhancements such as thermal desorption be added to a treatment

system, and the presence of ^{137}Cs 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, and reprinted in Table 2-4. The maximum concentration detected is compared to the allowable reduced infiltration concentration. Exceedance of the reduced infiltration concentrations indicates that impact to groundwater will not be mitigated by containment alternatives such as a barrier.

The profiles for each IRM candidate waste site in the 100-BC-1 Operable Unit are presented in Table 2-13.

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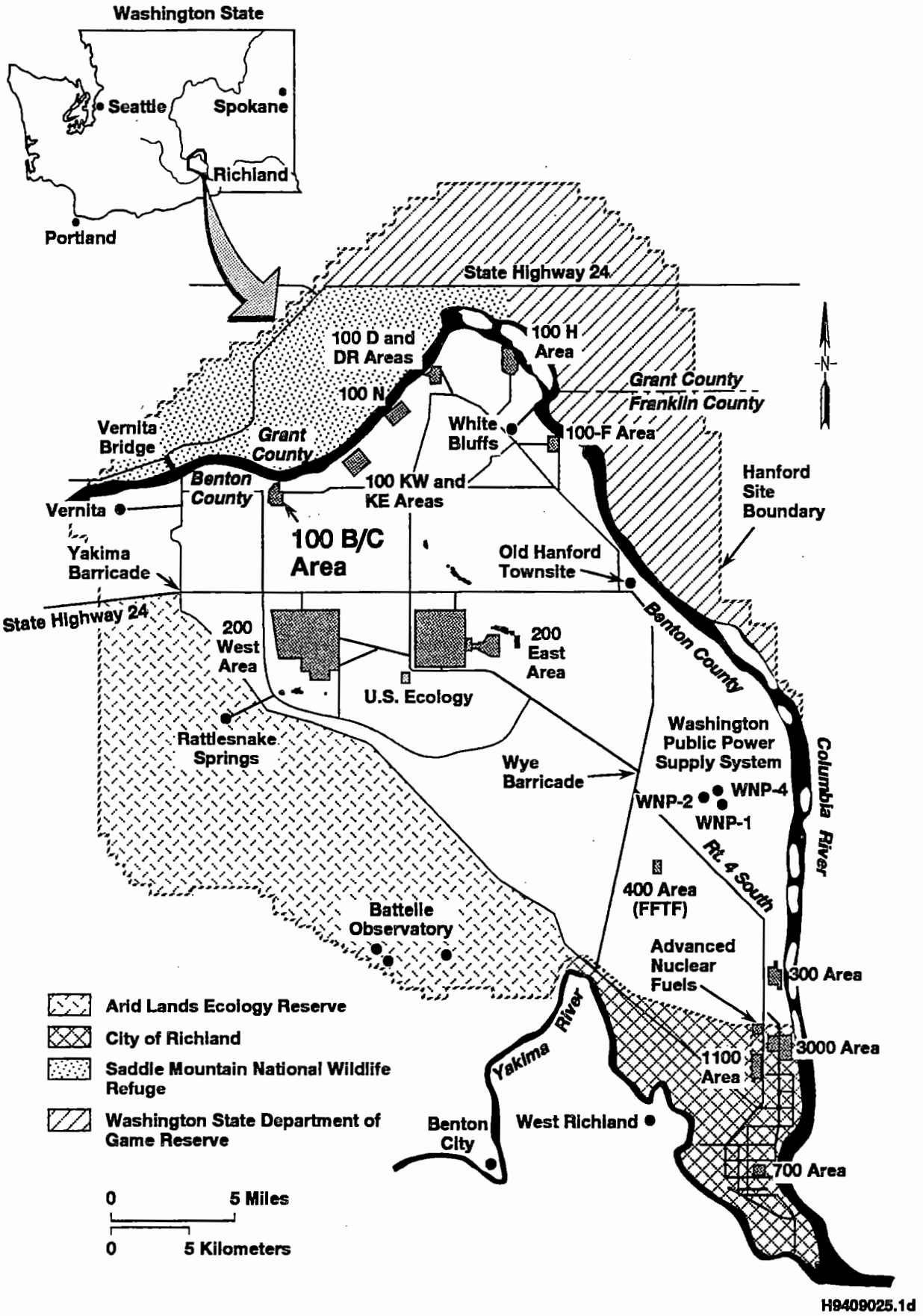
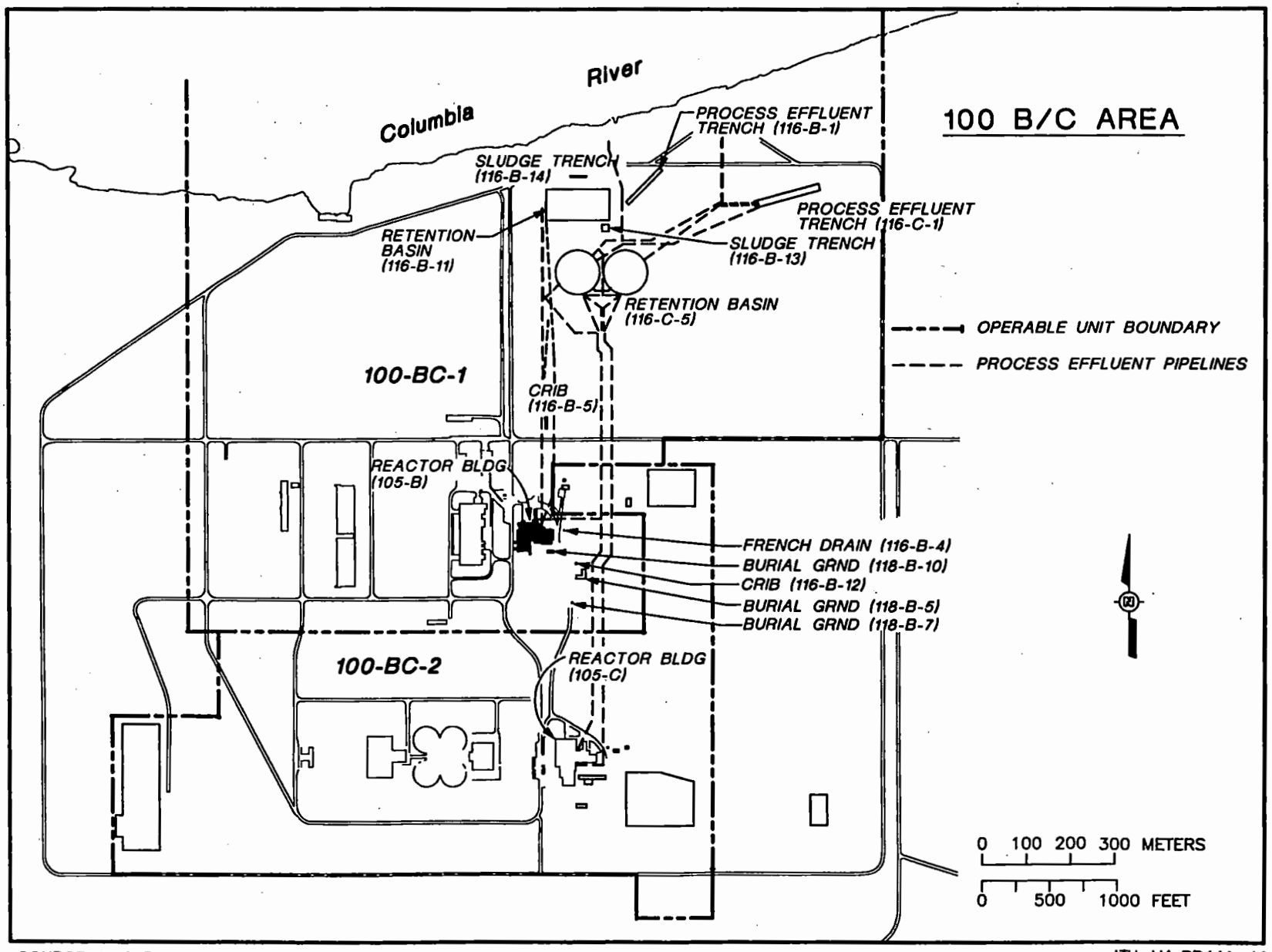
Figure 2-1. Hanford Site Map.





SOURCE: DOE/RL 94-62

ITH: JJA: PB44A–A1

Figure 2-2. 100-BC Operable Unit Map.

Table 2-1. IRM Recommendations from the 100-BC-1 LFI

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-B-1 Process Effluent Trench	low	no	adequate	yes	yes	yes	yes
116-B-2 Trench	low	no	adequate	no	no	yes	no
116-B-3 Pluto Crib	low	no	adequate	no	no	yes	no
116-B-5 Crib	low	yes	adequate	no	no	yes	yes
116-C-5 Retention Basin	medium	yes	adequate	yes	yes	no	yes
116-C-1 Process Effluent Trench	medium	no	adequate	yes	yes	yes	yes
116-B-11 Retention Basin	high	yes	adequate	yes	yes	no	yes
Process Pipe (sludge)	high	yes	adequate	yes	yes	no	yes
Process Pipe (soil)	low	no	adequate	yes	yes	no	yes
116-B-13/14 Sludge Trench	medium	yes	adequate	yes	yes	no	yes
116-B-6A Crib	low	-	adequate	no	no	no	no
116-B-6B Crib	very low	no	adequate	no	no	no	no
116-B-4 French Drain	medium	-	adequate	no	no	yes	yes
116-B-9 French Drain	low	-	incomplete*	unknown*	no	unknown*	yes*
116-B-10 Dry Well	high	-	incomplete*	unknown*	no	unknown*	yes*
116-B-12 Seal Pit Crib	medium	-	adequate	no	yes	no	yes
132-B-4 and 132-B-5 (D&D Facility)	very low	yes	adequate	no	yes	no	yes
128-B-3 Dump Site	low	-	adequate	no	no	no	no
126-B-2 Clear Well	low	-	adequate	no	no	no	no
118-B-5, 118-B-7, and 118-B-10 Burial grounds							yes

Source: 100-BC-1 LFI (DOE-RL 1993b)
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, waste site remains an IRM candidate until data are available, therefore not addressed in this FFS.
ARAR = Applicable or Relevant and Appropriate Requirements, specifically the *Washington State Model Toxics Control Act* Method B concentration values for soils

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Table 2-2. 100-BC-1 Site Description (2 sheets)

Site #/Name/(Alias)	Use	Physical Dimensions	Data Source
116-B-11 Retention Basin (107-B Retention Basin)	Held cooling water effluent from B Reactor for cooling/decay before release to the Columbia River; large leaks of effluent to soil.	70 m x 6 m deep 143.3 m x 70.1 m x 1.5 m deep	Historical
116-C-5 Retention Basin (107-C Retention Basin)	Held cooling water effluent from B and C Reactors for cooling/decay before release to the Columbia River; large leaks of effluent to soil.	101 m diameter x 4.9 m deep	LFI, Historical
Pipelines	Transported reactor cooling water from reactors to retention basins, outfall structures, 116-B-1, and 116-C-1 trenches; leaked effluent to soil; contains contaminated sludge and scale.	Buried 6 m bls. ~6533 m total length; various diameters; various depths	Historical
116-B-1 Effluent Disposal Trench (107-B Liquid Waste Disposal Trench)	Received 60 million liters of high activity effluent produced by failed fuel elements; disposed effluent to the soil.	Unlined trench, backfilled. 61 m x 9 m x 5 m deep 114.3 m x 15.2 m x 4.6 m deep	LFI, Historical
116-C-1 Effluent Disposal Trench (107-C Liquid Waste Disposal Trench)	Received 700 million liters of high activity effluent produced by failed fuel elements; disposed effluent to the soil.	Unlined trench, backfilled. 175.3 m x 38.1 m x 7.6 m deep	Historical
116-B-13 Sludge Trench (107-B South Sludge Trench)	Received sludge from 116-B-11 retention basin; sludge disposed to soil then trench backfilled.	Unlined trench, backfilled. 15.2 m x 15.2 m x 3 m deep	Analogous
116-B-14 Sludge Trench (107-B North Sludge Trench	Received sludge from 116-B-11 retention basin; sludge disposal to soil then trench backfilled.	Unlined trench, backfilled. 36.6 m x 3 m x 3 m deep	Analogous
116-B-4 French Drain (105 Dummy Decontamination French Drain)	Received 300,000 liters of effluent, e.g., contaminated spend acid from dummy decontamination facility; disposed effluent to soil.	Gravel filled pipe. 1.2 m diameter x 6.1 m deep	Historical
116-B-12 Seal Pit Crib (117-B Crib)	Received drainage from confinement seal system in 117-B building seal pits; disposed effluent to soil.	Timber reinforced excavation, filled with gravel, soil covered. 3 m x 3 m x 3 m deep.	Analogous
116-B-5 Crib (108-B Crib)	Received 10 million liters of low-level effluent from contaminated maintenance shop and decontamination pad in 108-B building including liquid tritium waste; disposed effluent to soil.	25.6 m x 4.9 m x 3.5 m deep	LFI, Historical
118-B-5 Burial Ground (Ball 3X)	Received highly contaminated reactor components removed from B Reactor.	Unlined L-shaped excavation. 2 m cover 22 m x 22 m x 8 m x 14 m x 14 m x 8.2 m x 6.1 m deep	Historical
118-B-7 Burial Ground (111-B Solid Waste Burial Site)	Miscellaneous solid waste, e.g., decontamination materials and associated equipment.	Unlined excavation. 2 m cover 7.3 m x 7.3 m x 2.4 m deep	Historical

Table 2-2. 100-BC-1 Site Description

Site #/Name/(Alias)	Use	Physical Dimensions	Data Source
118-B-10 Burial Ground (115-B/C Caisson Site)	Received activated reactor components; buried in unlined excavation; backfilled with soil.	Unlined excavation. 2 m cover 26.8 m x 17.7 m x 6.1 m deep	Historical
132-B-4 Filter Building (117-B Filter Building)	Contaminated building demolished in place; buried; covered with fill. (D&D Facility.)	Demolished reinforced concrete structure. Building: 18.0 m x 11.9 m x 8.2 m Tunnels: 58 m long	D&D
132-B-5 Gas Recirculation Building (115-B/C Gas Recirculation Facility)	Contaminated gas recirculation building demolished in place; buried; covered with fill. (D&D Facility.)	Demolished reinforced concrete structure. 51.2 m x 25.9 m x 3.4 m	D&D
Source: 100-BC-1 LFI (DOE-RL 1993c) LFI = limited field investigation			

Table 2-3. 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

Table 2-4. Reduced Infiltration Concentrations

Analyte	Soil Concentration
RADIONUCLIDES	**pCi/g**
^{241}Am	5,012
^{14}C	2,924
^{134}Cs	83,539
^{137}Cs	125,309
^{60}Co	208,848
^{152}Eu	3,341,560
^{154}Eu	3,341,560
^{155}Eu	16,707,800
^{3}H	83,539
^{40}K	23,391
^{22}Na	33,416
^{63}Ni	7,518,510
^{238}Pu	835
$^{239/240}Pu$	627
^{226}Ra	4
^{90}Sr	20,885
^{99}Tc	4,177
^{228}Th	16.708
^{232}Th	2.088
$^{233/234}U$	835
^{235}U	1,002
^{238}U	1,002
INORGANICS	**mg/kg**
Antimony	0.251
Arsenic	2.088
Barium	41,770
Cadmium	125.309
Chromium (VI)	4.177
Lead	1,253
Manganese	2,088
Mercury	50.123
Zinc	125,309
ORGANICS	**mg/kg**
Aroclor 1260	221
Benzo(a)pyrene	919
Chrysene	2
Pentachlorophenol	44

Table 2-5. 116-B-11 Retention Basin Refined Contaminants of Potential Concern

116-B-11	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		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
C-14	4.69E+00	NO a b c d e	2.59E+02	YES b c		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	5.10E-01	NO a b c d	4.60E-01	NO b c d	7.36E-03	NO c d	1.10E-01	NO d	5.06E-02	NO d	2.94E-03	NO d	1.43E-03	NO d		NO d e		NO d e	
Cs-137	3.74E+02	YES d	8.30E+02	YES	2.91E+02	YES d	2.70E+02	NO d	1.45E+02	NO d	4.98E+01	NO d	3.04E+01	NO d		NO d e	7.61E+00	NO d	YES
Co-60	3.17E+03	YES	4.39E+03	YES	2.07E+02	YES d	2.07E+02	NO d	9.27E+01	NO d	2.56E-01	NO d	4.27E-01	NO d		NO d e		NO d e	YES
Eu-152	1.02E+04	YES d	2.83E+04	YES	1.02E+03	YES d	9.72E+02	NO d	2.87E+02	NO d	1.90E+00	NO d	4.86E+00	NO d		NO d e		NO d e	YES
Eu-154	3.12E+03	YES d	8.24E+03	YES d	2.22E+02	YES d	2.84E+02	NO d	9.09E+01	NO d	1.65E+00	NO d	9.94E-01	NO d		NO d e		NO d e	YES
Eu-155	9.42E+01	NO a b c d	5.03E+02	NO b c d	5.89E+00	NO c d	5.14E+00	NO d	7.70E+00	NO d	1.71E+00	NO d	1.39E-01	NO d		NO d e	2.35E-02	NO d e	
H-3	3.69E+01	NO a b c d e	1.01E+02	NO b c d e	1.70E+01	NO c d e	6.89E-01	NO d e	7.70E+00	NO d e	1.54E+00	NO d e	2.27E+00	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		NO d e		NO d e		NO d e		NO d e		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		NO d e	
Ni-63	5.10E+04	YES a b c	3.76E+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	YES
Pu-238	4.14E+00	NO a b c d	7.66E+00	YES b c	5.11E-01	NO c d e	2.82E-01	NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Pu-239/240	1.70E+02	YES	3.40E+02	YES	1.80E+01	YES c	1.10E+01	YES	7.60E+00	YES	6.75E-01	NO d e	1.40E-01	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		NO d e		NO d e		NO d e	
Sr-90	2.10E+02	YES a b c	5.43E+01	NO b c d	5.43E+00	NO c d	3.33E+00	NO d	4.82E+00	NO d	1.97E+00	NO d	6.65E-01	NO d e		NO d e	1.15E+00	NO d	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		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-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		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	9.90E-01	NO a b c d e	9.00E+00	YES b c	2.70E-01	NO c d e	3.90E-01	NO d e	4.20E-01	NO d e	2.20E-01	NO d e		NO d e		NO d e		NO d e	YES
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		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
c) Soil concentration < or = plant concentration
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:

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-1, 2, 7, 9

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Table 2-6. 116-C-5 Retention Basin Refined Contaminants of Potential Concern

116-C-5	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	3.40E+01	YES a b c	1.30E-01	NO b c d e		NO c d e		NO d e	4.00E-03	NO d e		NO d e		NO d e		NO d e	YES
C-14	2.59E+02	YES a b c		NO b c d e		NO c d e		NO d e	4.10E-01	NO d e		NO d e		NO d e		NO d e	YES
Cs-134	7.82E+00	NO a b c d	5.52E-01	NO b c d	1.15E-03	NO c d e	7.82E-04	NO d e	6.90E-04	NO d e	3.91E-03	NO d e		NO d e		NO d e	
Cs-137	1.73E+03	YES	2.15E+03	YES	2.77E+01	YES d	1.04E+02	NO d	8.30E+01	NO d	2.21E+01	NO d		NO d e		NO d e	YES
Co-60	1.95E+03	YES	3.05E+02	YES d	6.22E+00	NO c d	3.17E+01	NO d	5.00E+01	NO d	5.86E+00	NO d		NO d e		NO d e	YES
Eu-152	5.75E+03	YES d	1.37E+03	YES d	5.75E+00	NO c d	1.64E+02	NO d	1.72E+02	NO d	2.61E+01	NO d		NO d e		NO d e	YES
Eu-154	6.53E+03	YES d	7.10E+02	YES d	1.16E+00	NO c d	4.54E+01	NO d	4.83E+01	NO d	8.24E+00	NO d		NO d e		NO d e	YES
Eu-155	5.35E+02	NO a b c d	7.38E+01	NO b c d	1.07E-01	NO c d	1.71E+00	NO d	3.32E+00	NO d	9.20E-01	NO d		NO d e		NO d e	
H-3	2.47E+01	NO a b c d e	1.78E+03	YES b c		NO c d e	2.07E-01	NO d e		NO d e		NO d e		NO d e		NO d e	YES
K-40		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	
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	4.56E+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	
Pu-238	9.40E+00	YES a b c		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Pu-239/240	2.30E+02	YES	7.90E+00	YES b c	2.40E-01	NO c d e	1.80E+00	NO d	1.90E+00	NO d	2.90E-01	NO d e		NO d e		NO d e	YES
Ra-226	8.40E-01	YES a b c	6.80E-01	YES b c		NO c d e		NO d e	1.02E+00	YES		NO d e		NO d e		NO d e	YES
Sr-90	7.70E+02	YES a b c	2.99E+02	YES b c	3.12E+00	NO c d	6.79E+00	NO d	5.43E+00	NO d	4.21E+00	NO d		NO d e		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	
Th-228		NO a b c d e		NO b c d e		NO c d e		NO d e	4.40E+00	YES		NO d e		NO d e		NO d e	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		NO d e	
U-233/234	1.40E+00	NO a b c d		NO b c d e		NO c d e	7.80E-01	NO d e	8.40E-01	NO d e		NO d e		NO d e		NO d e	
U-235	8.00E-02	NO a b c d e		NO b c d e		NO c d e		NO d e	9.00E-03	NO d e		NO d e		NO d e		NO d e	
U-238	3.00E+00	NO a b c d	9.90E-01	NO b c d e		NO c d e		NO d e		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	
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	2.60E+02	YES b c		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Cadmium		NO a b c d e		NO b c d e		NO c d e		NO d e	8.40E-01	YES		NO d e		NO d e		NO d e	YES
Chromium VI	6.09E+02	YES a b c		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Lead	5.64E+02	YES		NO b c d e		NO c d e		NO d e		NO d e		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	4.30E+00	YES a b c		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Zinc	3.09E+02	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	
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	1.00E-01	NO 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	9.20E-01	YES		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES

* 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
c) Soil concentration < or = plant concentration
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
Screening = YES: Exceeds PRG
Screening = NO: Eliminated as COPC

Sources:

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7- 4, 5, 8, 13

DOE-RL, 1993b, Tables 3-31, 32, 33, 36

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Table 2-7. 116-B-1 Process Effluent Trench Refined Contaminants of Potential Concern

116-B-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		NO d e	4.82E-01	NO d e	5.00E-02	NO d e	2.00E-03	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	6.18E+00	NO d e	3.76E+00	NO d e	1.89E+00	NO d e		NO d e	
Cs-134		NO a b c d e	3.13E-04	NO b c d e		NO c d e		NO d e	4.53E-01	NO d		NO d e		NO d e		NO d e	
Cs-137		NO a b c d e	8.30E-02	NO b c d e		NO c d e	1.80E-01	NO d	4.39E+01	NO d	1.04E+01	NO d	1.39E+00	NO d		NO d e	
Co-60		NO a b c d e	2.68E-02	NO b c d e	1.34E-02	NO c d e	3.42E-02	NO d e	4.76E+00	NO d	3.89E-01	NO d		NO d e		NO d e	
Eu-152		NO a b c d e	4.42E-01	NO b c d	3.45E-01	NO c d	7.07E-01	NO d	1.22E+02	NO d	1.76E+01	NO d	4.11E+00	NO d		NO d e	
Eu-154		NO a b c d e		NO b c d e		NO c d e	1.68E-01	NO d	1.36E+01	NO d	1.20E+00	NO d		NO d e		NO d e	
Eu-155		NO a b c d e	1.82E-02	NO b c d e	1.28E-02	NO c d e	6.42E-03	NO d e	1.28E+00	NO d		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	1.09E+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		NO d e		NO d e		NO d e		NO d e		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	1.08E-01	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	3.60E+00	NO d	2.69E-01	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		NO d e		NO d e		NO d e		NO d e	
Sr-90		NO a b c d e	8.83E-03	NO b c d e	4.75E-02	NO c d e	2.58E-02	NO d e	1.32E+01	NO d	5.08E+00	NO d	1.54E+00	NO d		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		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	
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	2.80E-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	
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	3.30E+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		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	8.39E+02	YES		NO d e		NO d e		NO d e	YES
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	1.28E+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
c) Soil concentration < or = plant concentration
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, 1993b, Tables 3-2, 3

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-3

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Table 2-8. 116-C-1 Process Effluent Trench Refined Contaminants of Potential Concern

116-C-1	Zone 1 0 - 3 ft		Zone 2 3 - 6 ft		Zone 3 6 - 10 ft		Zone 4 10 - 15 ft		Zone 4 15 - 20 ft		Zone 4 20 - 25 ft		Zone 4 25 - 30 ft		Zone 4 30 - 35 ft		Zone 4 35 - 40 ft		Refined COPC Summary
	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		NO d e		NO d e		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		NO d e		NO d e		NO d e		NO d e		NO d e		NO d e	
Cs-134		NO a b c d e	2.67E-04	NO b c d	8.28E-04	NO c d	9.66E-03	NO d	3.13E-02	NO d	1.10E-02	NO d		NO d e		NO d e	2.07E-01	NO d	
Cs-137		NO a b c d e	2.42E-01	NO b c d	1.18E+01	YES d	3.60E+01	NO d	5.54E+01	NO d	3.32E+02	NO d	1.45E+02	NO d		NO d e	1.38E+01	NO d	YES
Co-60		NO a b c d e	3.66E-02	NO b c d e	2.68E+00	NO c d	6.34E+01	NO d	2.20E+02	NO d	5.73E+01	NO d	4.76E+01	NO d		NO d e	1.17E+00	NO d	
Eu-152		NO a b c d e	4.86E-01	NO b c d	6.63E+00	YES d	2.12E+02	NO d	4.02E+02	NO d	9.72E+01	NO d	2.83E+02	NO d	7.96E-02	NO d e	1.02E+01	NO d	YES
Eu-154		NO a b c d e	1.56E-01	NO b c d	3.69E+00	NO c d	1.70E+02	NO d	1.05E+02	NO d	2.19E+01	NO d	5.96E+01	NO d		NO d e	3.41E+00	NO d	
Eu-155		NO a b c d e	3.00E-02	NO b c d e	1.82E-01	NO c d	2.25E+00	NO d	6.53E+00	NO d	1.03E+00	NO d	3.00E+00	NO d		NO d e	5.56E-01	NO d	
H-3		NO a b c d e	3.32E-01	NO b c d e	1.70E+00	NO c d e	4.46E-01	NO d e	9.72E-01	NO d e	3.40E+00	NO d e	1.62E+01	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		NO d e		NO d e		NO d e		NO d e		NO d e		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		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		NO c d e	7.50E-01	NO d e	2.10E+00	NO d	1.80E+00	NO d	5.30E+00	YES		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		NO d e		NO d e		NO d e	
Sr-90		NO a b c d e	2.65E-01	NO b c d e	2.78E-01	NO c d e	5.36E-01	NO d e	5.23E-01	NO d e	6.65E-01	NO d e	5.70E+00	NO d	2.51E-01	NO d e	3.40E-01	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		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		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	
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	7.50E-02	NO b c d e	3.10E-01	NO c d e	2.20E-01	NO d e	3.20E-01	NO d e	2.50E-02	NO d e	1.60E-01	NO d e		NO d e	2.10E-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		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
c) Soil concentration < or = plant concentration
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:

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-6

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Table 2-9. 116-B-5 Crib Refined Contaminants of Potential Concern

116-B-5	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	6.00E-03	NO c d e	2.00E-03	NO d e	2.00E-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		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	1.33E-04	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	3.11E-01	NO c d		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	2.56E+00	NO c d	2.60E-01	NO d	1.84E-01	NO d		NO d e		NO d e		NO d e	
Eu-152		NO a b c d e		NO b c d e	1.15E+01	YES d	1.53E+00	NO d		NO d e		NO d e		NO d e		NO d e	YES
Eu-154		NO a b c d e		NO b c d e	2.53E+00	NO c d		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	1.50E-02	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	2.96E+04	YES c		NO d e		NO d e	1.82E+02	NO d e		NO d e		NO d e	YES
K-40		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	
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		NO d e		NO d e		NO d e		NO d e	
Sr-90		NO a b c d e		NO b c d e	1.09E-01	NO c d e		NO d e	1.50E-01	NO d e		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		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		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	
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		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	
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	9.02E+01	NO c d	4.84E+02	YES	7.86E+01	NO d		NO d e		NO d e		NO d e	YES
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	1.40E+00	YES c	1.10E+00	YES	2.90E+00	YES		NO d e		NO d e		NO d e	YES
Zinc		NO a b c d e		NO b c d e	6.84E+01	NO c d	6.94E+01	NO d	1.25E+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
c) Soil concentration < or = plant concentration
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, 1993b, Tables 3-24, 25

Dorian, J.J., and V.R. Richards, 1978, Tables 3.4-1

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Table 2-10. 116-B-4 French Drain Refined Contaminants of Potential Concern

116-B-4	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		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		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	1.84E-04	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	2.08E+02	YES d	6.71E+01	NO d		NO d e		NO d e		NO d e		NO d e	YES
Co-60		NO a b c d e		NO b c d e	2.68E+02	YES d	6.34E+00	NO d		NO d e		NO d e		NO d e		NO d e	YES
Eu-152		NO a b c d e		NO b c d e	4.20E+02	YES d	3.05E+01	NO d		NO d e		NO d e		NO d e		NO d e	YES
Eu-154		NO a b c d e		NO b c d e	4.54E+01	YES d	4.83E+00	NO d		NO d e		NO d e		NO d e		NO d e	YES
Eu-155		NO a b c d e		NO b c d e	6.53E+00	NO c d	2.14E-01	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	1.22E+02	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		NO d e		NO d e		NO d e		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	2.91E-01	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	8.60E+00	YES c	7.70E+00	YES		NO d e		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		NO d e		NO d e	
Sr-90		NO a b c d e		NO b c d e	3.73E+01	NO c d	2.24E+00	NO d		NO d e		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		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		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	
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	2.80E-01	NO c d e		NO d e		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	
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
c) Soil concentration < or = plant concentration
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:

Dorian, J.J., and V.R. Richards, 1978, Table 3.4-1
(As 116-B-3, 105-B Pluto Crib)

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Table 2-11. 100 B/C Pipeline Sludge Refined Contaminants of Potential Concern

Pipeline Sludge	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		NO d e		NO d e		NO d e		NO d e	
C-14	1.20E+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	
Cs-134	1.66E+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		NO d e	
Cs-137	1.11E+05	YES		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Co-60	2.81E+03	YES		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Eu-152	1.68E+04	YES 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	YES
Eu-154	3.41E+03	YES 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	YES
Eu-155	9.42E+03	YES 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	YES
H-3	2.47E+00	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		NO d e		NO d e		NO d e		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	6.18E+04	YES a b c		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Pu-238	1.41E+02	YES		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		NO d e	YES
Pu-239/240	2.80E+03	YES		NO b c d e		NO c d e		NO d e		NO d e		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		NO d e		NO d e	
Sr-90	2.04E+03	YES		NO b c d e		NO c d e		NO d e		NO d e		NO d e		NO d e		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	
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		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		NO d e		NO d e		NO d e		NO d e		NO d e	
U-238	2.30E-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	
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
c) Soil concentration < or = plant concentration
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:

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-24

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Table 2-12. 100 B/C Pipeline Soil Refined Contaminants of Potential Concern

Pipeline Soil	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		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		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	3.96E-04	NO c d	4.32E-04	NO d	6.44E-01	NO d	9.20E-04	NO d	2.44E-01	NO d	6.44E-04	NO d	
Cs-137		NO a b c d e		NO b c d e	4.36E+00	NO c d	3.67E+00	NO d	4.64E+03	YES	1.45E+02	NO d	2.56E+03	YES	4.01E+01	NO d	YES
Co-60		NO a b c d e		NO b c d e	2.32E-01	NO c d	2.20E+00	NO d	1.02E+02	NO d	1.59E+01	NO d	8.17E+01	NO d	3.78E-01	NO d	
Eu-152		NO a b c d e		NO b c d e	7.96E-01	NO c d	5.75E+00	NO d		NO d e	3.36E+01	NO d	1.11E+02	NO d	1.99E+00	NO d	
Eu-154		NO a b c d e		NO b c d e	1.85E-01	NO c d	8.80E-01	NO d	1.02E+02	NO d	5.68E+00	NO d	2.75E+01	NO d	4.54E-01	NO d	
Eu-155		NO a b c d e		NO b c d e	8.88E-03	NO c d e	2.57E-02	NO d e	3.21E+03	NO d	2.89E-01	NO d	1.61E+03	NO d	8.67E-02	NO d e	
H-3		NO a b c d e		NO b c d e		NO c d e		NO d e	4.86E+01	NO d e		NO d e	3.81E+01	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		NO d e		NO d e		NO d e		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	3.61E-01	NO d e		NO d e	
Pu-239/240		NO a b c d e		NO b c d e	2.90E-01	NO c d e	2.20E-01	NO d e	6.40E+00	YES	2.20E+00	NO d	1.00E+01	YES	1.40E-01	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		NO d e		NO d e	
Sr-90		NO a b c d e		NO b c d e	3.87E-01	NO c d e	1.56E+00	NO d	8.15E+00	NO d	1.36E+02	YES	6.79E+01	NO d	8.83E+00	NO d	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	
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		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		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	4.20E-01	NO d e	5.20E-01	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
c) Soil concentration < or = plant concentration
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:

Dorian, J.J., and V.R. Richards, 1978, Tables 2.7-19, 20

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Table 2-13. 100-BC-1 Waste Site Profile (Page 1 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-B-11 (Retention Basin)	118835.0	210.3	111.3	23406.0	6.1	Soil	Radionuclides	pCi/g	
						Concrete	^{14}C	2.59(10^2)	NO
							^{60}Co	4.39(10^3)	NO
							^{137}Cs	8.30(10^2)	NO
							^{152}Eu	2.83(10^4)	NO
							^{154}Eu	8.24(10^4)	NO
							^{63}Ni	5.10(10^4)	NO
							^{238}Pu	7.66	NO
							$^{239/240}Pu$	3.40(10^2)	NO
							^{90}Sr	2.10(10^2)	NO
							^{238}U	9.00	NO
							Inorganics	mg/kg	
							Arsenic	assumed from group data	YES(b)
							Cadmium		
							Chromium VI		
							Lead		

Table 2-13. 100-BC-1 Waste Site Profile (Page 2 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-C-5 (Retention Basin)	145210.0	(c)	(c)	23805.0	6.1	Soil Concrete	Radionuclides	pCi/g	
							^{241}Am	$3.40(10^1)$	NO
							^{14}C	$2.59(10^2)$	NO
							^{60}Co	$1.95(10^3)$	NO
							^{137}Cs	$2.15(10^3)$	NO
							^{152}Eu	$5.75(10^3)$	NO
							^{154}Eu	$6.53(10^3)$	NO
							^{3}H	$1.78(10^3)$	NO
							^{238}Pu	9.40	NO
							$^{239/240}Pu$	$2.30(10^2)$	NO
							^{90}Sr	$7.70(10^2)$	NO
							^{228}Th	4.40	NO
							Inorganics	mg/kg	
							Barium	$2.60(10^2)$	NO
							Cadmium	$8.40(10^1)$	NO
							Chromium VI	$6.09(10^2)$	YES
							Lead	$5.64(10^2)$	NO
							Mercury	4.30	NO
							Organics	ppb	
							Pentachlorophenol	$9.20(10^2)$	NO
100 B/C Pipelines	302973.0	6533.0	varies	varies	varies	Soil Steel Concrete Sludge	Radionuclides	pCi/g	
							^{60}Co	$2.81(10^3)$	NO
							^{137}Cs	$1.18(10^5)$	NO
							^{152}Eu	$1.68(10^4)$	NO
							^{154}Eu	$3.44(10^3)$	NO
							^{155}Eu	$9.42(10^3)$	NO
							^{63}Ni	$6.18(10^4)$	NO
							^{238}Pu	$1.41(10^2)$	NO
							$^{239/240}Pu$	$2.80(10^3)$	YES(d)
							^{90}Sr	$2.04(10^3)$	NO
100 B/C Pipeline Leak at Junction Box	1325.0	76.2	5.8	441.0	3.0	Soil Concrete	Radionuclides	pCi/g	
							^{137}Cs	$4.64(10^3)$	NO
							$^{239/240}Pu$	$1.00(10^1)$	NO
							^{90}Sr	$1.36(10^2)$	NO

Table 2-13. 100-BC-1 Waste Site Profile (Page 3 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-B-1 (Effluent Disposal Trench)	3001.0	112.2	13.1	1470.0	4.6	Soil	Inorganics Chromium VI Manganese	mg/kg $3.30(10^1)$ $8.39(10^2)$	 YES NO
116-C-1 (Effluent Disposal Trench)	31441.0	169.8	32.6	5535.0	5.8	Soil Concrete	Radionuclides ^{137}Cs ^{152}Eu $^{239/240}Pu$ Inorganics Chromium VI	pCi/g $1.18(10^1)$ 6.63 5.30 mg/kg assumed from process effluent trench group data	 NO NO NO YES(e)
116-B-13 (Sludge Trench)	924.0	15.2	15.2	228	4.0	Sludge	Radionuclides ^{241}Am ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{63}Ni ^{238}Pu $^{239/240}Pu$ ^{90}Sr ^{228}Th Tritium ^{238}U Inorganics Arsenic Barium Cadmium Chromium VI Mercury Lead	assumed from area retention basins	YES(b)

Table 2-13. 100-BC-1 Waste Site Profile (Page 4 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
116-B-14 (Sludge Trench)	439.0	36.6	3.0	110.0	4.0	Sludge	Radionuclides ^{241}Am ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{63}Ni ^{238}Pu $^{239/240}Pu$ ^{90}Sr ^{228}Th Tritium ^{238}U Inorganics Arsenic Barium Cadmium Chromium VI Mercury Lead	assumed from area retention basins	YES(b)
116-B-4 (French Drain)	3.2	1.2 (f)	1.2 (f)	1.1	2.7	Soil Steel	Radionuclides ^{60}Co ^{137}Cs ^{152}Eu ^{154}Eu $^{239/240}Pu$	pCi/g $2.68(10^2)$ $2.08(10^2)$ $4.20(10^2)$ $4.54(10^1)$ 8.60	 NO NO NO NO NO
116-B-12 (Seal Pit Crib)	0.0	0.0	0.0	0.0	0.0	NA	None	Assume data from seal pit cribs	NO(e)
116-B-5 Crib	1022.0	29.0	8.2	232.0	4.3	Soil Concrete	Radionuclides ^{152}Eu Tritium Inorganics Barium Mercury	pCi/g $1.15(10^1)$ $2.96(10^4)$ mg/kg $4.84(10^2)$ 2.90	 NO NO NO NO

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Table 2-13. 100-BC-1 Waste Site Profile (Page 5 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-B-5 Ball 3X Burial Ground	3297.0	varies	varies	907.0	6.1	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{63}Ni ^{90}Sr Tritium Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(h)	NO(g)

Table 2-13. 100-BC-1 Waste Site Profile (Page 6 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-B-7 Burial Ground	61.0	7.3	7.3	46	2.4	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{63}Ni ^{90}Sr Tritium Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(h)	NO(g)

Table 2-13. 100-BC-1 Waste Site Profile (Page 7 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
118-B-10 Burial Ground	1346.0	26.8	17.7	402	6.1	Misc. Solid Waste	Radionuclides ^{14}C ^{137}Cs ^{60}Co ^{152}Eu ^{154}Eu ^{63}Ni ^{90}Sr Tritium Inorganics Cadmium Lead Mercury Organics -no specific constituents identified, but 5% of volume is assumed to be contaminated by organics	(h)	NO(g)
132-B-4 Filter Building (D&D Facility)	0	0	0	0	0	NA	None	NA	NA

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Table 2-13. 100-BC-1 Waste Site Profile (Page 8 of 8)

Waste Site/Group	Extent of Contamination					Media/ Material	Refined COPC	Maximum Concentration Detected (a)	Are Reduced Infiltration Concentrations Exceeded?
	Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Depth (m)				
132-B-5 Gas Recirculation Building (D&D Facility)	0	0	0	0	0	NA	None	NA	NA

a Where concentration exceeds PRG.
b Based on retention basin group data.
c Contamination is defined by an additional 40 ft (12.2 m) radius beyond the retention basin walls.
d Data is from pipeline sludge. Although the in situ PRG are exceeded, impact to groundwater is expected to be negligible due to containment of the material by the pipe.
e Based on group data.
f 4 ft (1.2 m) is the diameter of the french drain.
g Assumed to meet in situ PRG.
h No quantitative data is available. Constituents are assumed from Miller and Wahlen 1987.

PRG preliminary remediation goals
COPC contaminants of potential concern
NA not applicable
Dimensions = Contaminated volume dimensions from Appendix A.

3.0 APPLICATION OF THE PLUG-IN APPROACH

This chapter considers IRM candidate waste site characteristics which have been developed in the previous sections and implements the plug-in approach employed by the 100 Area source operable unit FFS.

As stated in Section 3.0 of the Process Document, group profiles were developed based on characteristics of IRM candidate waste sites from the 100-BC-1, 100-HR-1, and 100-DR-1 Operable Units. It is anticipated that there will be variations between waste 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.

3.1 GROUP IDENTIFICATION

Waste site identification is accomplished by using the site descriptions defined in Section 2.0 and fitting the site into the appropriate group in Figure 1-3. It may also be necessary to refer 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

As stated in Section 3.0, the final step in the plug-in approach is an evaluation of waste site characteristics against the applicability criteria for each remedial alternative. Remedial alternatives and their designatives were developed and explained in the Process Document. Soil site alternatives are designated with a SS prefix while the solid waste site alternatives are designated with a SW prefix. Site characteristics are defined by the descriptions and profiles developed in Section 2.0. Applicability criteria and enhancements for each alternative as defined in Section 4.0 of the Process Document are identified in Table 3-1.

The applicability criteria are elements that must be present for an alternative to be effective 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 based on waste site characteristics, but do not limit or define the applicability of the alternative. Treatment is an alternative that has enhancements depending on the types of contaminants present at a site. One enhancement is thermal desorption, which is used to treat organic contaminants. Organic contaminants may warrant the use of thermal desorption, but is not required for the treatment alternative, 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 waste site. Any deviation from alternatives developed for the appropriate group in the Process Document are identified by a (d). As stated in Step 6, deviations require additional consideration in subsequent chapters, however sites with no deviation plug-in to the analysis performed for the respective group.

Based on the information presented in Section 2.0, sites 132-B-4 and 132-B-5 belong to the D&D group. As discussed in Section 5.0 of the Process Document, the D&D group falls under a no interim action alternative based on the current site conditions. The D&D facilities were remediated to meet allowable residual contamination levels (ARCL) established by DOE. The no interim action alternative therefore applies to 132-B-4 and 132-B-5.

The deviation in Table 3-1 indicates 116-C-5 retention basin has organic contamination, therefore, thermal desorption will be added as an enhancement to the treatment alternative.

3.3 EXAMPLE APPLICATION OF THE PLUG-IN APPROACH (116-B-1)

To achieve further understanding of the plug-in approach, an example of its application has been developed. The example site, 116-B-1, will be evaluated as dictated by the plug-in approach. The waste site profile has been defined in Section 2.0 therefore completing Step 4 of the approach. Steps 5 and 6 are completed below.

3.3.1 Identification of Appropriate Group

The 116-B-1 process effluent trench 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 effluent was disposed to the soil. This indicates that it is a contaminated soil site used for liquid disposal. Table 2-2 indicates that the site is an unlined trench and that it received effluent from the reactor. It can be concluded that the appropriate waste site group for 116-B-1 is the process effluent trenches. 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 Criteria

Based on the description and profile developed for 116-B-1 in Section 2.0, an evaluation of the alternative criteria can be accomplished. The evaluation of each alternative is presented below.

No Interim Action - There is data indicating 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-B-1 in Table 2-13, which indicates that there are contaminants present that exceed PRG. Therefore, institutional controls will not effectively address contaminants at the site.

Containment - Because there are contaminants that exceed reduced infiltration concentrations, containment may 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, the in situ treatment option may be applicable.

Removal/Treatment/Disposal - Because contaminants exceed PRG, this alternative may be applicable. The thermal desorption enhancement is not necessary since organic contaminants are not present 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-B-1 Alternatives	Group Alternatives
Applicable	Removal/Disposal	Removal/Disposal
	In Situ Treatment	In Situ Treatment
	Removal/Treatment/Disposal - no enhancements	Removal/Treatment/Disposal - no enhancements
Not applicable	No Interim Action	No Interim Action
	Institutional Controls	Institutional Controls
	Containment	Containment

The alternatives for 116-B-1 are the same as those for the process effluent group, therefore, no deviations are identified and the site effectively plugs into the analyses for the group.

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

Waste Site Group		132-B-4 132-B-5 D&D Facility	116-B-11 Retention Basin	116-C-5 Retention Basin	PIPE-LINES Pipeline	116-B-1 Process Effluent Trench
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	Yes	No	No	No	No
Institutional Controls						
SS-2 SW-2	Criterion: • Contaminants < PRG	Yes	No	No	No	No
Containment						
SS-3 SW-3	Criteria: • Contaminants > PRG	No	Yes	Yes	Yes	Yes
	• Contaminants < reduced infiltration concentrations	No	No	No	Yes	No
Removal/Disposal						
SS-4 SW-4	Criterion: • Contaminants > PRG	No	Yes	Yes	Yes	Yes
In Situ Treatment						
SS-8A	Criteria: • Contaminants > PRG	No	Yes	Yes	NA	Yes
	• Contamination < 5.8 m in depth	NA	No	No	NA	Yes
SS-8B	Criteria: • Contaminants > PRG	NA	NA	NA	Yes	NA
	• Contaminants < reduced infiltration concentrations	NA	NA	NA	Yes	NA
SW-7	Criteria: • Contaminants > PRG	NA	NA	NA	NA	NA
	• Contaminants < reduced infiltration concentrations	NA	NA	NA	NA	NA
Removal/Treatment/Disposal						
SS-10	Criterion: • Contaminants > PRG	No	Yes	Yes	Yes	Yes
	Enhancements: • Organic contaminants (if yes, thermal desorption must be included in the treatment system)	NA	No	Yes(d)	No	No
	• Percentage of contaminated volume less than twice the PRG for cesium-137.		33%	33%	100%	100%
SW-9	Criterion: • Contaminants > PRG	NA	NA	NA	NA	NA
	Enhancement: • Organic contaminants	NA	NA	NA	NA	NA

Table 3-1. Comparison of Waste Sites and Alternatives (page 2 of 2)

Waste Site Group		116-C-1 Process Effluent Trench	116-B-13 116-B-14 Sludge Trench	116-B-4 Dummy Decon/ French Drain	116-B-12 Seal Pit Crib	116-B-5 Special Crib	118-B-5 118-B-7 118-B-10 Burial Ground
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	No	No	No	No
Institutional Controls							
SS-2 SW-2	Criterion: • Contaminants < PRG	No	No	No	Yes	No	No
Containment							
SS-3 SW-3	Criteria: • Contaminants > PRG • Contaminants < reduced infiltration concentrations	Yes No	Yes No	Yes Yes	NA NA	Yes Yes	Yes Yes
Removal/Disposal							
SS-4 SW-4	Criterion: • Contaminants > PRG	Yes	Yes	Yes	NA	Yes	Yes
In Situ Treatment							
SS-8A	Criteria: • Contaminants > PRG • Contamination < 5.8 m in depth	Yes Yes	Yes Yes	Yes Yes	NA NA	Yes Yes	NA NA
SS-8B	Criteria: • Contaminants > PRG • Contaminants < reduced infiltration concentrations	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
SW-7	Criteria: • Contaminants > PRG • Contaminants < reduced infiltration concentrations	NA NA	NA NA	NA NA	NA NA	NA NA	Yes Yes
Removal/Treatment/Disposal							
SS-10	Criterion: • Contaminants > PRG	Yes	Yes	Yes	NA	Yes	NA
	Enhancements: • Organic contaminants (if yes, thermal desorption must be included in the treatment system) • Percentage of contaminated volume < twice the PRG for ^{137}Cs	No 0%	No 67%	No 67%	NA NA	No 100%	NA NA
SW-9	Criterion: • Contaminants > PRG	NA	NA	NA	NA	NA	Yes
	Enhancement: • Organic contaminants	NA	NA	NA	NA	NA	Yes

NA - Not Applicable d - deviation from waste group PRG - Preliminary Remediation Goals Decon - decontamination

4.0 ALTERNATIVE DEVELOPMENT

In accordance with Step 6 (see Section 1.4) of the plug-in approach, the degree to which an individual site plugs into the analyses presented in the Process Document depends on its compatibility with the applicable group profile. Deviations from the group profiles may be 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). Sites that meet this requirement include 116-B-11, pipelines, 116-B-1, 116-C-1, 116-B-13, 116-B-14, 116-B-4, 116-B-12, 118-B-5, 118-B-7, 118-B-10, 132-B-4 and 132-B-5. The 116-B-5 waste site is considered a special crib due to its unique waste stream. Because the special crib category contains sites associated with unique project or facilities, they must be addressed individually, and no group profile is developed. However, in the case of 116-B-5, based on the evaluation in Table 3-1, it is apparent that the alternatives are consistent with the dummy decontamination crib/french drain group.

Sites that do not plug in directly (Step 6b) can be divided into two sets. The first set contains 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 site that meets this requirement and applicable deviation is the 116-C-5 Retention Basin. The 116-C-5 requires thermal desorption as an enhancement option to the removal/treatment/disposal alternative, therefore, additional development of the technology and alternative are not required.

The second set of sites that do not plug in are those sites that 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-BC-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-BC-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 100-BC-1 Operable Unit is presented in the following manner:

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

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

The 100-BC-1 individual waste sites are discussed in Section 5.2.

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 that deviate from the process document 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 objective 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 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 impacts are closely related to exposure duration, specifically, the amount of time a person may be exposed to hazards associated with the waste 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). The 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	high
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.

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.

5.2 SITE-SPECIFIC DETAILED ANALYSIS

Based on the comparison presented in Table 3-1, several of the individual waste sites within 100-BC-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 1994). These individual waste sites include 116-B-11, pipelines, 116-B-1, 116-C-1, 116-B-13, 116-B-14, 116-B-4, 116-B-12, 118-B-5, 118-B-7, 118-B-10, 132-B-4, and 132-B-5. The 116-B-5 waste site is considered a special crib due to its unique waste stream. Because the special crib category contains sites associated with unique projects or facilities, they must be addressed individually, and no group profile is developed. However, in the case of 116-B-5, based on the evaluation in Table 3-1, it is apparent that the detailed analysis for the dummy decontamination crib/french drain group can be assumed for this site.

The detailed analysis for the remaining waste site (116-C-5) is discussed in the following sections. Tables 5-1 and 5-2 present remediation costs and durations associated with all waste sites.

5.2.1 116-C-5 Retention Basin

This section evaluates the alternatives that deviate from the Process Document for the 116-C-5 retention basin site against the CERCLA evaluation criteria. Alternatives SS-4 and SS-10 are applicable to this site. Alternative SS-10 deviates from the waste site group analysis in that thermal desorption is included as an enhancement to the treatment process. This deviation in alternative SS-10 is discussed in the following sections.

5.2.1.1 Overall Protection of Human Health and the Environment. Based on the presence of pentachlorophenol, alternative SS-10 requires that thermal desorption be included for this waste site. The removal/treatment/disposal technologies associated with the thermal desorption enhancement of alternative SS-10 will result in protection of human health and the environment. Any potential additional short-term risk to the workers or the community can be minimized through engineering controls and proper health and safety protocol.

5.2.1.2 Compliance with ARAR. Chemical-specific ARAR for alternative SS-10 will be met by desorption of organic compounds from the soil. Location-specific ARAR can be met through proper planning and scheduling. Action-specific ARAR are met through appropriate design and operation.

5.2.1.3 Long-Term Effectiveness and Permanence. The addition of thermal desorption to alternative SS-10 does not change the analysis of this alternative with respect to this criterion from the Process Document. Contaminated soil exceeding PRG will be permanently removed from the site.

5.2.1.4 Reduction of Toxicity, Mobility, or Volume. Thermal desorption is primarily an irreversible process in which nearly all of the volatile and semivolatile constituents will be reduced. Any remaining volatile and semivolatile organic contaminants will be rendered immobile. Thermal desorption may completely reduce the volume of soil, producing minimal amounts of residuals that will be transferred to a disposal facility.

5.2.1.5 Short-Term Effectiveness. Risks to the community and workers during thermal desorption include potential releases of fugitive gases. These releases can be controlled through vapor abatement and proper operating procedures. No receptors are currently in the area. However, remedial activities can be scheduled to accommodate nesting or roosting species if encountered. All remedial action objectives are met upon completion of remedial alternative.

5.2.1.6 Implementability. No difficulties are anticipated with the implementation of thermal desorption despite the absence of site-specific treatability study data. An influent soil particle size limitation of 2 in. (6 cm) exists. It is very unlikely that technical problems will lead to schedule delays. All necessary equipment and specialists are readily available and adjustments to alternative SS-10 are easily accomplished as thermal desorption will be an off-line process. Due to removal, post closure monitoring will not be required.

Table 5-1. 100-BC-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-BC-1 OPERABLE UNIT												
116-B-11 Retention Basin				$5.05E+07	$0.00E+00	$4.81E+07				$5.16E+07	$7.69E+06	$5.55E+07
116-C-5 Retention Basin				$5.90E+07	$0.00E+00	$5.62E+07				$6.87E+07	$1.19E+07	$7.52E+07
116-B-13 Sludge Trench				$8.65E+05	$0.00E+00	$8.26E+05	$1.77E+06	$9.37E+05	$2.58E+06	$1.29E+06	$1.14E+05	$1.35E+06
116-B-14 Sludge Trench				$7.53E+05	$0.00E+00	$7.20E+05	$1.39E+06	$6.13E+05	$1.91E+06	$1.18E+06	$7.83E+04	$1.20E+06
116-B-1 Process Effluent Trench				$3.13E+06	$0.00E+00	$2.99E+06	$6.59E+06	$4.33E+06	$1.04E+07	$3.43E+06	$5.85E+05	$3.83E+06
116-C-1 Process Effluent Trench				$1.65E+07	$0.00E+00	$1.57E+07	$3.39E+07	$2.77E+07	$5.48E+07	$1.73E+07	$1.45E+06	$1.79E+07
116-B-5 Crib	$7.05E+05	$2.68E+05	$8.23E+05	$1.13E+06	$0.00E+00	$1.08E+06	$2.19E+06	$1.24E+06	$3.28E+06	$1.50E+06	$1.68E+05	$1.60E+06
116-B-4 French Drain	$4.01E+05	$1.25E+05	$4.54E+05	$2.95E+05	$0.00E+00	$2.83E+05	$6.32E+05	$1.13E+05	$7.15E+05	$7.21E+05	$1.14E+04	$7.07E+05
116-B-12 Seal Pit Crib	Institutional Controls proposed at site											
100 B/C PIPELINES	$4.70E+07	$2.18E+07	$5.46E+07	$3.61E+07	$0.00E+00	$3.29E+07	$7.04E+06	$3.88E+06	$8.87E+06	$3.81E+07	$5.78E+06	$4.00E+07
118-B-5 Burial Ground	$1.14E+06	$4.75E+05	$1.35E+06	$1.88E+06	$0.00E+00	$1.79E+06	$1.34E+06	$5.30E+05	$1.57E+06	$2.00E+06	$1.00E+05	$2.01E+06
118-B-7 Burial Ground	$5.16E+05	$1.80E+05	$5.94E+05	$2.31E+05	$0.00E+00	$2.22E+05	$5.99E+05	$1.95E+05	$6.82E+05	$7.47E+05	$1.48E+04	$7.38E+05
118-B-10 Burial Groun	$8.74E+05	$3.50E+05	$1.03E+06	$1.00E+06	$0.00E+00	$9.58E+05	$1.03E+06	$3.91E+05	$1.20E+06	$1.37E+06	$5.11E+04	$1.37E+06
132-B-4 D&D Facility	No interim action proposed at site											
132-B-5 D&D Facility	No interim action proposed at site											

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Table 5-2. 100-BC-1 Site-Specific Alternative Durations

Site	Containment Duration (yrs)	Removal/Disposal Duration (yrs)	In Situ Treatment Duration (yrs)	Removal/Treatment/Disposal Duration (yrs)
100-BC-1 OPERABLE UNIT				
116-B-11 Retention Basin		0.7		1.5
116-C-5 Retention Basin		0.7		1.7
116-B-13 Sludge Trench		0.1	0.2	0.1
116-B-14 Sludge Trench		0.1	0.2	0.1
116-B-1 Process Effluent Trench		0.1	0.7	0.2
116-C-1 Process Effluent Trench		0.5	3.8	0.6
116-B-5 Crib	0.1	0.1	0.3	0.1
116-B-4 French Drain	0.1	0.1	0.1	0.1
116-B-12 Seal Pit Crib	Institutional Controls proposed at site			
100 B/C PIPELINES	2.4	2.4	0.2	2.5
118-B-5 Burial Ground	0.1	0.1	0.1	0.1
118-B-7 Burial Ground	0.1	0.1	0.1	0.1
118-B-10 Burial Ground	0.1	0.1	0.2	0.1
132-B-4 D&D Facility	No interim action proposed at site			
132-B-5 D&D Facility	No interim action proposed at site			

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-BC-1 alternatives is presented in tabular format (Tables 6-1 through 6-8). 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.

Institutional controls are identified as the only applicable alternative for the 116-B-12 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. Likewise, the Process Document identifies no interim action for the D&D group, such as 132-B-4 and 132-B-5. Thus, these sites are also not presented in the following tables.

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

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Table 6-1. Comparative Analysis - 116-B-11 Retention Basin

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as protective 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 protective 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 reductive 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 reductive 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 objective are achieved within approximately 0.7 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.	Nearly as effective as SS-4. RAO are achieved within approximately 1.5 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-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 the implementability of soil washing at the field scale.
Present Worth*	$48,100,000	$55,500,000

* 5% discount rate

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

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Table 6-2. Comparative Analysis - 116-C-5 Retention Basin

COMPARATIVE EVALUATION CRITERIA	REMOVAL/DISPOSAL SS-4	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Nearly as protective 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 protective 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 reductive 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 reductive than SS-4. All contaminated material, exceeding PRG, is removed, treated, and transported to a common disposal facility. Treatment (i.e., soil washing and thermal desorption) 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 0.7 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.	Nearly as effective as SS-4. Remedial action objectives are achieved within approximately 1.7 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-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 the implementability of soil washing and thermal desorption at the field scale.
Present Worth*	$56,200,000	$75,200,000

* 5% discount rate

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

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Table 6-3. Comparative Analysis - 100 B/C Pipelines (page 1 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8B	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Less protective than SS-4, SS-8B, and SS-10. 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.	Nearly as protective as SS-10 but more effective than SS-3 and SS-8B. Potential risk is eliminated by removal of the pipeline and associated contaminated material. The pipeline is excavated, and along with any contaminated material exceeding PRG, is transported to a common disposal facility (i.e., W-025 or ERDF).	More protective than SS-3 but less effective than SS-4 and SS-10. 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.	More protective than SS-3, SS-4 and SS-8B since any potential risk is eliminated by removal of the pipeline and removal and treatment of the contaminated material. Contaminated material, exceeding PRG, is excavated, treated, and transported to a common disposal facility, along with the excavated pipeline (i.e., W-025 or ERDF).
Compliance with ARAR	SS-3, SS-4, SS-8B, and SS-10 comply with all chemical-, location-, and action-specific ARAR.			
Long-Term Effectiveness and Permanence	Less effective than SS-4, SS-8B, and SS-10. 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 and equally effective as SS-10 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 and SS-10 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.	More effective than SS-3 and SS-8B 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 reductive than SS-4, SS-8B and SS-10. 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 reductive than SS-8B and SS-10 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 reductive than SS-3, SS-4, and SS-10. 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. Contaminant mobilization are eliminated. Radionuclides present in the contaminated material will naturally degrade.	Nearly as reductive as SS-8B but more effective than SS-3 and 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.

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Table 6-3. Comparative Analysis - 100 B/C Pipelines
(page 2 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8B	REMOVAL/TREATMENT/DISPOSAL SS-10
Short-Term Effectiveness	More effective than SS-4, SS-8B, and SS-10. Remedial action objectives are achieved within approximately 2.4 years. Potential sources of risk remain at the waste site; however, installation of an engineered barrier along the entire pipeline effectively immobilizes the contaminants and eliminates exposure pathways. The contaminated soil is not disturbed during the remedial action.	Nearly as effective as SS-8B, more effective than SS-10, and less effective than SS-3. Remedial action objectives are achieved within approximately 2.4 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 but not as effective as SS-3. Remedial action objectives are achieved within approximately 0.2 years. Potential sources of risk remain at the waste site; however, grouting of the pipeline immobilizes the contaminants and installation of an engineered barrier at contaminated areas only eliminates exposure pathways. The contaminated soil is not disturbed during the remedial action.	Less effective than SS-3, SS-4 and SS-8B. Remedial action objectives are achieved within approximately 2.1 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-3 is more implementable than SS-4, SS-8B and SS-10 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 and SS-10 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, SS-4, and SS-10 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.	SS-10 is more implementable than SS-8B but less implementable compared to SS-3 and 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*	$54,600,000	$32,900,000	$8,900,000	$40,000,000

* 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 6-4. Comparative Analysis - 116-B-1 and 116-C-1 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 protective 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 protective 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 protective 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, operations and maintenance of vitrification cation 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 reductive 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 reductive 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 reductive 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 0.1 (116-B-1) and 0.5 (116-C-1) years, 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.	More effective than SS-4 and SS-10. Remedial action objectives are achieved within approximately 0.7 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 0.2 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 m (19 ft).	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*	116-B-1: $2,990,000 116-C-1: $15,700,000	116-B-1: $10,400,000 116-C-1: $54,800,000	116-B-1: $3,830,000 116-C-1: $17,900,000

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

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Table 6-5. Comparative Analysis - 116-B-13 and 116-B-14 Sludge 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 protective 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 protective 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 protective 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, operations and maintenance of 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 reductive 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 reductive 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 reductive as SS-8A but more reduction 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 for both 116-B-13 and 116-B-14. 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 0.2 (116-B-13) and 0.2 (116-B-14) 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 for both 116-B-13 and 116-B-14. 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 m (19 ft).	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*	116-B-13: $826,000 116-B-14: $720,000	116-B-13: $2,580,000 116-B-14: $1,910,000	116-B-13: $1,350,000 116-B-14: $1,200,000

* 5% discount rate
ARAR - applicable or relevant and appropriate requirement
PRG - preliminary remediation goal
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 6-6. Comparative Analysis - 116-B-4 Dummy Decontamination Crib/French Drain and 116-B-5 Crib (page 1 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Overall Protection of Human Health and the Environment	Less protective than SS-4, SS-8A, and SS-10. 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 protective as SS-10 but more effective than SS-3 and 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).	More protective than SS-3 but 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 protective than SS-3, 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-3, SS-4, SS-8A, and SS-10 comply with all chemical-, location-, and action-specific ARAR.			
Long-Term Effectiveness and Permanence	Less effective than SS-4, SS-8A, and SS-10. Remedial action objectives are achieved; however,contaminated material exceeding PRG remains at the waste site. Long-term O&M requirements consist of: repair and maintenance of engineered barrier, deed restrictions, and groundwater surveillance monitoring.	More effective than SS-3 and 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 but more effective than SS-3. 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, operations and maintenance of the vitrification system, and groundwater surveillance monitoring.	More effective than SS-3 and 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 reductive than SS-4, SS-8A and SS-10. 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 reductive than SS-8A and SS-10 but more reduction 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 reductive than SS-3, 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 reductive as SS-8A but more reduction than SS-3 and 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.

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Table 6-6. Comparative Analysis - 116-B-4 Dummy Decontamination Crib/French Drain and 116-B-5 Crib (page 2 of 2)

COMPARATIVE EVALUATION CRITERIA	CONTAINMENT SS-3	REMOVAL/DISPOSAL SS-4	IN SITU TREATMENT SS-8A	REMOVAL/TREATMENT/DISPOSAL SS-10
Short-Term Effectiveness	More effective than SS-4, SS-8A, and SS-10. Remedial action objectives are achieved within approximately 0.3 (116-B-4) and 0.1 (116-B-5) 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-8A, more effective than SS-10, and less effective than SS-3. Remedial action objectives are achieved within approximately 0.3 (116-B-4) and 0.1 (116-B-5) 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 but not as effective as SS-3. Remedial action objectives are achieved within approximately 0.3 (116-B-4) and 0.1 (116-B-5) 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-3, SS-4 and SS-8A. Remedial action objectives are achieved within approximately 0.3 (116-B-4) and 0.1 (116-B-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-3 is more implementable than SS-4, SS-8A and SS-10 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-8A and SS-10 but is less implementable compared to SS-3. Excavation is well demonstrated and no treatment is proposed.	SS-8A is less implementable compared to SS-3, 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 m (19 ft).	SS-10 is more implementable than SS-8A but less implementable compared to SS-3 and 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*	116-B-4: $454,000 116-B-5: $823,000	116-B-4: $283,000 116-B-5: $1,080,000	116-B-4: $715,000 116-B-5: $3,280,000	116-B-4: $707,000 116-B-5: $1,600,000

* 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 6-7. Comparative Analysis - 118-B-5, 118-B-7, and 118-B-10 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 protective 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 protective as SW-9 but more protective 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 protective 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 reduce the mobility of contaminants. However, the contaminated materials remain at the waste site.	More protective 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 along with the excavated pipeline [i.e., W-025 or ERDF].
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. Remedial action objectives 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.
Reduction of Toxicity, Mobility, or Volume	Less reductive 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 reductive than SW-7 and SW-9 but more reduction 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 reductive 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 reductive as SW-7 but more reduction 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 23%). Radionuclides present in the contaminated material will naturally degrade.

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Table 6-7. Comparative Analysis - 118-B-5, 118-B-7, and 118-B-10 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, 0.1, and 0.2 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, 0.1, and 0.2 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, 0.1, and 0.2 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, 0.1, and 0.2 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 treatment at the field scale.
Present Worth*	118-B-5: $1,350,000 118-B-7: $594,000 118-B-10: $1,030,000	118-B-5: $1,790,000 118-B-7: $222,000 118-B-10: $958,000	118-B-5: $1,570,000 118-B-7: $682,000 118-B-10: $1,200,000	118-B-5: $2,010,000 118-B-7: $738,000 118-B-10: $1,370,000

* 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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7.0 REFERENCES

Cadwell, L. L., 1994, *Wildlife Studies on the Hanford Site: 1993 Highlights Report,* PNL-7380, Pacific Northwest Laboratory, Richland, Washington.

Chatters, J. C., H. A. Gard, and P. E. Minthorn, 1992, *Hanford Cultural Resources Laboratory Annual Report for Fiscal Year 1989,* PNL-7362, Pacific Northwest Laboratory, Richland, Washington.

Cushing, C. E., Editor, 1994, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev. 5, Pacific Northwest Laboratory, Richland, Washington.

DOE-RL, 1994a, *100 Area Source Operable Unit Focused Feasibility Study Report*, DOE/RL-94-61, WHC Internal Draft, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1994b, *100 Area River Effluent Pipelines Expected Response Action Proposal*, DOE/RL-94-79, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1994c, *Risk Evaluation of Remedial Alternatives for the Hanford Site*. DOE/RL-93-54, Decisional Draft, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993a, *100 Area Feasibility Study Phases 1 and 2*, DOE/RL-92-11, Revision 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993b, *Limited Field Investigation for the 100-BC-1 Operable Unit*, DOE/RL-93-06, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993c, *Limited Field Investigation for the 100-HR-1 Operable Unit*, DOE/RL-93-51, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993d, *Limited Field Investigation for the 100-DR-1 Operable Unit*, DOE/RL-93-51, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993e, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 1, Draft, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1993f, *Hanford Site Baseline Risk Assessment Methodology*, DOE/RL-91-45, Rev. 2, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1992a, *Remedial Investigation/Feasibility Study Work Plan for the 100-BC-5 Operable Unit*, DOE/RL-90-08, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1992b, *Remedial Investigation/Feasibility Study Work Plan for the 100-BC-1 Operable Unit*, DOE/RL-90-07, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1991, *Hanford Past-Practice Strategy,* DOE/RL-91-40, Draft A, U.S. Department of Energy, Richland, Washington.

Dorian, J. J., and V. R. Richards, 1978, *Radiological Characterization of the Retired 100 Areas*, United Nuclear Industries, Inc., Richland, Washington.

Ecology, EPA, and DOE-RL, 1994, *Hanford Federal Facility Agreement and Consent Order,* Fourth Amendment, January 1994, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1993, *Operable Unit Feasibility Study, VOCs in Vadose Zone Indian Bend Wash Superfund Site, South Area, Tempe, Arizona*, 1993, U.S. Environmental Protection Agency, Washington, D.C.

Fitzner, R. E. (Pacific Northwest Laboratory) and S. G. Weiss (Westinghouse Hanford Company), 1992, *Bald Eagle Site Management Plan for the Hanford Site, South Central Washington*, WHC-EP-0510, Westinghouse Hanford Company, Richland, Washington.

Fitzner, R. E. (Pacific Northwest Laboratory), S. G. Weiss, and J. A. Stegen (Westinghouse Hanford Company), 1992, *Biological Assessment for Threatened and Endangered Species*, WHC-EP-0513, Westinghouse Hanford Company, Richland, Washington.

Landeen, D. S., M. R. Sackschewsky, and S. G. Weiss, 1993, *100 Areas CERCLA Ecological Investigations*, 1993, WHC-EP-0620, Westinghouse Hanford Company, Richland, Washington.

Miller, R. L. and R. K. Wahlen, 1987, *Estimates of Solid Waste in 100 Area Burial Grounds*, WHC-EP-0087, Westinghouse Hanford Company, Richland, Washington.

Sackschewsky, M. R. and D. S. Landeen, 1992, *Fiscal Year 1992 100 Areas CERCLA Ecological Investigations,* WHC-EP-0601, Westinghouse Hanford Company, Richland, Washington.

Stegen, J. A., 1992, *Biological Assessment for State Candidates and Monitored Wildlife Species Related to CERCLA*, WHC-SD-EN-TI-009, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Weiss, S. and R. M. Mitchell, 1992, *A Synthesis of Ecological Data from the 100 Areas of the Hanford Site,* WHC-EP-0601, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993, *Qualitative Risk Assessment of the 100-BC-1 Source Operable Unit,* WHC-SD-EN-RA-003, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

100-BC-1 OPERABLE UNIT WASTE SITE VOLUME ESTIMATES

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Volume Estimate
100-BC-1 Operable Unit

OBJECTIVE:

Provide estimates of:

- The volume of contaminated materials within high priority waste sites in the 100-BC-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-B-1	107-B Liquid Waste Disposal Trench	A-7
116-B-5	108-B Crib	A-9
116-C-5	107-C Retention Basin	A-11
116-C-1	107-C Liquid Waste Disposal Trench	A-13
116-B-11	107-B Retention Basin	A-15
116-B-13	107-B South Sludge Trench	A-21
116-B-14	107-B North Sludge Trench	A-23
116-B-4	105-B Dummy Decon French Drain	A-25
116-B-12	117-B Crib	A-27
132-B-4	117-B Filter Building	A-28
132-B-5	115-B/C Gas Recirculation Building	A-29
118-B-5	Ball 3X Burial Ground	A-30
118-B-7	118-B Solid Waste Burial Ground	A-32
118-B-10	Pit/Burial Ground	A-34
Pipelines	Effluent Pipelines (soil and sludge)	A-36
Pipelines	Pipeline Leak at B/C Junction Box	A-37

Volume Estimate
100-BC-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 7). Coordinates for each waste site are converted to Washington State coordinates (see reference 8). 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 (references 5 and 6). The data used, assumptions made, and method for estimating extent is discussed in a separate brief (see reference 9). 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 9 for assumptions concerning extent of contamination and reference 7 for assumptions concerning location of the waste site.

Volume Estimate
100-BC-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.
- 1.5 H: 1.0 V side slopes assumed for excavation.

All depths are below grade unless noted.

REFERENCES:

1. U.S. Department of Energy, Richland Operations Office (DOE-RL), 1991, Hanford Site Waste Information Data System (WIDS), Richland, Washington.

2. Hanford Site Drawings and Plans.

3. Site topographic maps, Drawings H-13-000100 to H-13-000106.

4. Historical photographs of the 100-B/C Area.

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

6. U.S. Department of Energy, Richland Operations Office (DOE-RL), 1993, "Limited Field Investigations Report for the 100-BC-1 Operable Unit", DOE-RL-93-06, March 1993, U.S. Department of Energy, Richland, Washington.

7. U.S. Department of Energy, Richland Operations Office (DOE-RL), 1993, "Limited Field Investigations Report for the 100-BC-5 Operable Unit", DOE-RL-93-97, June 1993, U.S. Department of Energy, Richland, Washington.

8. IT Corporation, 1993, "100-B/C Waste Site Locations", IT Corporation Calculation Brief. Project Number 199806.317.

Volume Estimate
100-BC-1 Operable Unit

REFERENCES (continued):

9. IT Corporation, 1993, "100-B/C Area Volume Estimate", IT Corporation Calculation Brief. Project Number 199806.317.

10. IT Corporation, 1993, "100-BC-1 Waste Site Contaminated Extent" IT Corporation Calculation Brief. Project Number 199806.407.

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-1
SITE NAME: 107-B Liquid Waste Disposal Trench

WASTE SITE DIMENSIONS:

Length - 375 ft (114.3 m) along top, 355 ft (108.2 m) along bottom [4]
Width - 30 ft (9.1 m) along bottom, 50 ft (15.2 m) at surface [4]
Depth - 15 ft (4.6 m) [1]. Sandy gravel fill extends to a depth of about 21 ft (6.4 m) below grade, 6 ft (1.8 m) below trench bottom [6]
Slopes - 1.0 H : 1.5 V [9]
Orientation - Long axis oriented N 45 E [2]

Waste site has been backfilled to the surface [3]. Backfill is considered uncontaminated.

CONTAMINATED VOLUME DIMENSIONS:

Trench was filled with liquids to an average level of 10 ft above base, side slopes and substrate are contaminated to a depth of 5 ft (1.5 m) below the trench bottom) [10]. No lateral contamination extends from the edges of the trench [9].

Length - 368 ft (112.2 m); 6.7 ft (2.0 m) SW and NE from bottom edge of site
Width - 43 ft (13.1 m); 6.7 ft (2.0 m) NW and SE from bottom edge of site
Depth - 20 ft (6.1 m) below grade, 5 ft (1.5 m) below base of trench

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 368 ft (112.2 m) x 43 ft (13.1 m) at a depth of 20 ft (6.1 m) [10]
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

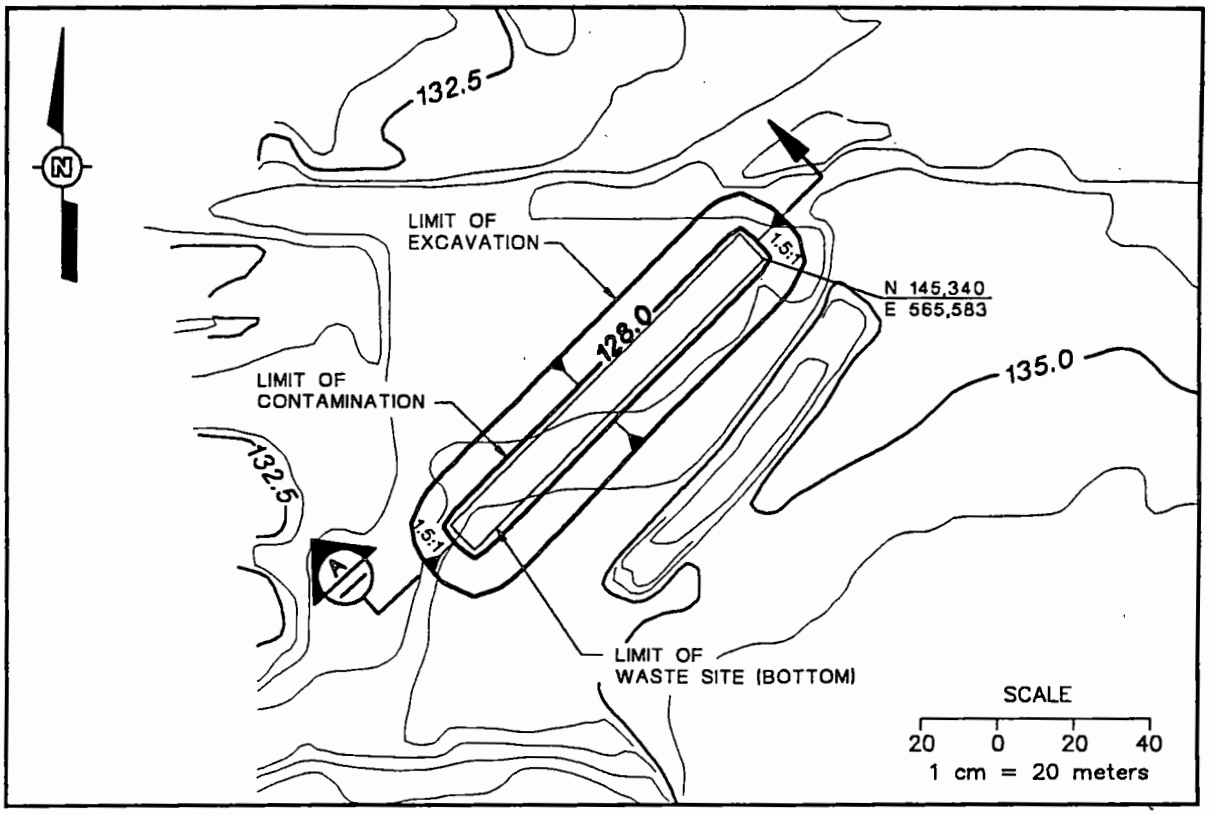
Northing: 145,340
Easting: 565,583

Reference Point: Northeast corner at surface

ELEVATIONS:

Surface: 440 ft (134.1 m) [3]
Groundwater: 392 ft (119.5 m) [7]

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



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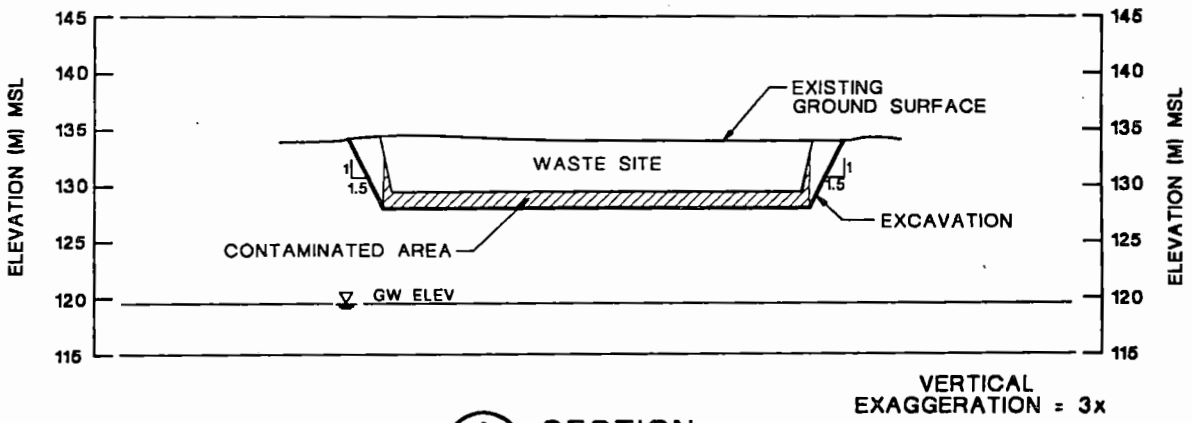


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 1,470 sq. meters
VOLUME = 3,001 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 4,007 sq. meters
VOLUME = 16,263 cu. meters

116B1

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-5
SITE NAME: 108-B Crib

WASTE SITE DIMENSIONS:

Length - 84 ft (25.6 m) along bottom [1]
Width - 16 ft (4.9 m) along bottom [1]
Depth - 11.5 ft (3.5 m) [6]
Slopes - 1.0 H : 1.0 V
Orientation - Long axis oriented N-S [2]

Waste site contains layers of boiler ash, concrete, void space and sandy gravel fill [6].

CONTAMINATED VOLUME DIMENSIONS:

Data indicate that contamination has spread to 8.5 ft (2.6 m) below the base of the site [10]. No lateral contamination is assumed to exist beyond top dimensions of site [10].

Length - 95 ft (29 m); 5.5 ft (1.7 m) beyond each end of the bottom of site
Width - 27 ft (8.2 m); 5.5 ft (1.7 m) beyond each side of the bottom of site
Depth - 14 ft (4.3 m); from 6 ft (1.8 m) to 20 ft (6.1 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 95 ft (29 m) x 27 ft (8.2 m) at a depth of 20 ft (6.1 m)
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

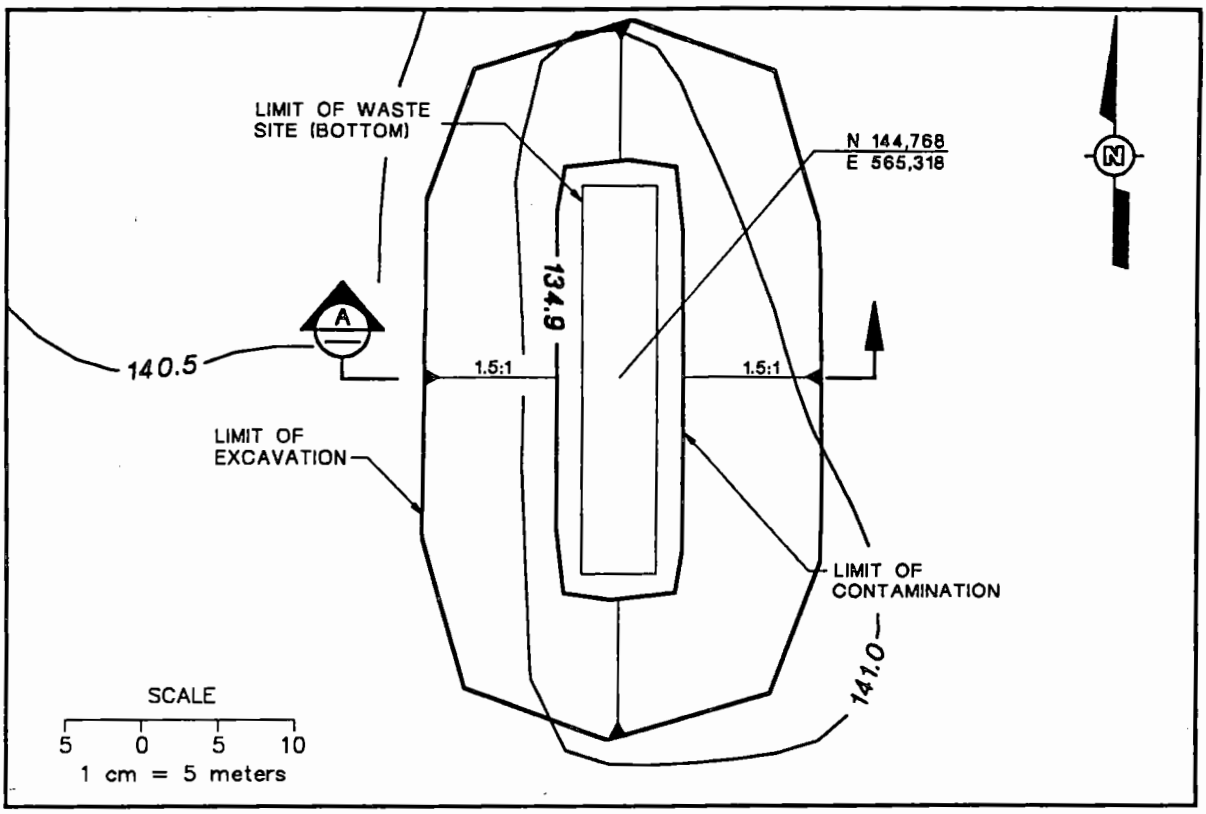
Northing: 144,768
Easting: 565,318

Reference Point: Center of waste site

ELEVATIONS:

Surface: 461 ft (140.5 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Figure A-2 IRM Site: 116-B-5



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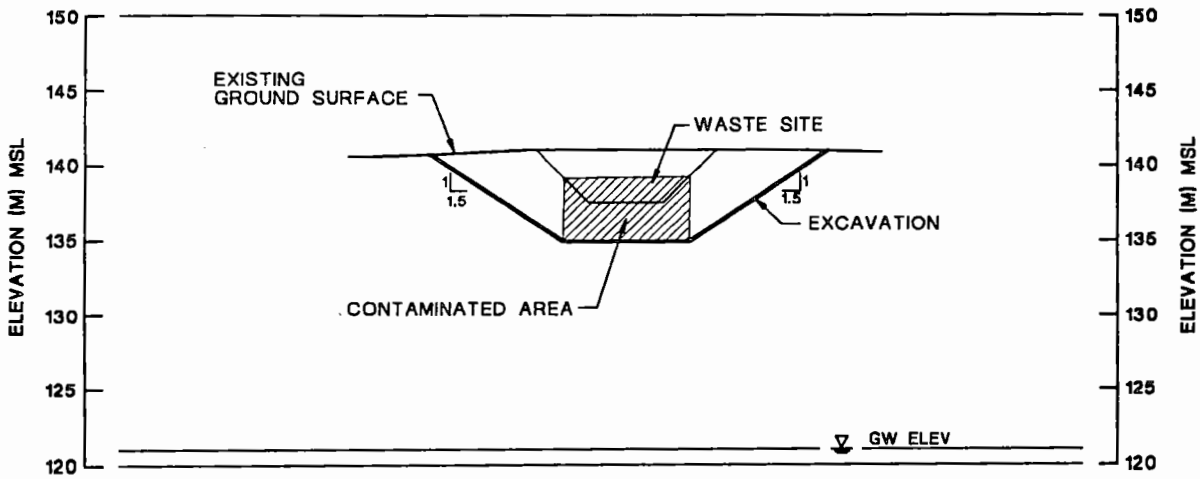


A SECTION

VERTICAL EXAGGERATION = 1x

EXTENT OF CONTAMINATION

SURFACE AREA = 232 sq. meters
VOLUME = 1,022 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,066 sq. meters
VOLUME = 3,763 cu. meters

116B5

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-C-5
SITE NAME: 107-C Retention Basin

WASTE SITE DIMENSIONS:

Diameter - 330 ft (100.6 m) each tank [1]
Depth - Tanks sit on grade, walls are 16 ft (4.9 m) high [1]
Slopes - Vertical walls [2]

Waste site consists of two carbon steel tanks with a series of baffle plates inside. Tanks have been backfilled with 3 ft of soil [6].

CONTAMINATED VOLUME DIMENSIONS:

Data indicate that contamination has spread laterally up to 40 ft (12.2 m) from the edges of the tank [10].

Diameter - 40 ft (12.2 m) from edge of each tank
Depth - 20 ft (6.1 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation will be an additional 40 ft (12.2) radius around tank at a depth of 20 ft (6.1 m)
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

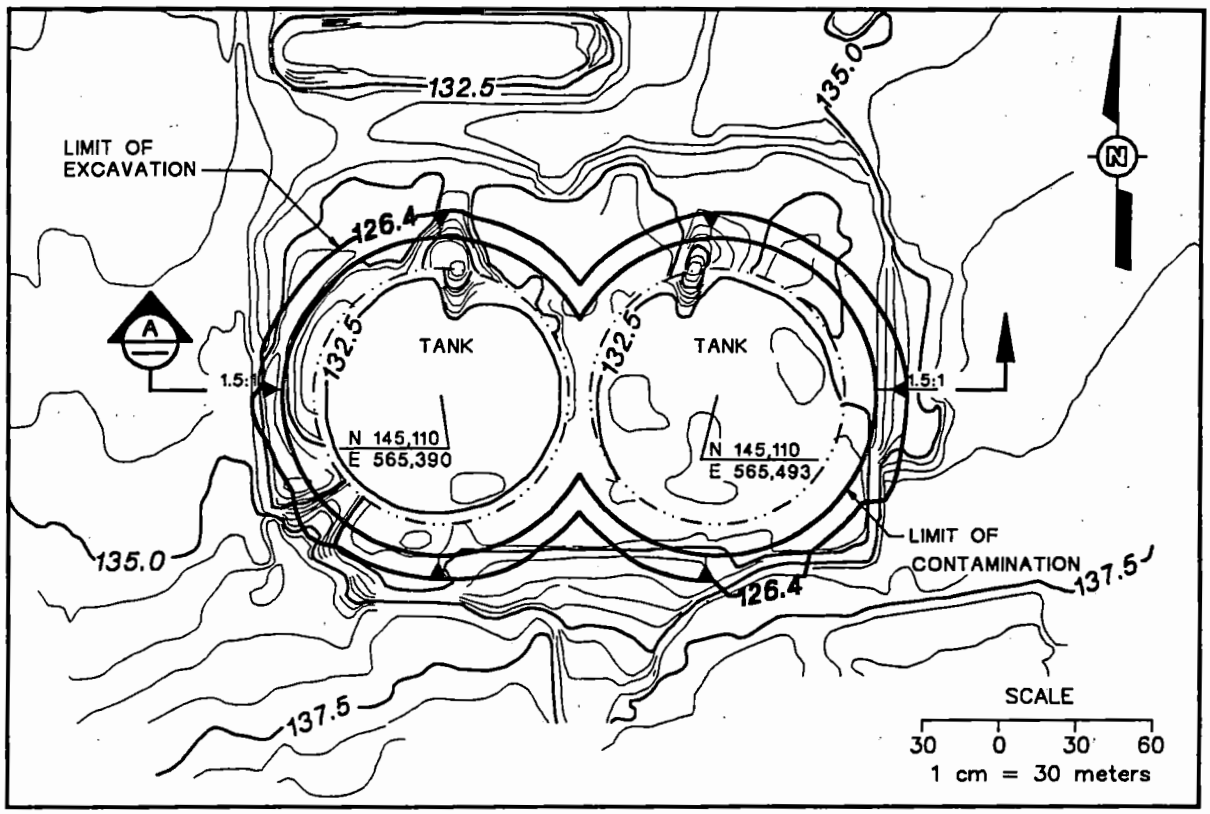
WASTE SITE LOCATION:

Northing:	145,110	Northing:	145,110
Easting:	565,390	Easting:	565,493
Reference Point:	Center of W tank.	Reference Point:	Center of E tank

ELEVATIONS:

Surface: 434 ft (132.3 m) [3]
Groundwater: 395 ft (120.4 m) [7]

Figure A-3 IRM Site: 116-C-5



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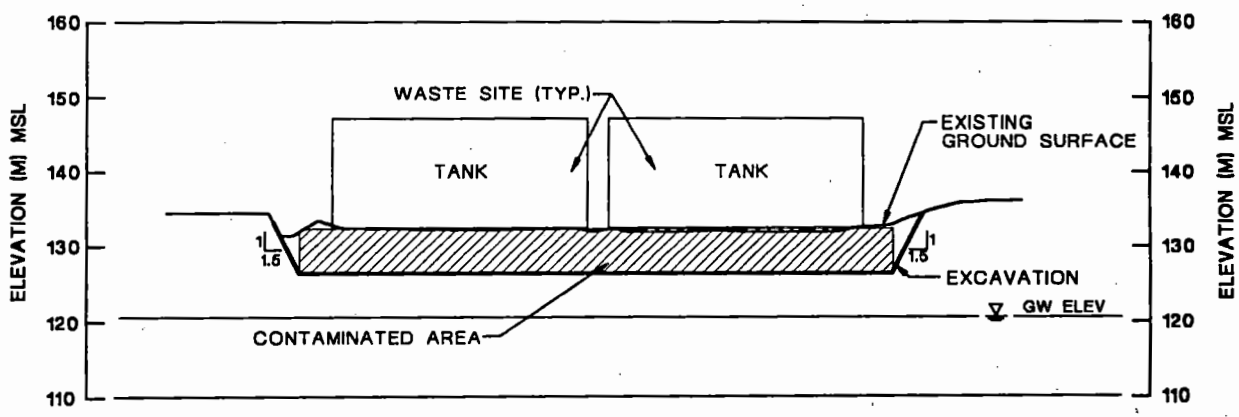


A SECTION

VERTICAL
EXAGGERATION = 3x

EXTENT OF CONTAMINATION

SURFACE AREA = 23,805 sq. meters
VOLUME = 145,210 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 30,628 sq. meters
VOLUME = 160,667 cu. meters

116C5

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-C-1
SITE NAME: 107-C Liquid Waste Disposal Trench

WASTE SITE DIMENSIONS:

Length - 500 ft (152.4 m) along bottom, 575 ft (175.3 m) at surface [1,2]
Width - 50 ft (15.2 m) along bottom, 125 ft (38.1 m) at surface [1,2]
Depth - 25 ft (7.6 m) [1]
Slopes - 1.5 H : 1.0 V [2]
Orientation - Long axis oriented N 75 E [2]

Waste site has been backfilled to the surface [3].

CONTAMINATED VOLUME DIMENSIONS:

Contamination extends from 6 ft (1.8 m) to 25 ft (7.6 m) below grade. Contamination is within the top dimension of the trench.

Length - 557 ft (169.8 m)
Width - 107 ft (32.6 m)
Depth - 19 ft (5.8 m)

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 557 ft (169.8 m) x 107 ft (32.6 m) at a depth of 25 ft (7.6 m)
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for surface dimensions.

WASTE SITE LOCATION:

Northing: 145,363
Easting: 565,794

Reference Point: Center of SW bottom site edge.

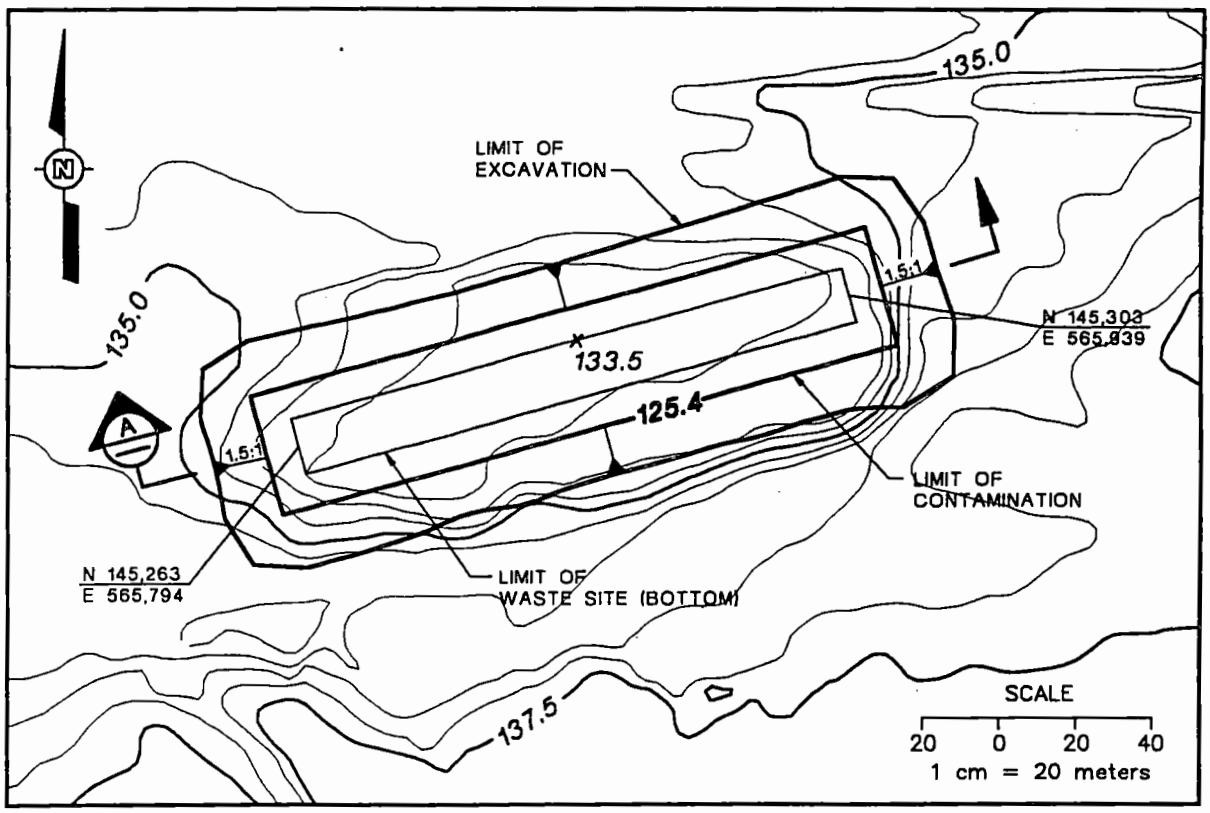
Northing: 145,303
Easting: 565,939

Reference Point: Center of NE bottom site edge

ELEVATIONS:

Surface: 437 ft (133.2 m) [3]
Groundwater: 392 ft (119.5 m) [7]

Figure A-4 IRM Site: 116-C-1



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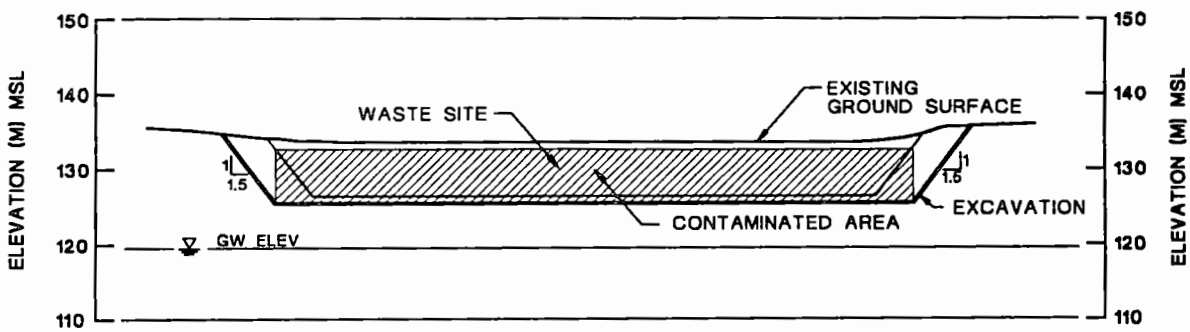


A SECTION

VERTICAL
EXAGGERATION = 2x

EXTENT OF CONTAMINATION

SURFACE AREA = 5,535 sq. meters
VOLUME = 31,441 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 11,475 sq. meters
VOLUME = 69,048 cu. meters

116C1

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-11
SITE NAME: 107-B Retention Basin

WASTE SITE DIMENSIONS:

Length - 470 ft (143.3 m) [2]
Width - 230 ft (70.1 m) [1,2]
Depth - 5 ft (1.5 m) [5]
Slopes - Vertical [2]
Orientation - Long axis oriented E-W [2]

Waste site has been backfilled with 4 ft of fill [5]. Backfill is considered contaminated.

CONTAMINATED VOLUME DIMENSIONS:

Data indicate that contamination has spread laterally up to 135 ft (41.1 m) north and 110 ft (33.5 m) east, and west of the site boundaries [10].

Length - 690 ft (210.3 m); 110 ft (33.5 m) from E and W edge of site
Width - 365 ft (111.3 m); 135 ft (41.1 m) N from edge of site
Depth - 20 ft (6.1 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 690 ft (210.3 m) x 365 ft (111.3 m) at a depth of 20 ft (6.1 m) below grade.
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

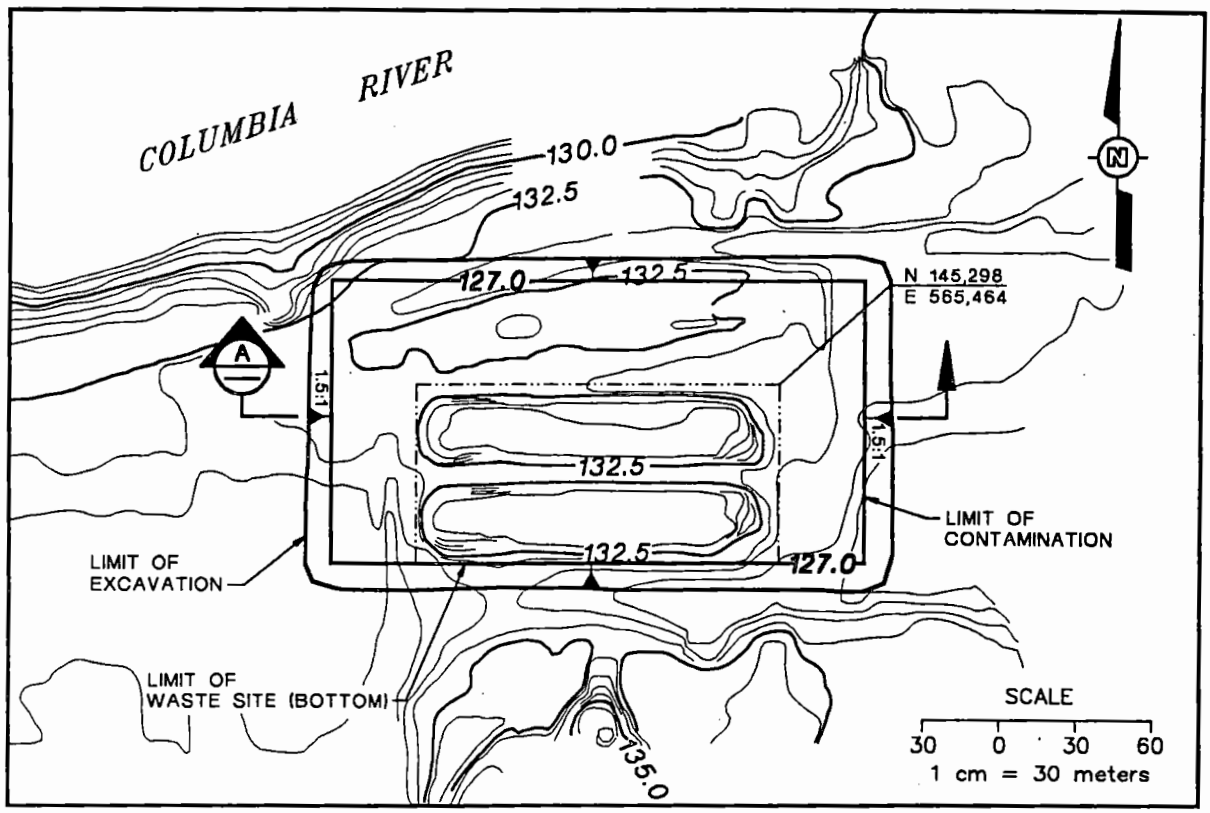
Northing: 145,298
Easting: 565,464

Reference Point: Northeast corner of waste site

ELEVATIONS:

Surface: 427 ft (130.2 m) [3]
Groundwater: 392 ft (119.5 m) [7]

Figure A-5 IRM Site: 116-B-11



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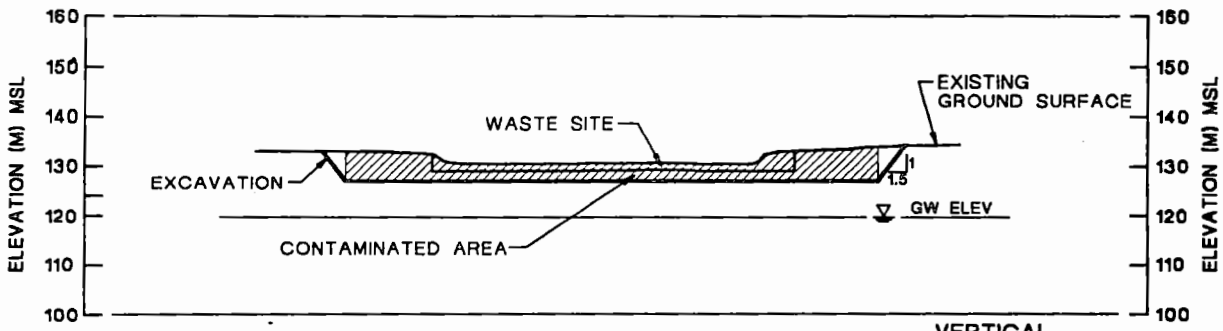


A SECTION

VERTICAL EXAGGERATION = 2x

EXTENT OF CONTAMINATION

SURFACE AREA = 23,406 sq. meters
VOLUME = 118,835 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 29,849 sq. meters
VOLUME = 144,366 cu. meters

116B11

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-13
SITE NAME: 107-B South Sludge Trench

WASTE SITE DIMENSIONS:

Length - 50 ft (15.2 m) [1]
Width - 50 ft (15.2 m) [1]
Depth - 10 ft (3.0 m) [1]
Slopes - Vertical [2].
Orientation - Oriented N-S [2]

Sludge trench has been covered with 6 ft (1.8 m) of soil [1].

CONTAMINATED VOLUME DIMENSIONS:

It is assumed that contamination has spread to 3 ft (0.9 m) below the base of the site [10]. No lateral contamination is assumed to exist [10].

Length - 50 ft (15.2 m)
Width - 50 ft (15.2 m)
Depth - 13 ft (4.0 m); from 6 ft (1.8 m) to 19 ft (5.8 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 50 ft (15.2 m) x 50 ft (15.2 m) at a depth of 19 ft (5.8 m)
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

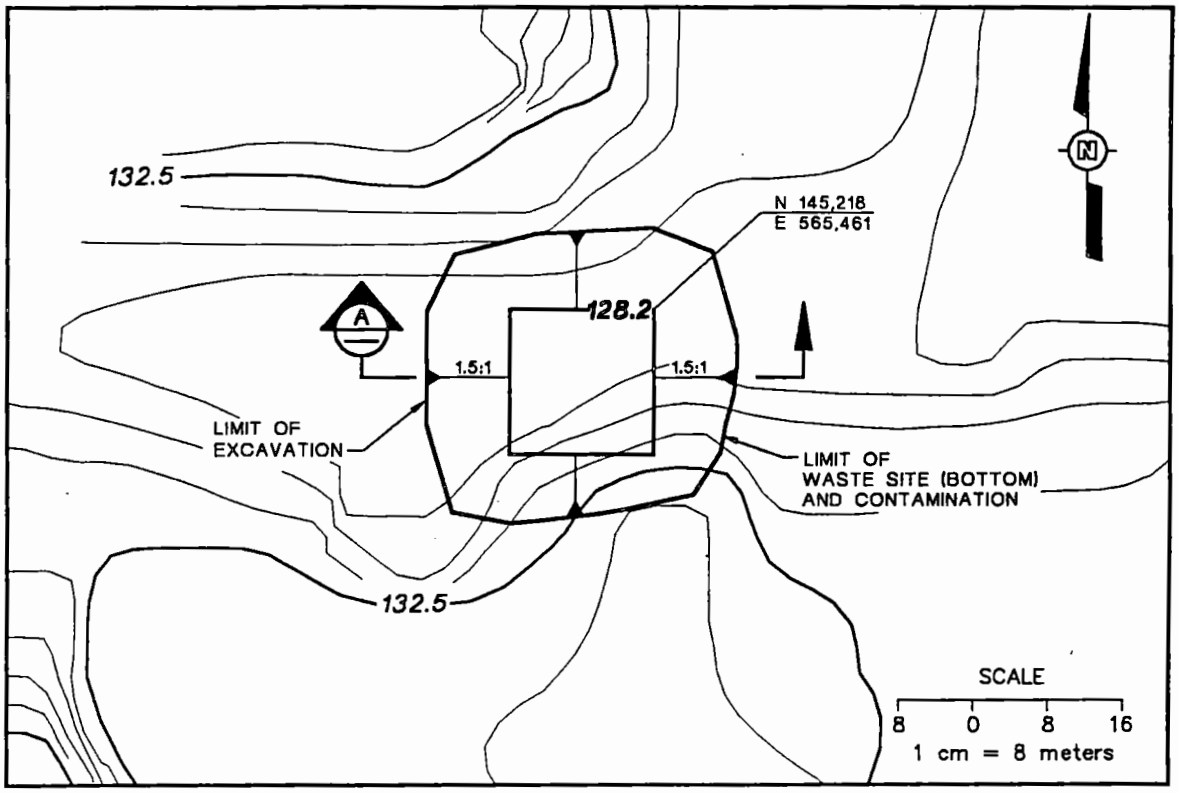
Northing: 145,218
Easting: 565,461

Reference Point: Northeast corner of waste site

ELEVATIONS:

Surface: 440 ft (134.1 m) [3]
Groundwater: 394 ft (120.1 m) [7]

Figure A-6 IRM Site: 116-B-13



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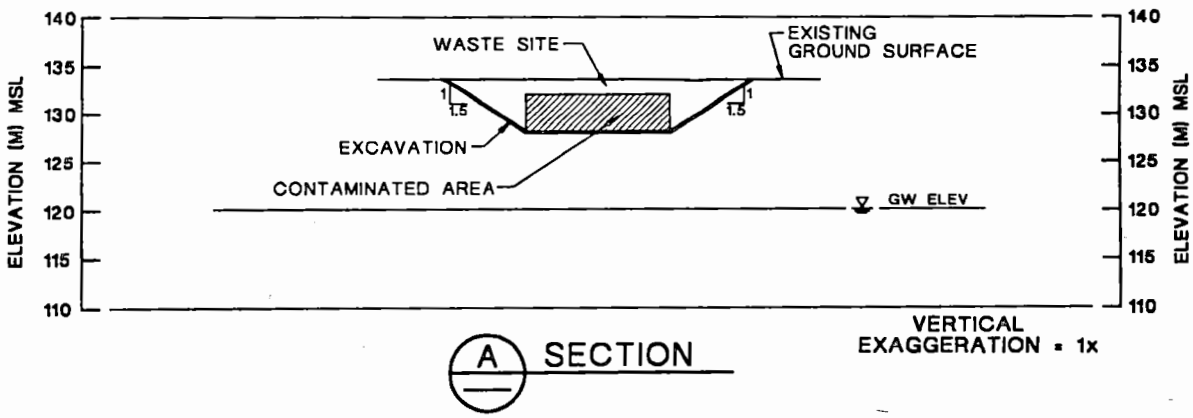


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 228 sq. meters
VOLUME = 924 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 879 sq. meters
VOLUME = 2,927 cu. meters

116B13

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-14
SITE NAME: 107-B North Sludge Trench

WASTE SITE DIMENSIONS:

Length - 120 ft (36.6 m) [1]
Width - 10 ft (3.0 m) [1]
Depth - 10 ft (3.0 m) [1]
Slopes - Vertical [9]
Orientation - Long axis oriented E-W [2]

Sludge trench has been covered with 6 ft (1.8 m) of soil [1].

CONTAMINATED VOLUME DIMENSIONS:

It is assumed that contamination has spread to 3 ft (0.9 m) below the base of the site [10]. No lateral contamination is assumed to exist [10].

Length - 120 ft (36.6 m)
Width - 10 ft (3.0 m)
Depth - 13 ft (4.0 m) from 6 ft (1.8 m) to 19 ft (5.8 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 120 ft (36.6 m) x 10 ft (3 m) at a depth of 19 ft (5.8 m) below grade
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

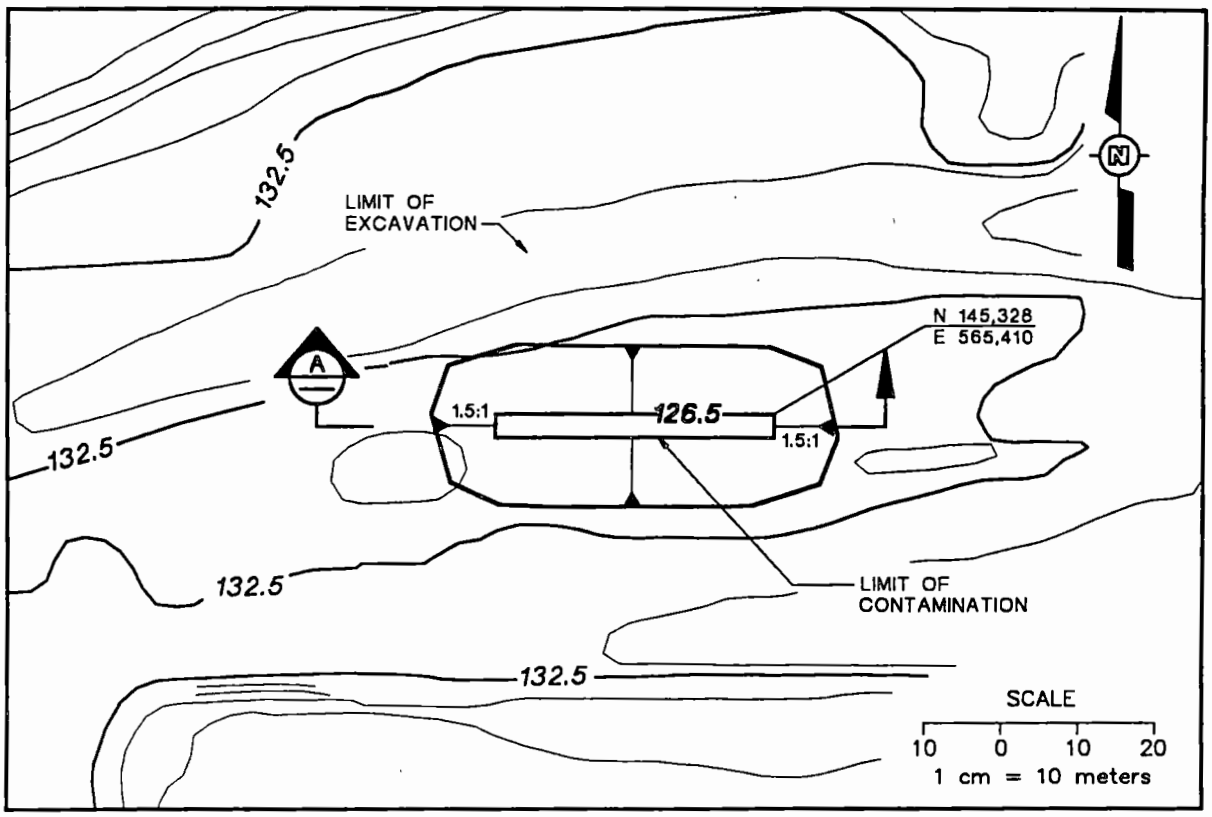
Northing: 145,328
Easting: 565,410

Reference Point: Northeast corner of waste site

ELEVATIONS:

Surface: 440 ft (134.1 m) [3]
Groundwater: 394 ft (120.1 m) [7]

Figure A-7 IRM Site: 116-B-14



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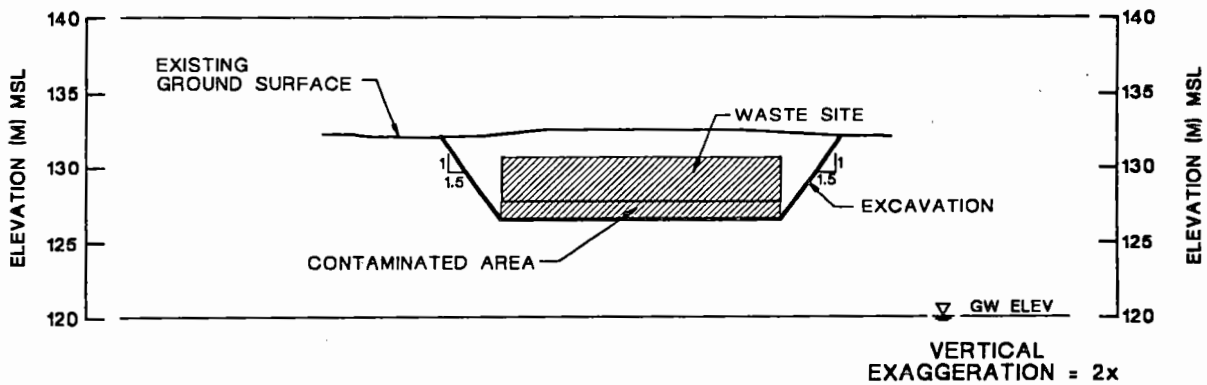


A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 110 sq. meters
VOLUME = 439 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,011 sq. meters
VOLUME = 3,106 cu. meters

116B14

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-4
SITE NAME: 105-B Dummy Decontamination French Drain

WASTE SITE DIMENSIONS:

Diameter - 4 ft (1.2 m) [1]
Depth - 20 ft (6.1 m) [1]
Slopes - Vertical walls [2]

Waste site has a graded rock and sand bottom [1]. The site has been backfilled to the surface [9].

CONTAMINATED VOLUME DIMENSIONS:

It is assumed that contamination is within the confines of the site [10]. No lateral contamination exists [10].

Diameter - 4 ft (1.2 m)
Depth - 9 ft (2.7 m); from 6 ft (1.8 m) to 15 ft (4.6 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 4 ft (1.2 m) in diameter at a depth of 15 ft (4.6 m) below grade
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

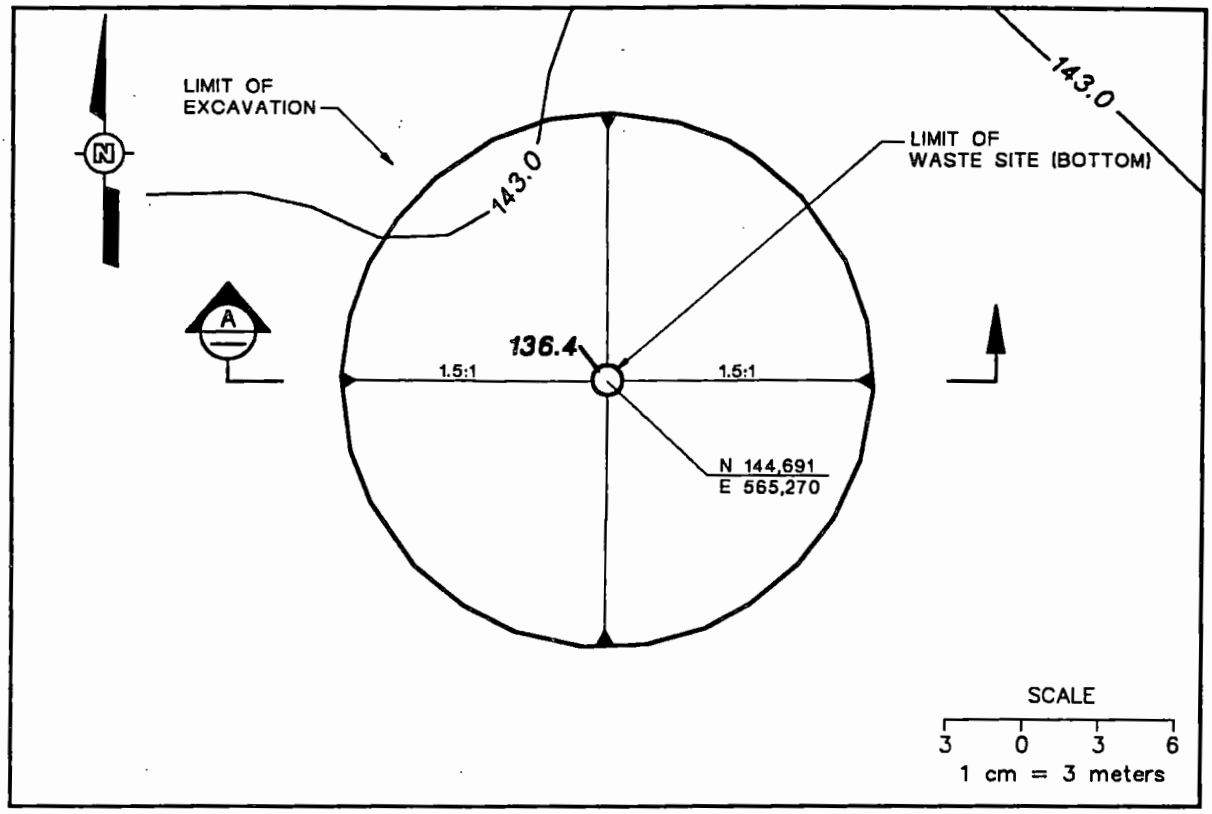
Northing: 144,523
Easting: 565,359

Reference Point: Center of waste site

ELEVATIONS:

Surface: 469 ft (143.0 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Figure A-8 IRM Site: 116-B-4



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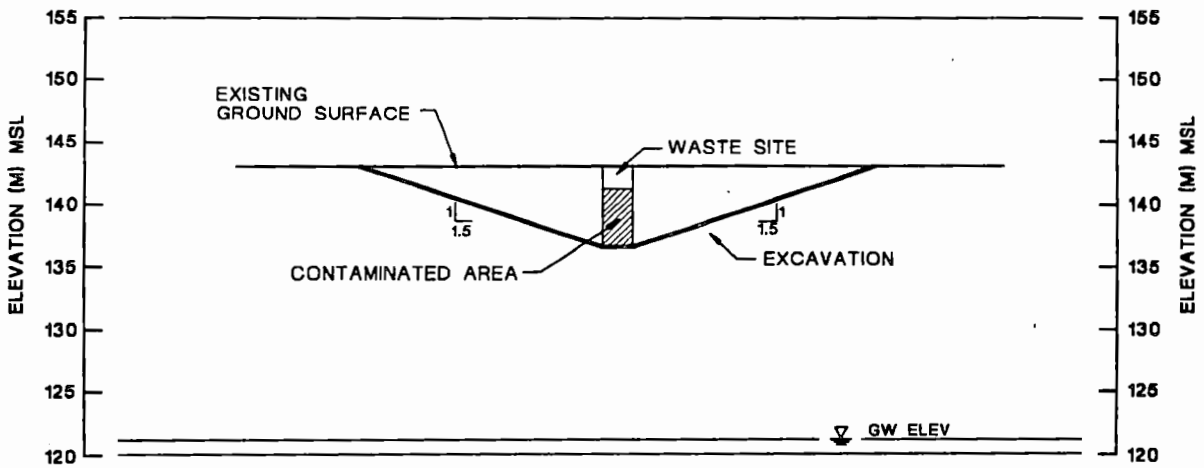


VERTICAL
EXAGGERATION = 0.5x

A SECTION

EXTENT OF CONTAMINATION

SURFACE AREA = 1.12 sq. meters
VOLUME = 3.20 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 340 sq. meters
VOLUME = 789 cu. meters

116B4

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 116-B-12
SITE NAME: 117-B Crib

WASTE SITE DIMENSIONS:

Length - 10 ft (3.0 m) [1]
Width - 10 ft (3.0 m) [1]
Depth - 10 ft (3.0 m) [5]
Slopes - Vertical [9]
Orientation - Oriented N-S [2]

The crib was backfilled to grade with soil after use [6]. Top of crib is 6 ft (1.8 m) below land surface.

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 144,447
Easting: 565,387

Reference Point: Center of waste site

ELEVATIONS:

Surface: 474 ft (144.5 m) [3]
Groundwater: 397 ft (121.0 m) [7].

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 132-B-4
SITE NAME: 117-B 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 [9]
Orientation - Long axis oriented E-W [2]

The top of the existing structure is 3 ft (0.9 m) below grade and is covered with clean backfill [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 144,458
Easting: 565,290

Reference Point: NW corner of waste site.

ELEVATIONS:

Surface: 472 ft (143.9 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 132-B-5
SITE NAME: 115-B/C Gas Recirculation Building

WASTE SITE DIMENSIONS:

Length - 168 ft (51.2 m) [1]
Width - 85 ft (25.9 m) [1]
Depth - 11 ft (3.4 m) [1]
Slopes - Vertical [9]
Orientation - Long axis oriented E-W [2]

The top of the existing structure is 3 ft (0.9 m) below grade and is covered with clean backfill [1].

CONTAMINATED VOLUME DIMENSIONS:

Assume no contaminated volume [10].

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - N/A

WASTE SITE LOCATION:

Northing: 144,441
Easting: 565,344

Reference Point: Northeast corner of waste site

ELEVATIONS:

Surface: 472 ft (143.9 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 118-B-5
SITE NAME: Ball 3X Burial Ground

WASTE SITE DIMENSIONS:

Site is L-shaped with bottom dimensions from the SW corner (72 x 72 x 26 x 46 x 46 x 27 ft) (22 x 22 x 8 x 14 x 14 x 8.2 m)
Depth - 20 ft (6.1 m) [1]
Slopes - 1.0 H : 1.0 V [9].
Orientation - Oriented N-S [2]

Waste site has been covered with 5 ft (1.5 m) (mounded) of overburden [1]. Overburden is considered uncontaminated.

CONTAMINATED VOLUME DIMENSIONS:

No contamination extends beyond the limits of the site [9].

Contaminated dimensions are equal to waste site dimensions.

EXCAVATED VOLUME DIMENSIONS:

Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

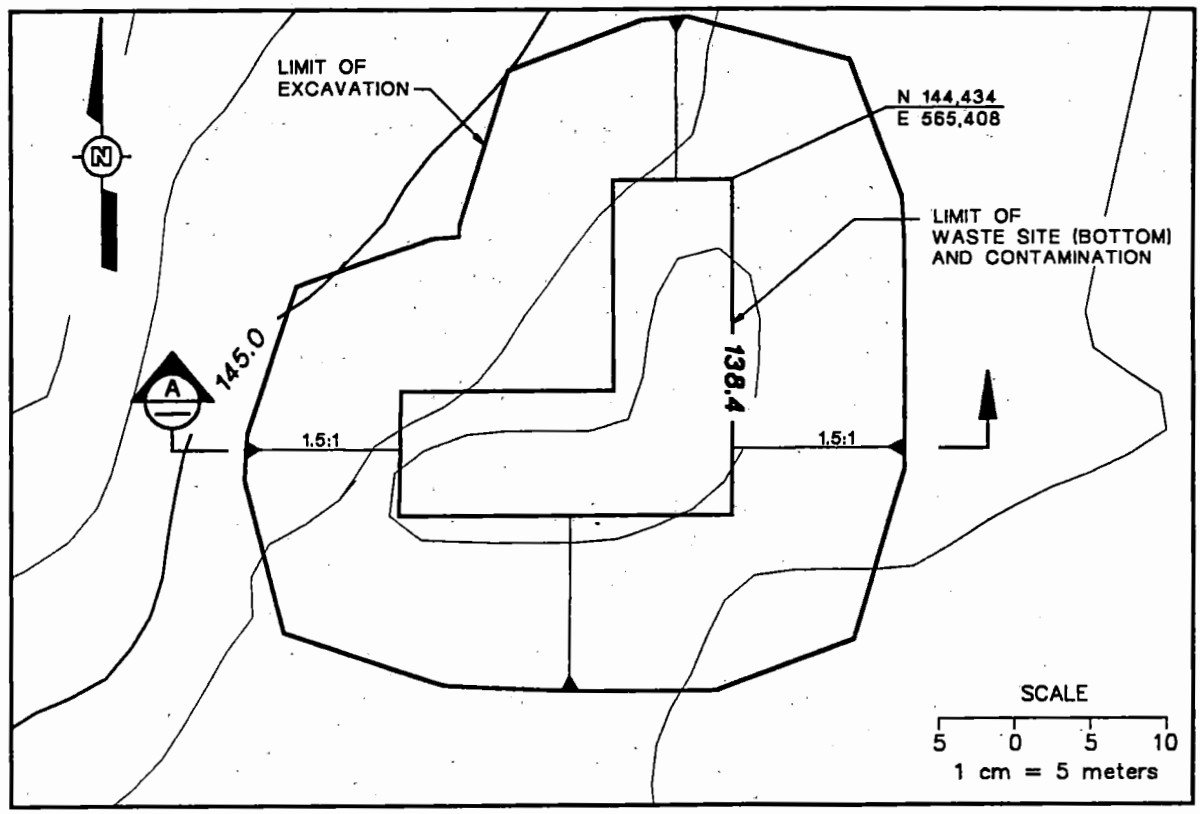
Northing: 145,395
Easting: 565,368

Reference Point: NW corner at surface

ELEVATIONS:

Surface: 476 ft (145.1 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Figure A-9 IRM Site: 118-B-5



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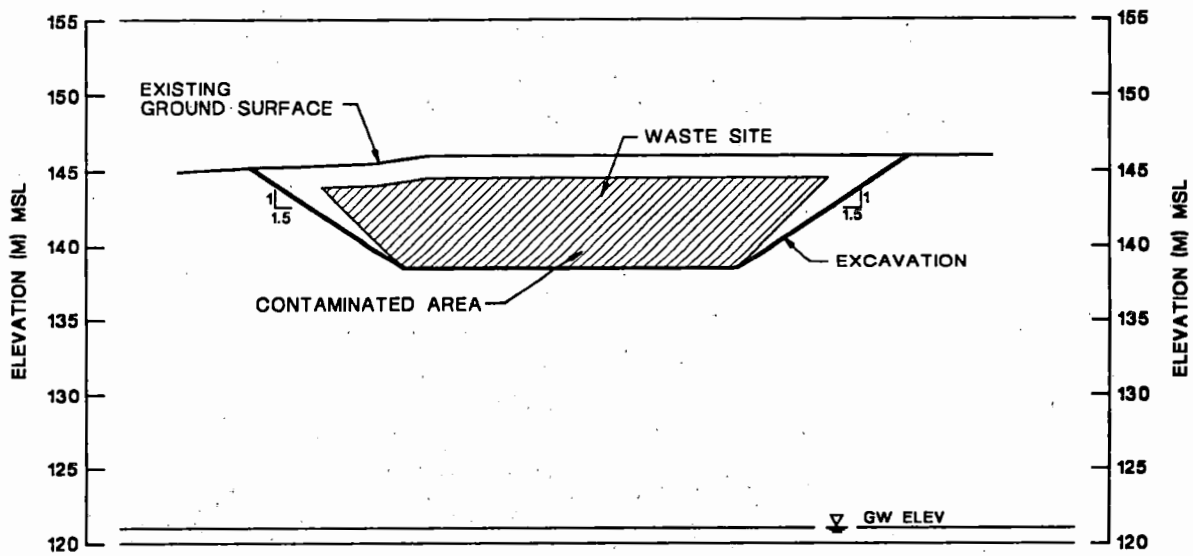


A SECTION

VERTICAL
EXAGGERATION = 1x

EXTENT OF CONTAMINATION

SURFACE AREA = 907 sq. meters
VOLUME = 3,297 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,505 sq. meters
VOLUME = 5,973 cu. meters

118B5

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 118-B-7
SITE NAME: 111-B Solid Waste Burial Ground

WASTE SITE DIMENSIONS:

Length - 8 ft (2.4 m) along bottom [1]; 24 ft (7.3 m) along top [10]
Width - 8 ft (2.4 m) along bottom [1]; 24 ft (7.3 m) along top [10]
Depth - 8 ft (2.4 m) [1]
Slopes - 1.0 H : 1.0 V [9]
Orientation - Oriented N-S [2]

Waste site has been covered with 5 ft (1.5 m) (mounded) of backfill [1]. Backfill is considered uncontaminated.

CONTAMINATED VOLUME DIMENSIONS:

No contamination extends beyond the limits of the site [9]

Length - 8 ft (2.4 m) along bottom; 24 ft (7.3 m) along top
Width - 8 ft (2.4 m) along bottom; 24 ft (7.3 m) along top
Depth - 8 ft (2.4 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 8 ft (2.4 m) x 8 ft (2.4 m) at a depth of 8 ft (2.4 m) below grade (excluding overburden).
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

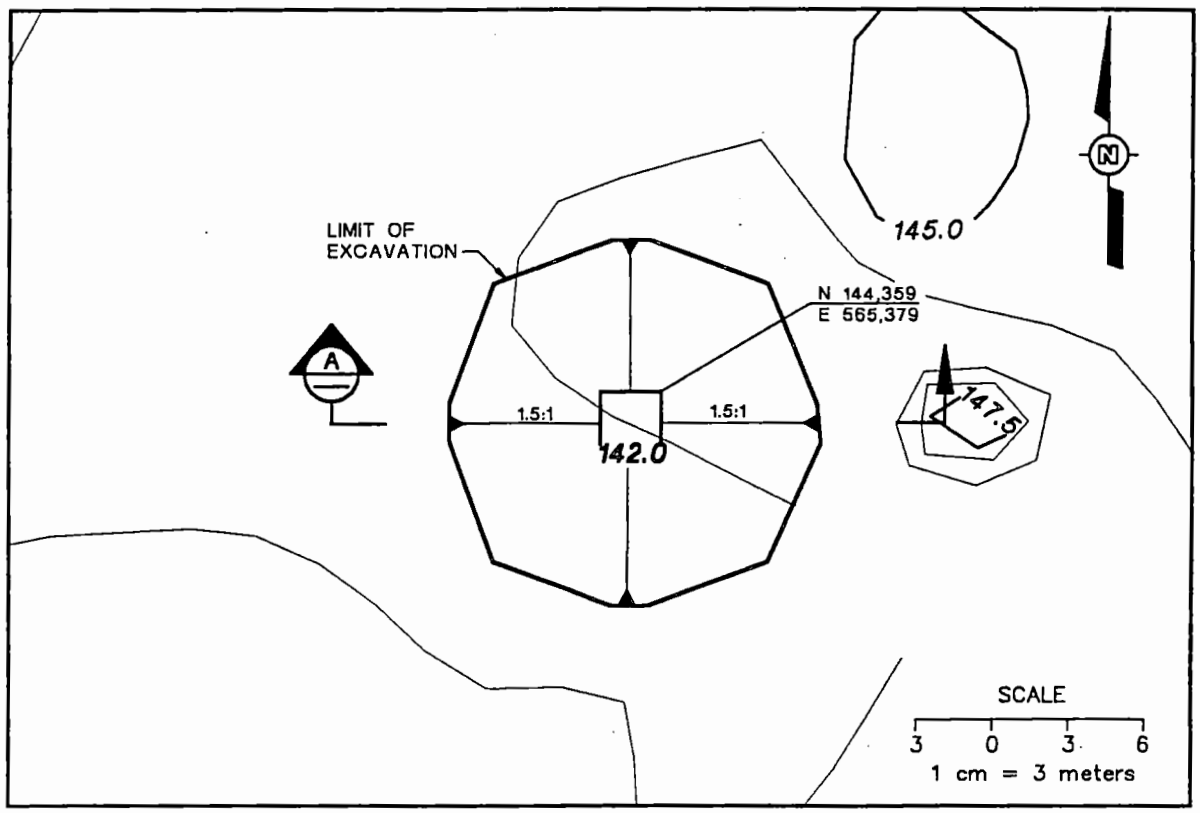
Northing: 145,359
Easting: 565,379

Reference Point: Northeast corner at surface

ELEVATIONS:

Surface: 476 ft (145.1 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Figure A-10 IRM Site: 118-B-7



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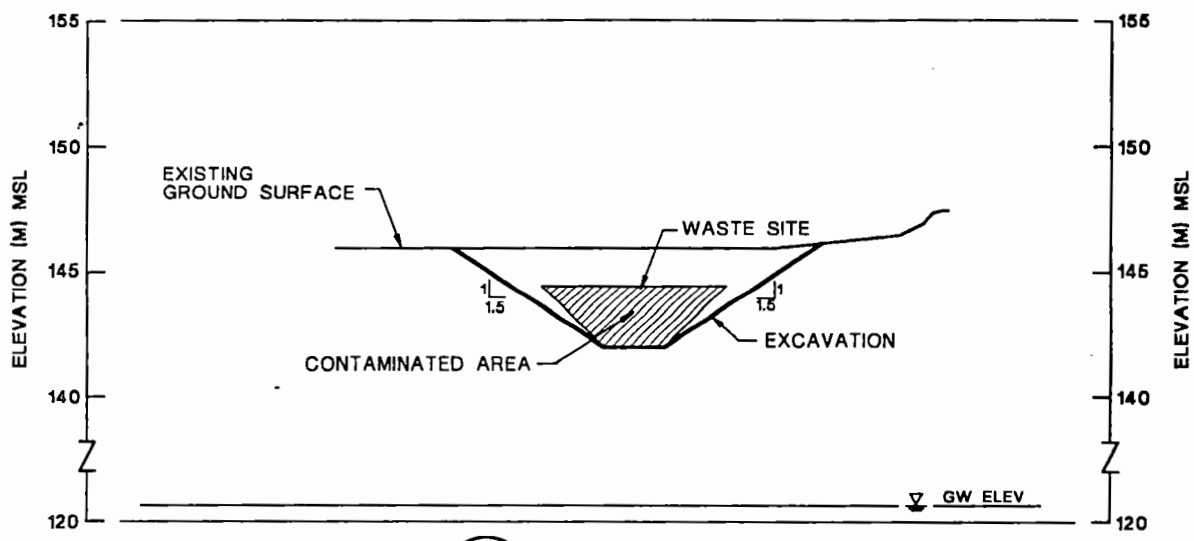


A SECTION

VERTICAL
EXAGGERATION = 1x

EXTENT OF CONTAMINATION

SURFACE AREA = 46 sq. meters
VOLUME = 61 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 164 sq. meters
VOLUME = 268 cu. meters

118B7

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: 118-B-10
SITE NAME: Pit/Burial Ground

WASTE SITE DIMENSIONS:

Length - 48 ft (14.6 m) along bottom [1]; 88 ft (26.8 m) along top [10]
Width - 18 ft (5.6 m) along bottom [1]; 58 ft (17.7 m) along top [10]
Depth - 20 ft (6.1 m)
Slopes - 1.0 H : 1.0 V [9]
Orientation - Oriented E-W [2]

Waste site has been covered with 8 ft (2.4 m) (3 ft [0.9 m] mounded) of backfill [1]. Backfill is considered uncontaminated.

CONTAMINATED VOLUME DIMENSIONS:

No contamination extends beyond the limits of the site [9].

Length - 48 ft (14.6 m) along bottom; 88 ft (26.8 m) along top
Width - 18 ft (5.5 m) along bottom; 58 ft (17.7 m) along top
Depth - From 8 ft (2.4 m) to 28 ft (8.5 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 48 ft (14.6 m) x 18 ft (5.6 m) at a depth of 28 ft (8.5 m)
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

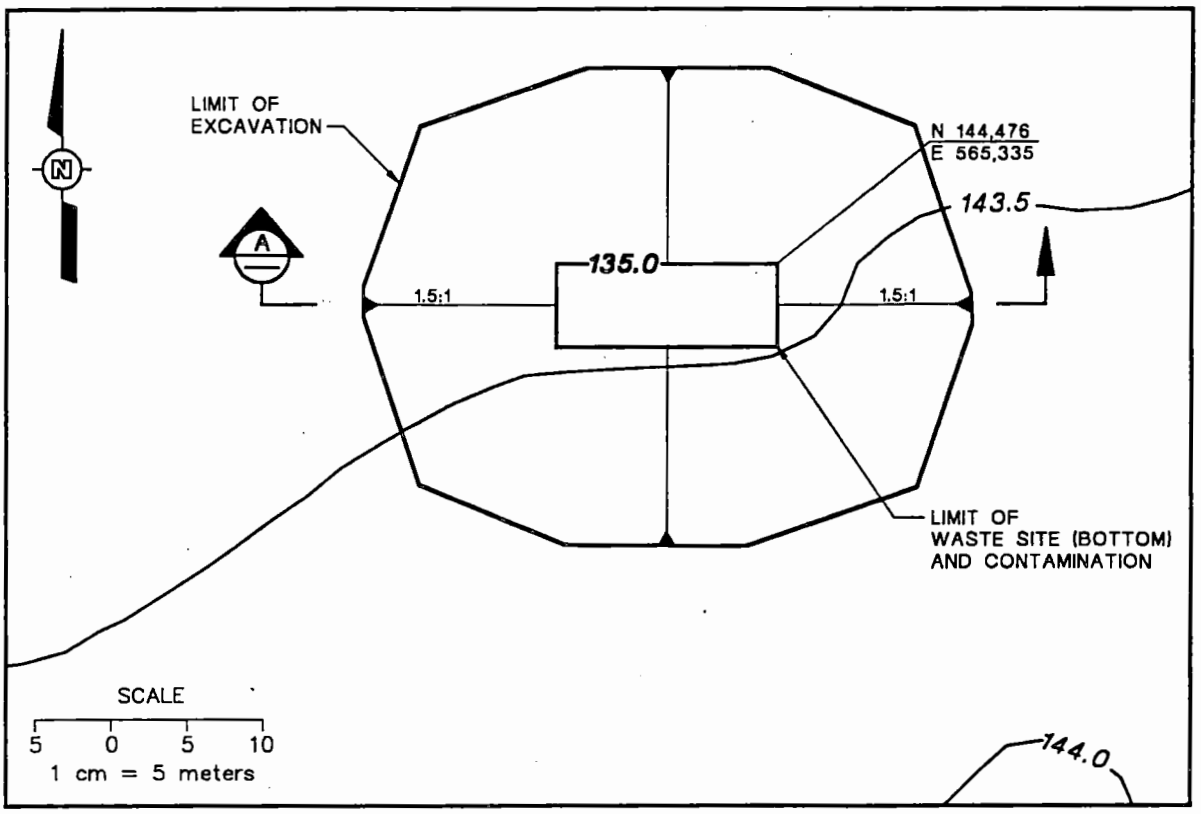
Northing: 145,477
Easting: 565,320

Reference Point: Northeast corner at bottom

ELEVATIONS:

Surface: 472 ft (143.9 m) [3]
Groundwater: 397 ft (121.0 m) [7]

Figure A-11 IRM Site: 118-B-10



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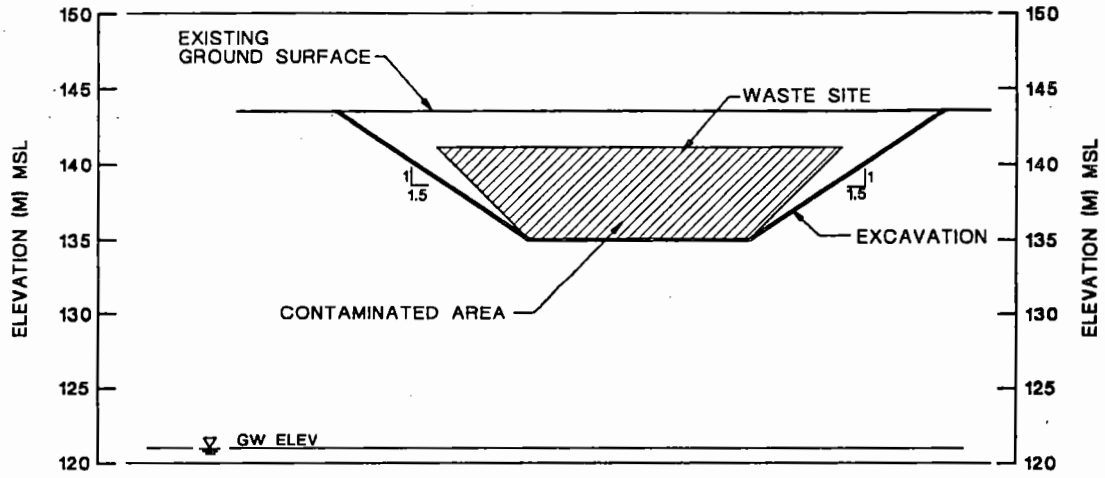


A SECTION

VERTICAL
EXAGGERATION = 1x

EXTENT OF CONTAMINATION

SURFACE AREA = 402 sq. meters
VOLUME = 1,346 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,045 sq. meters
VOLUME = 4,054 cu. meters

118B10

Volume Estimate
100-BC-1 Operable Unit

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

WASTE SITE DIMENSIONS:

Length - 10,650 ft (3,246 m) [2]
Width - 66 in (1.7 m) [2]
Length - 4,900 ft (1,494 m) [2]
Width - 60 in (1.5 m) [2]
Length - 440 ft (134 m) [2]
Width - 54 in (1.4 m) [2]
Length - 2,350 ft (716 m) [2]
Width - 48 in (1.2 m) [2]
Length - 1,050 ft (320 m) [2]
Width - 42 in (1.1 m) [2]
Length - 1,520 ft (463 m) [2]
Width - 24 in (.6 m) [2]
Length - 524 ft (160 m) [2]
Width - 18 in (.5 m) [2]

CONTAMINATED VOLUME DIMENSIONS:

Soil around pipe. See Pipeline Leak at B/C Junction Box.

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 (0.6 m) on each side of the pipe and begins 3 inches below invert of pipe.

Excavation Slopes - 1.5 H : 1.0 V

WASTE SITE LOCATION:

See figure.

ELEVATIONS:

See figure.

Volume Estimate
100-BC-1 Operable Unit

SITE NUMBER: N/A
SITE NAME: Pipeline Leak at B/C Junction Box

WASTE SITE DIMENSIONS:

The contamination is associated with a leak around a 54" steel pipeline and the associated junction box leading to the 116-C-5 Retention Basins [5].

Assume pipeline is in a gravel bed 3 in. below, 6 in. above and 2 ft on either side of the pipe. Assume top of gravel bed is 15 ft below grade.

Pipeline is in a trench with 1 H : 1 V side slopes.

CONTAMINATED VOLUME DIMENSIONS:

Assume contamination has spread throughout the gravel bed and then downward below the site.

Length - 250 ft (76.2 m)
Width - 19 ft (5.8 m)
Depth - 10 ft (3 m); from 15 ft (4.6 m) to 25 ft (7.6 m) below grade

EXCAVATED VOLUME DIMENSIONS:

Bottom of excavation is 250 ft (76.2 m) x 19 ft (5.8 m) at a depth of 25 ft (7.6 m) below grade.
Excavation Slopes - 1.5 H : 1.0 V
See attached figure for excavation top dimensions.

WASTE SITE LOCATION:

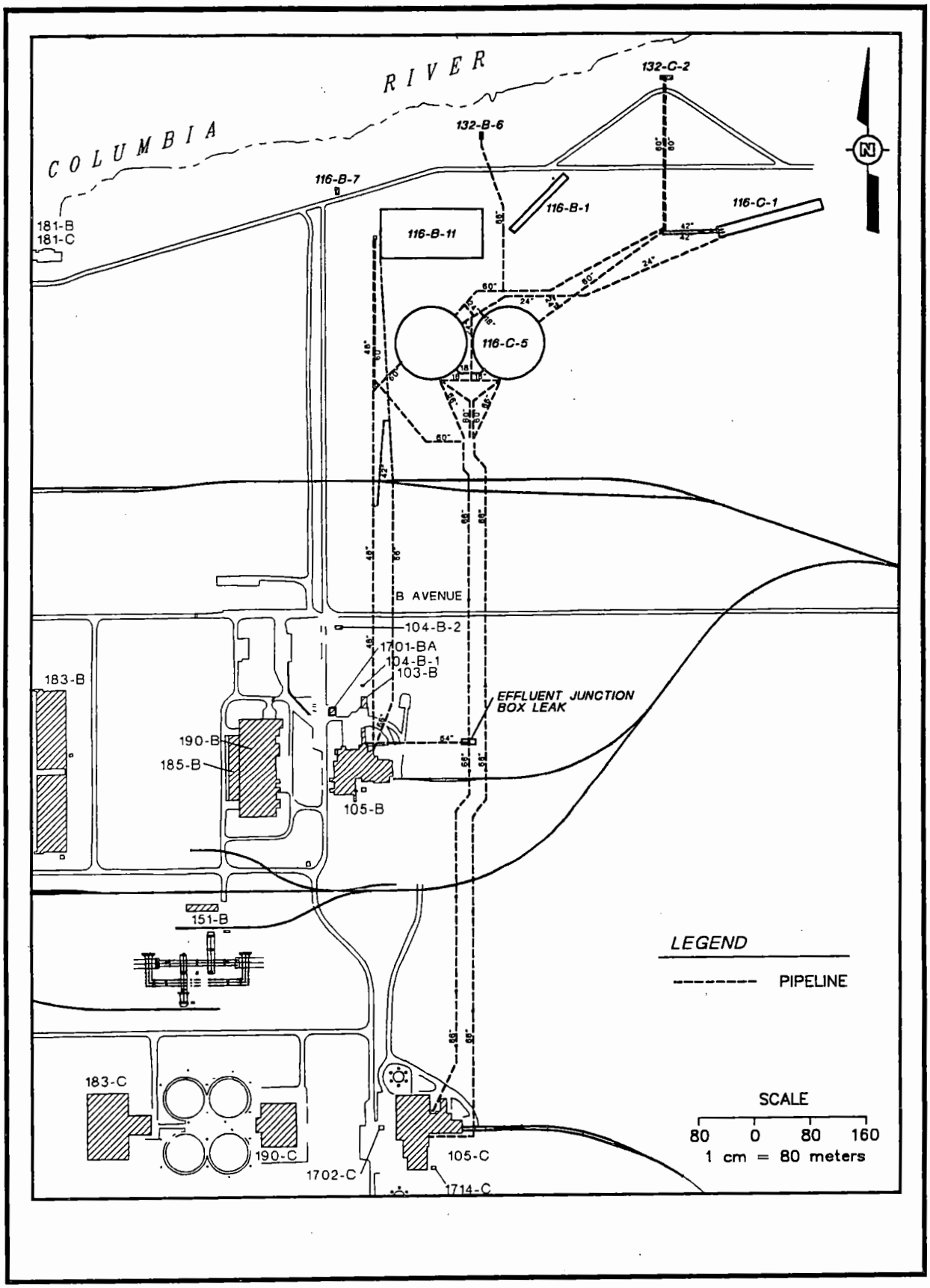
Northing: 144,551
Easting: 565,440

Reference Point: Junction Box

ELEVATIONS:

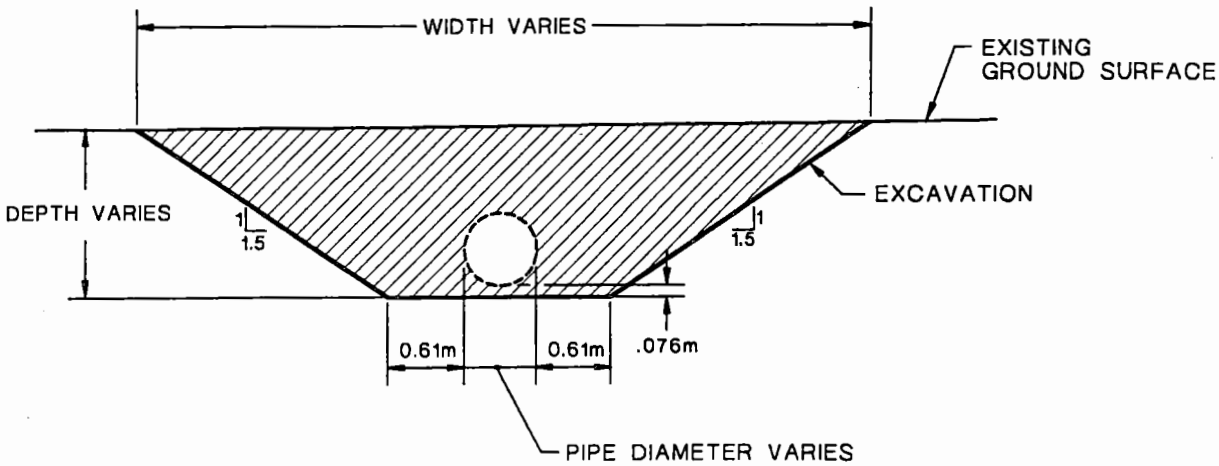
Surface: 466 ft (142 m) [10]
Groundwater:

Figure A-12 IRM Site: 100 B/C Pipelines



100BCPLN

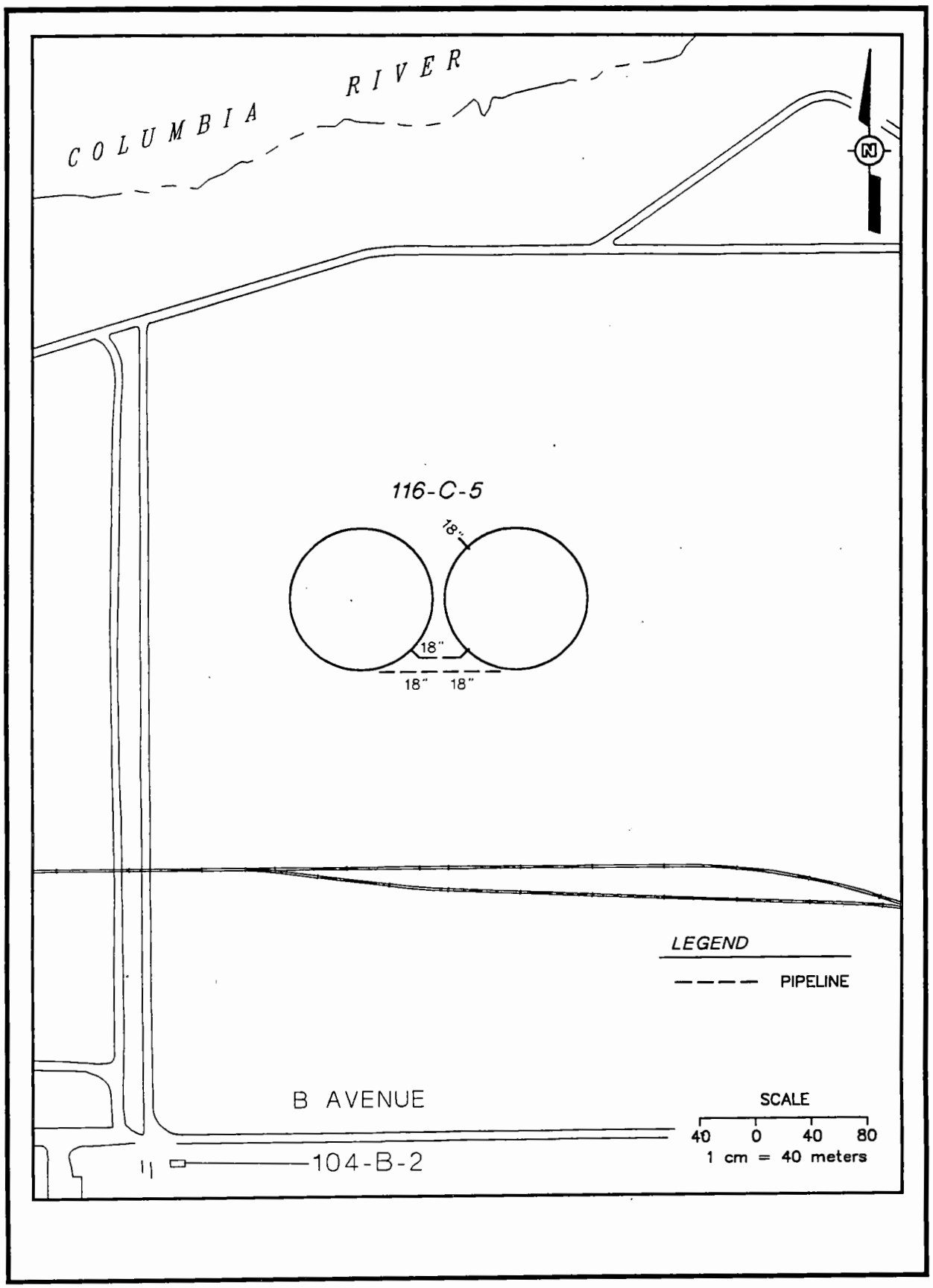
Figure A-13 Typical Pipeline Excavation Cross Section



TYPICAL CROSS SECTION

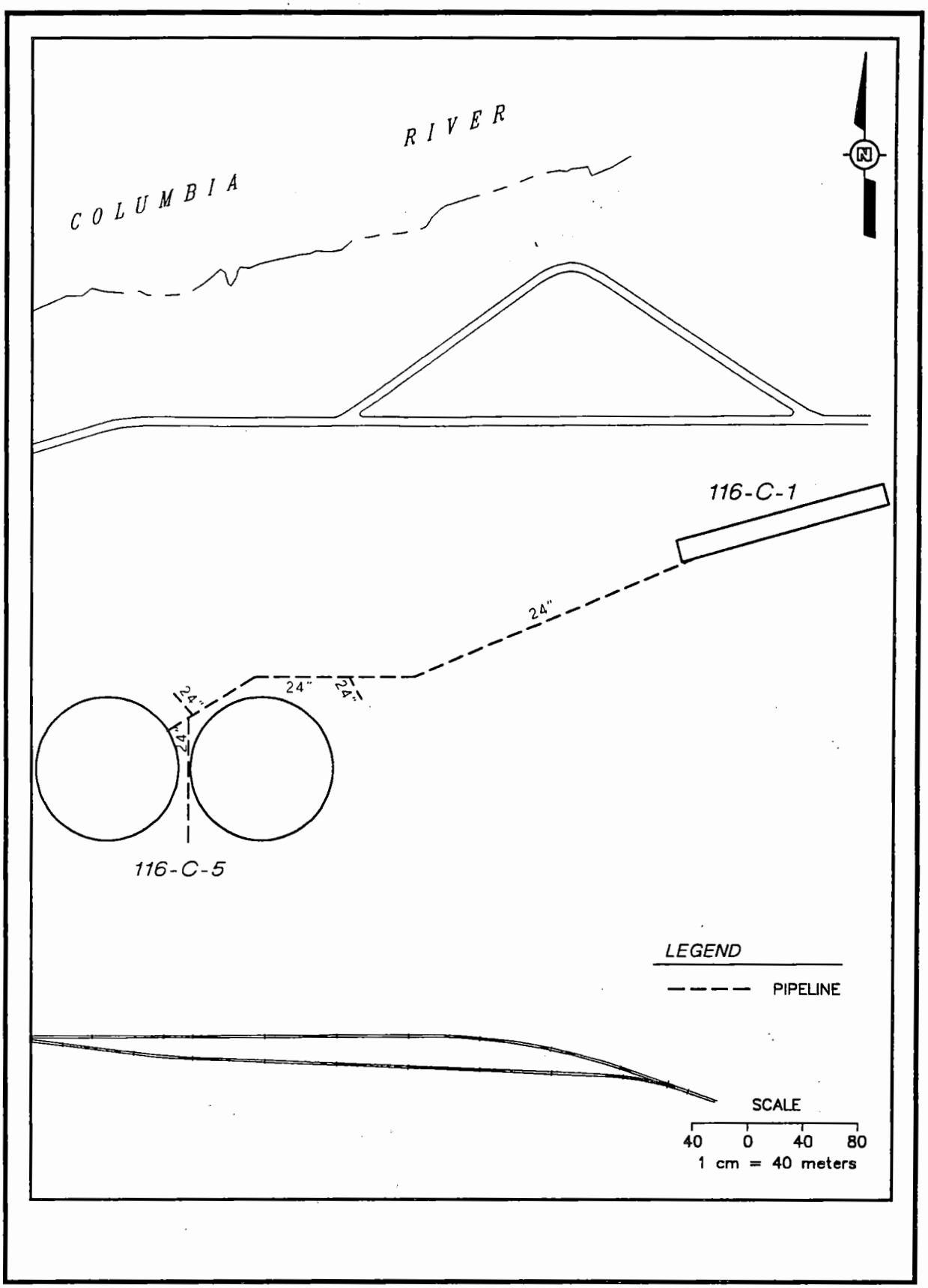
PEXSEC

Figure A-14 100 B/C 18 inch Pipelines



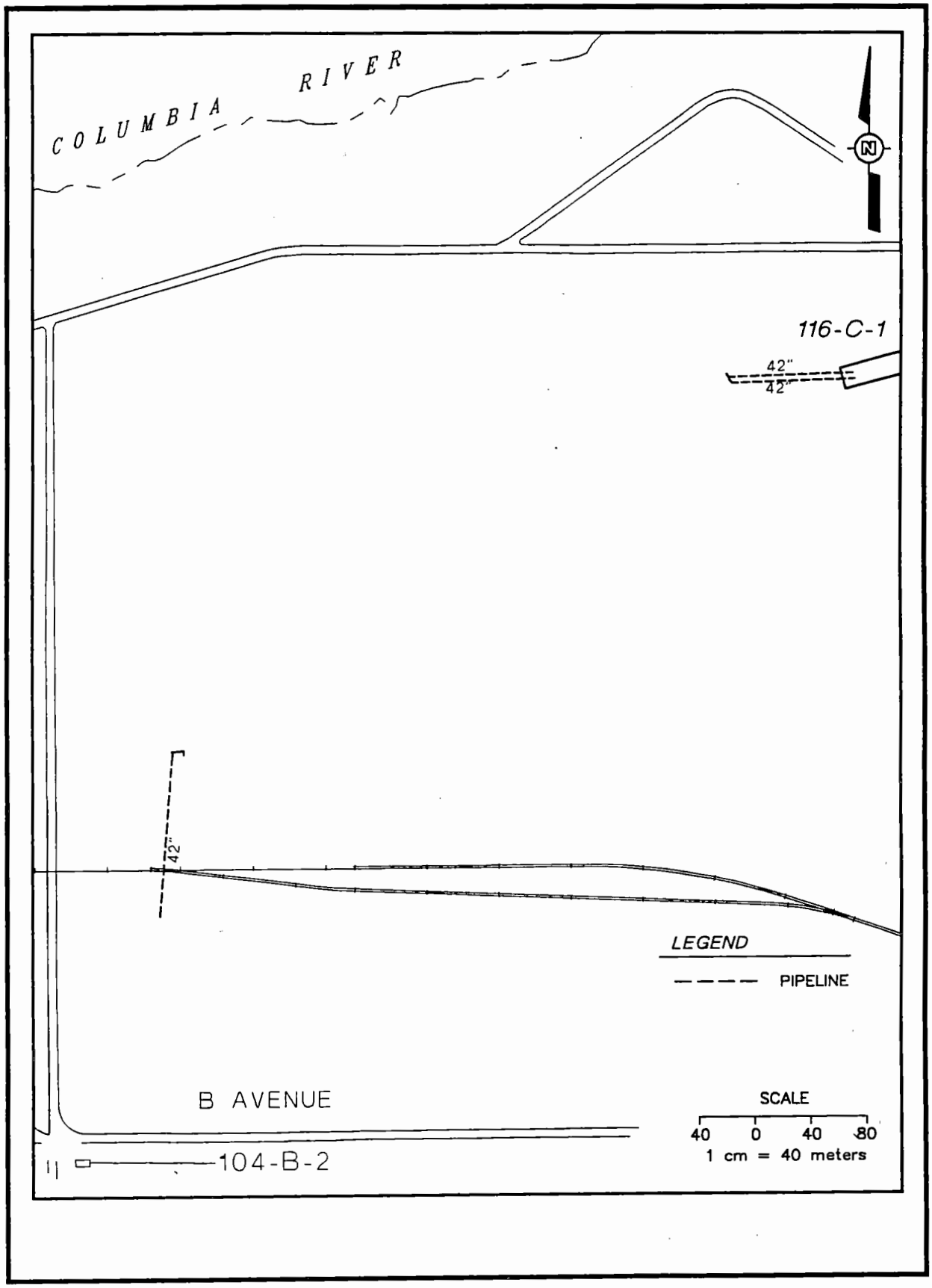
PLN18

Figure A-15 100 B/C 24 inch Pipelines



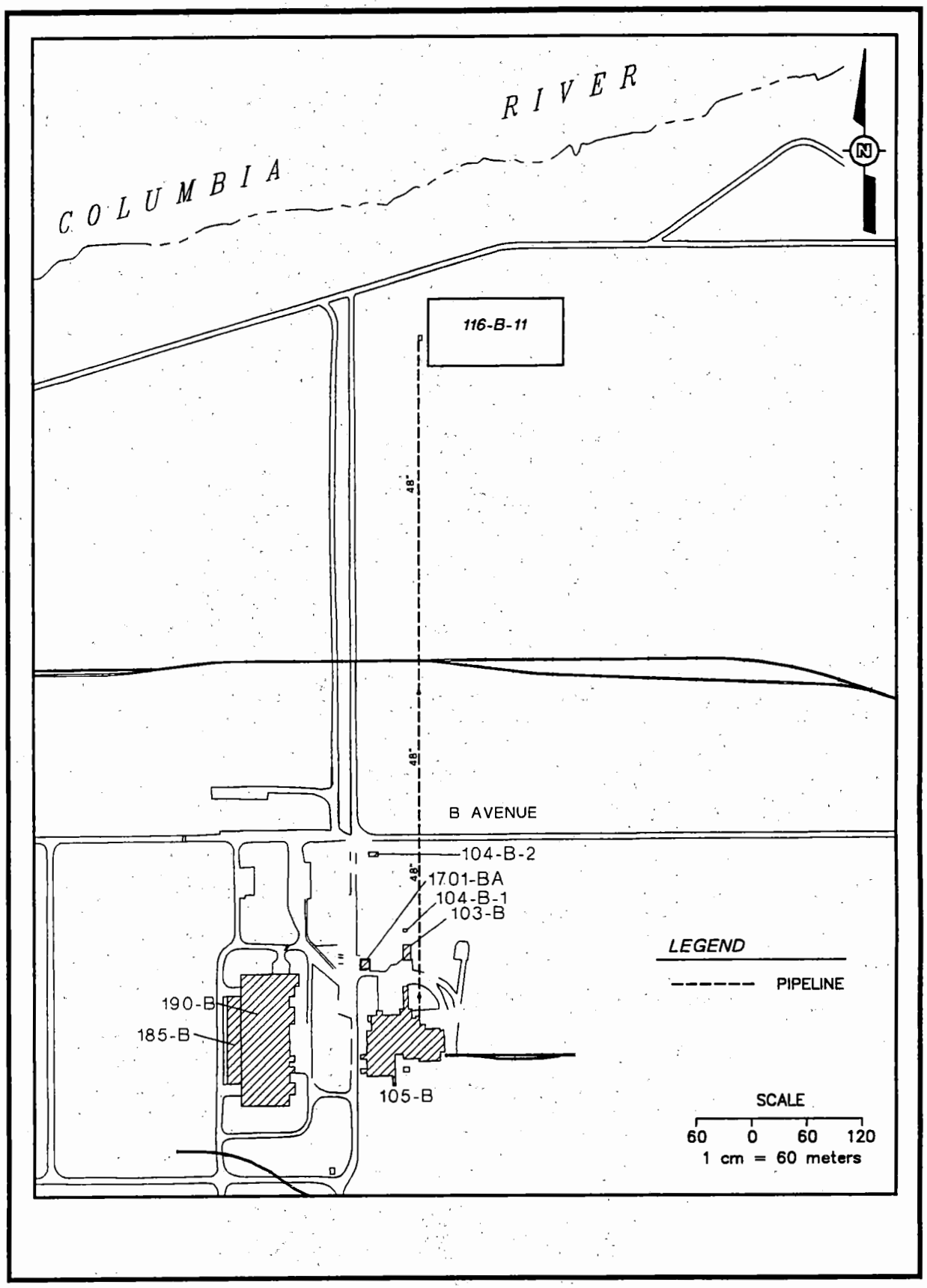
PLN24

Figure A-16 100 B/C 42 inch Pipelines



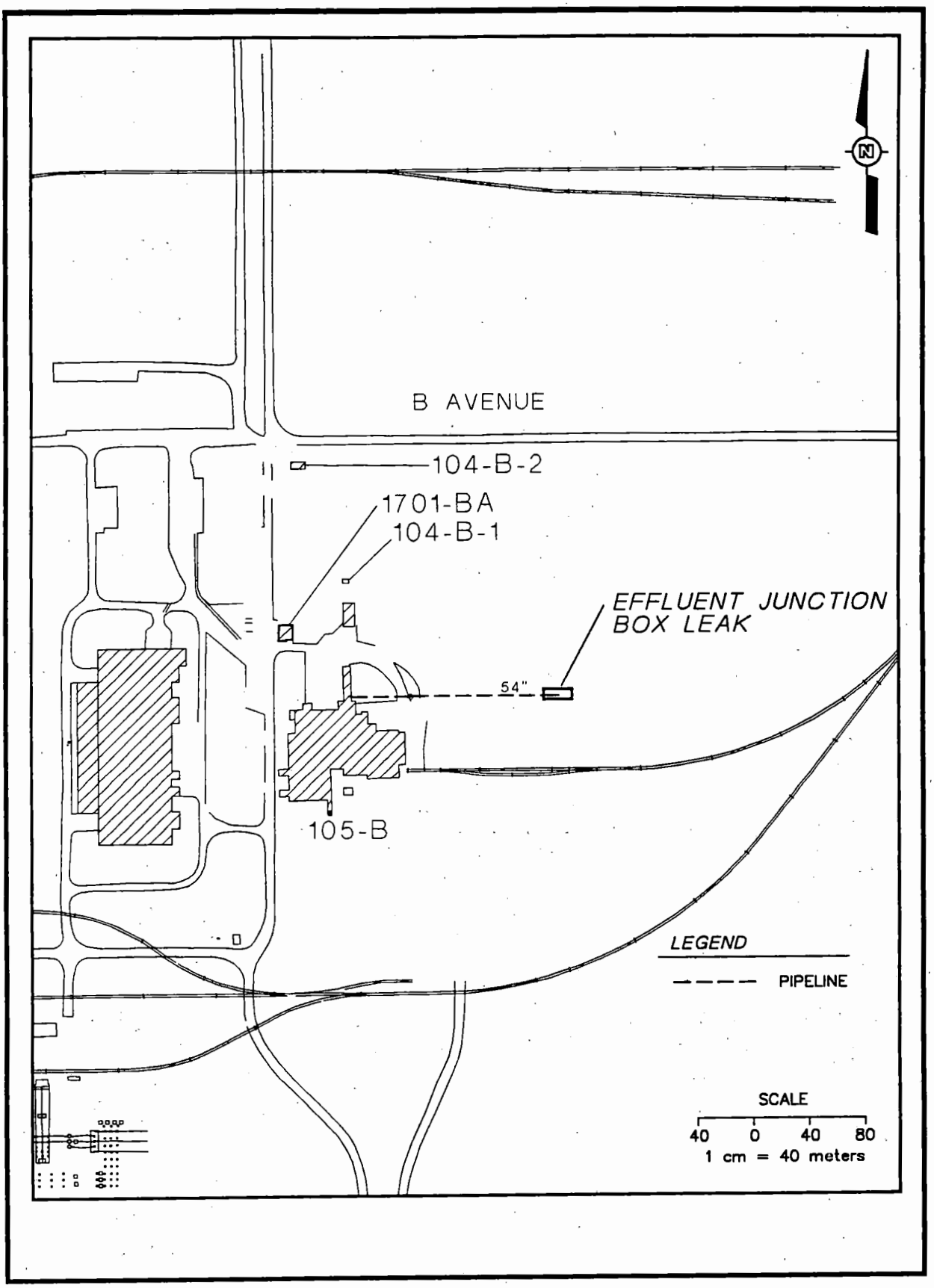
PLN42

Figure A-17 100 B/C 48 inch Pipelines



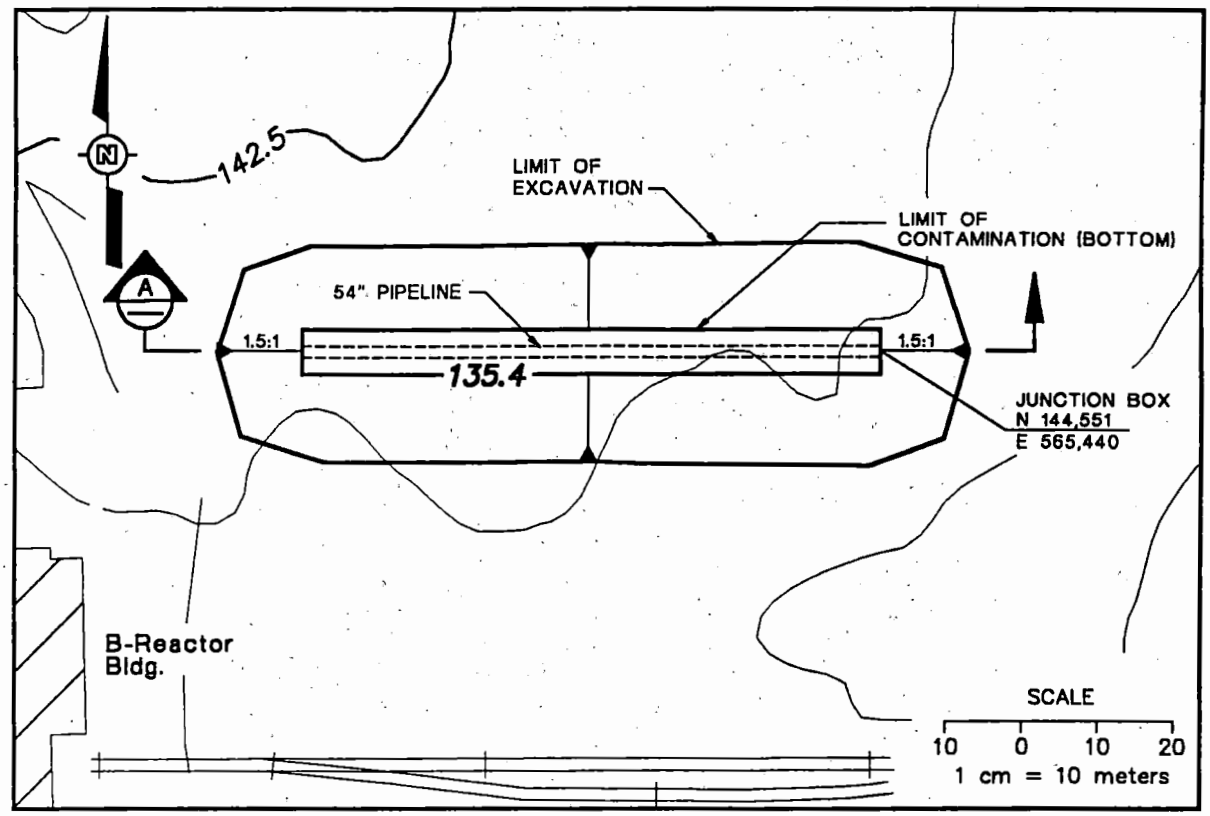
PLN48

Figure A-18 100 B/C 54 inch Pipelines

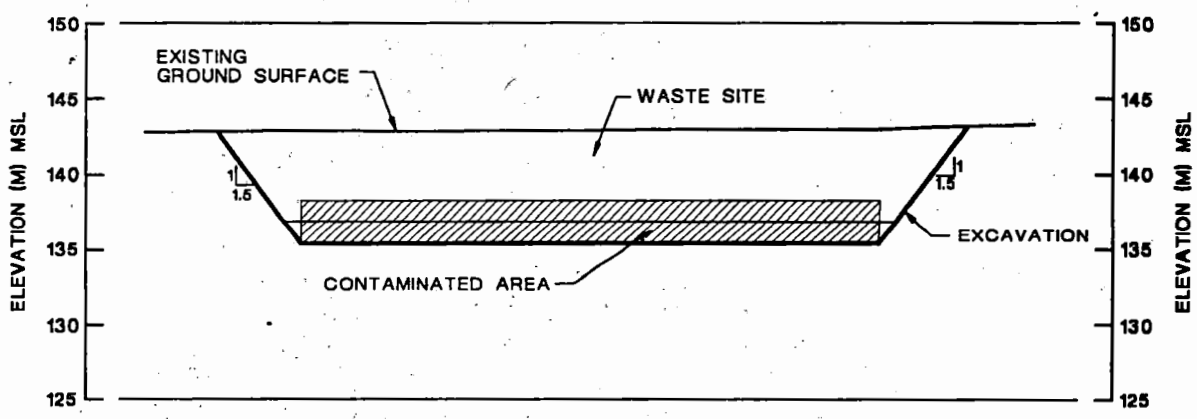


PLN54

Figure A-19 100 B/C 54 inch Pipeline at Junction Box Leak



PLAN



A SECTION

VERTICAL EXAGGERATION = 2x

EXTENT OF CONTAMINATION

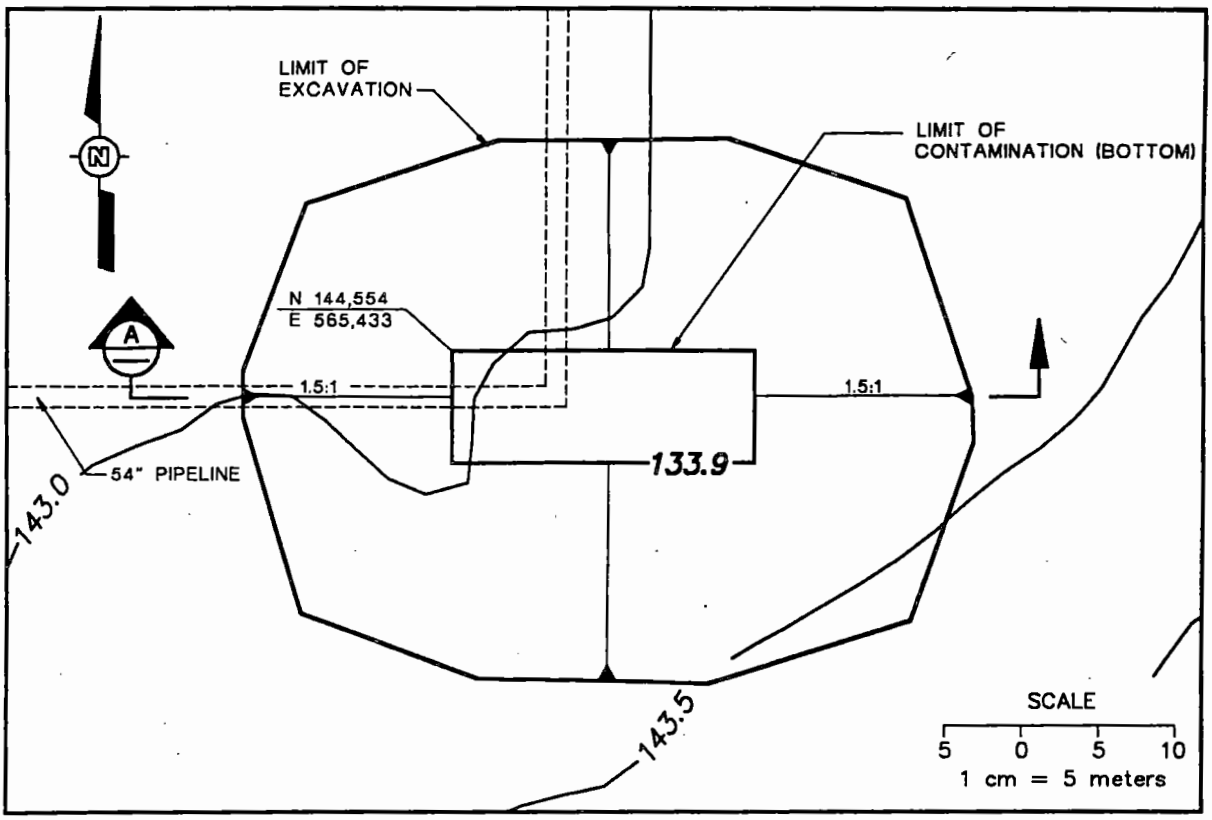
SURFACE AREA = 441 sq. meters
VOLUME = 1,325 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 2,637 sq. meters
VOLUME = 11,117 cu. meters

54LEAK

Figure A-20 100 B/C Junction Box Leak



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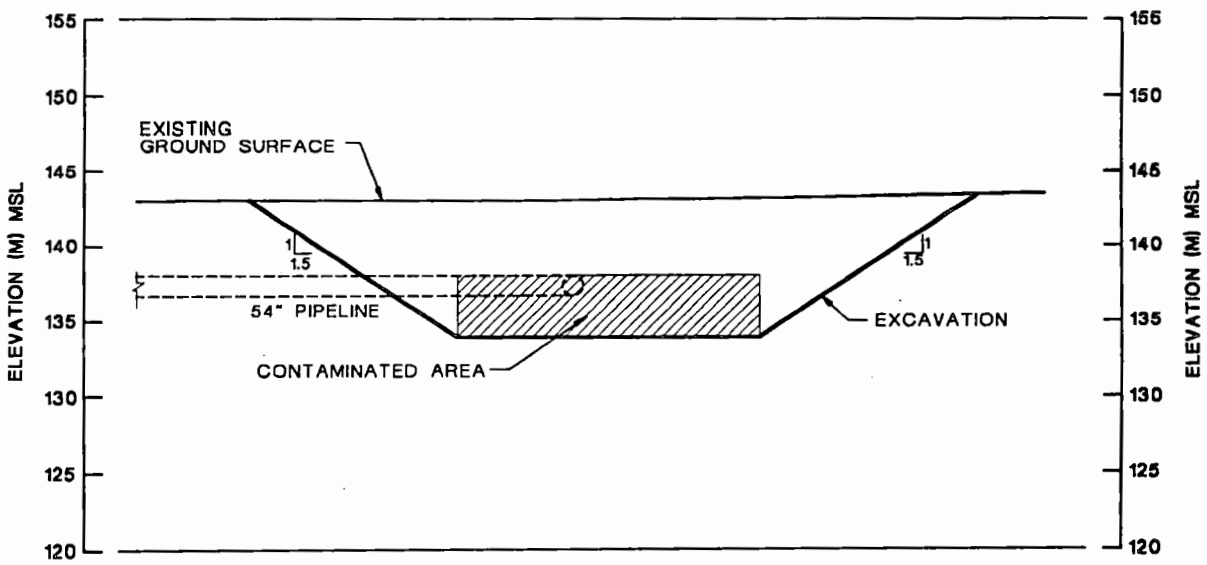


A SECTION

VERTICAL
EXAGGERATION = 1x

EXTENT OF CONTAMINATION

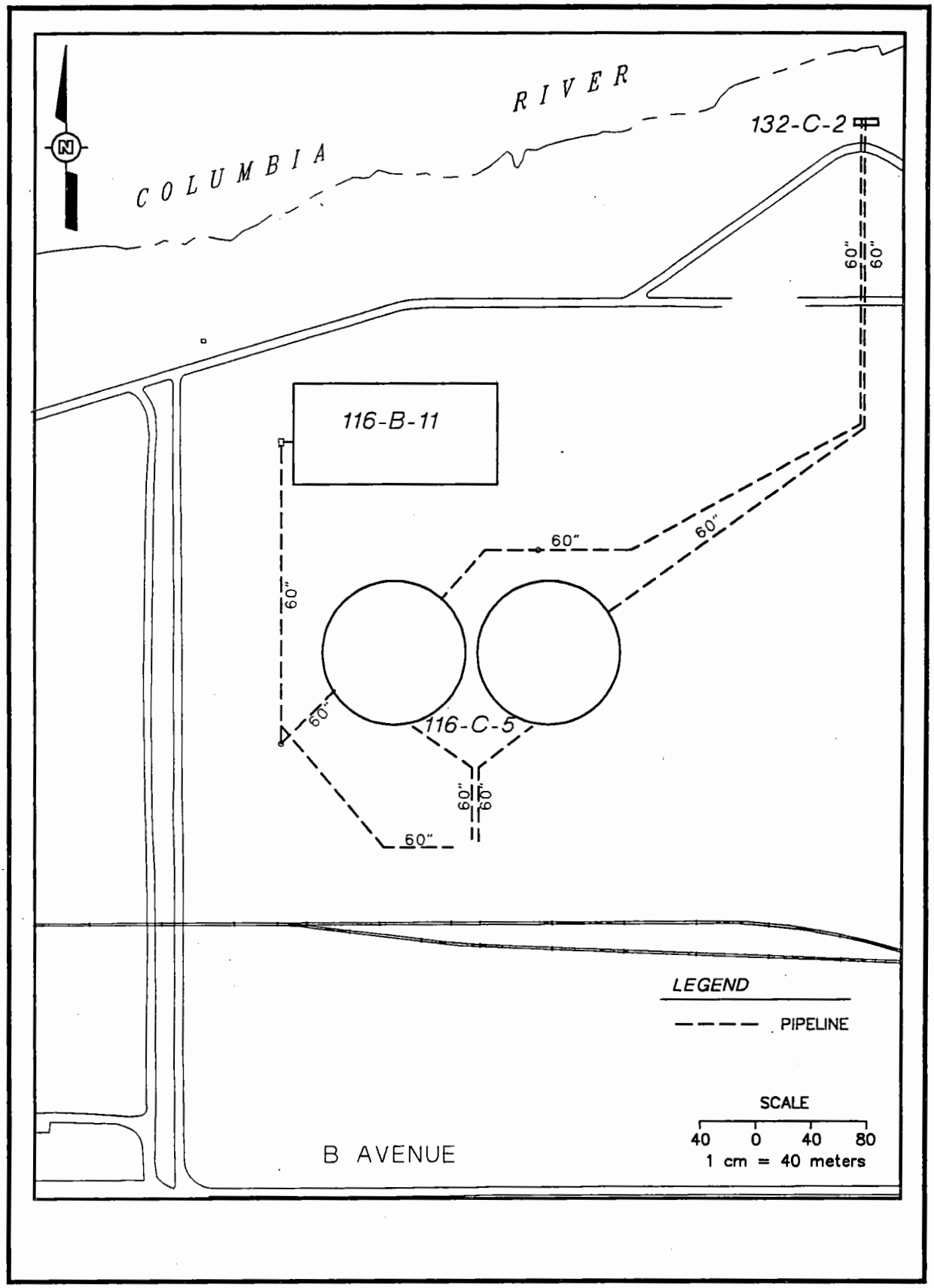
SURFACE AREA = 144 sq. meters
VOLUME = 665 cu. meters

EXTENT OF EXCAVATION

SURFACE AREA = 1,413 sq. meters
VOLUME = 6,358 cu. meters

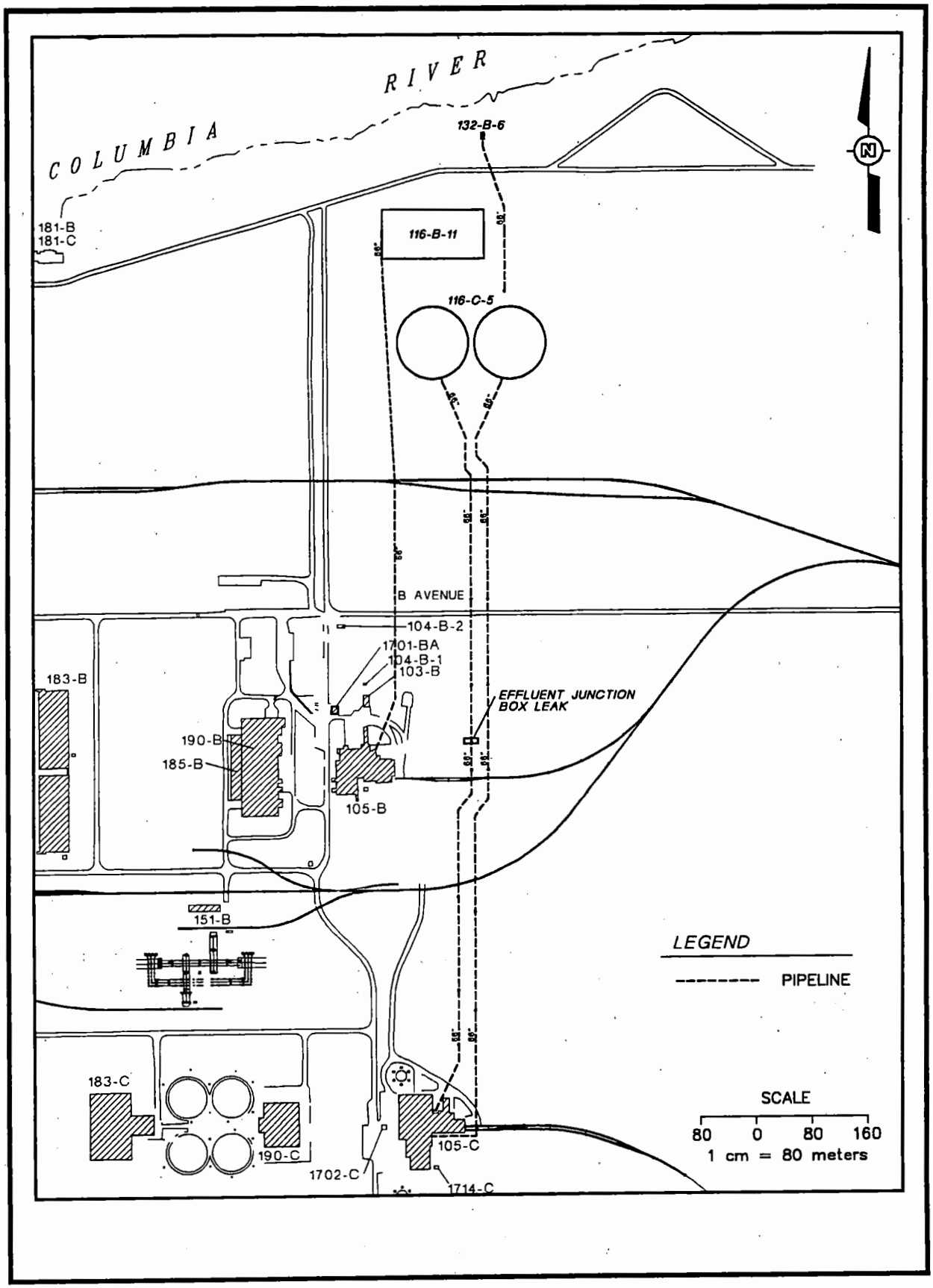
54JUNC

Figure A-21 100 B/C 60 inch Pipelines



PLN60

Figure A-22 100 B/C 66 inch Pipelines



PLN66

APPENDIX B

100-BC-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.

Figure B-1 116-B-11 Retention Basin Disposal Cost Comparison

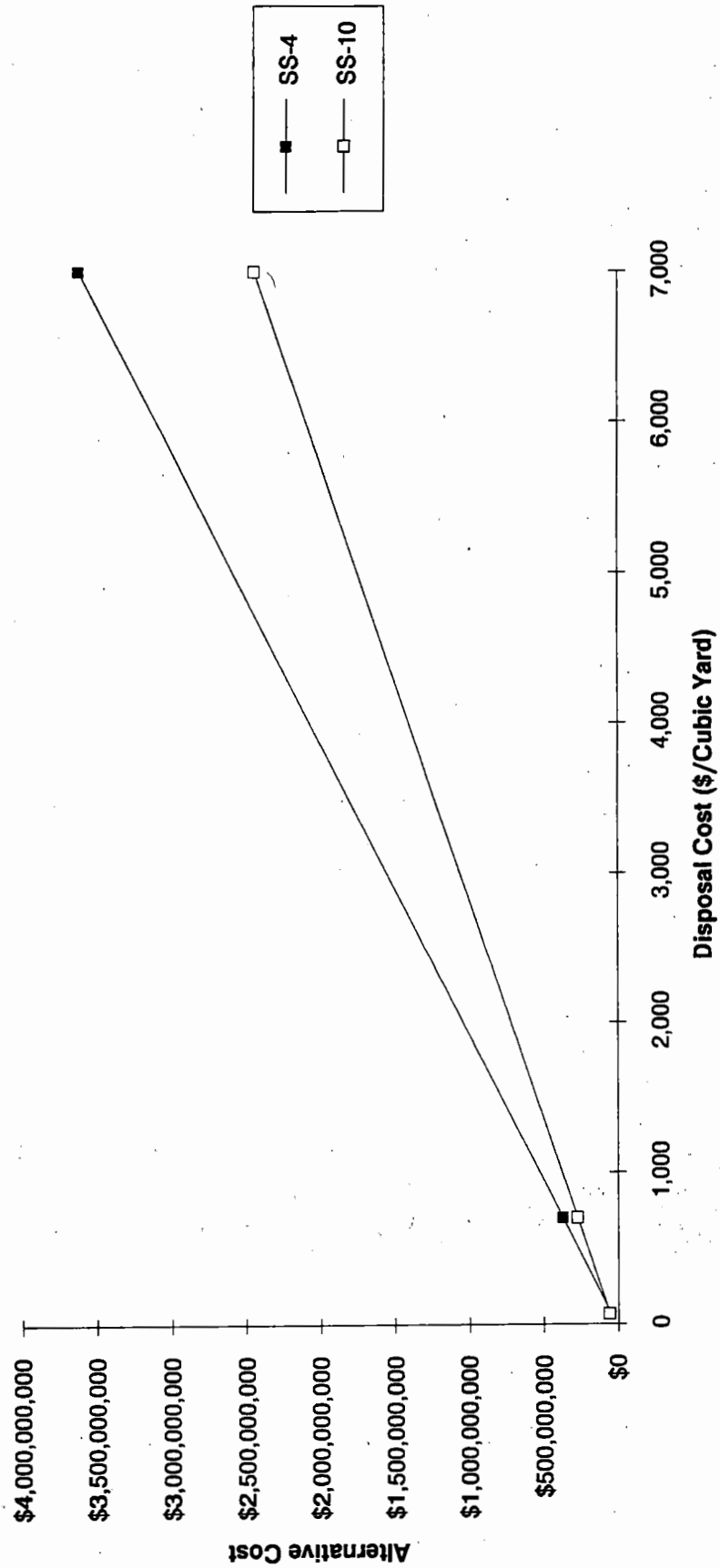

Figure B-2 116-C-5 Retention Basin Disposal Cost Comparison

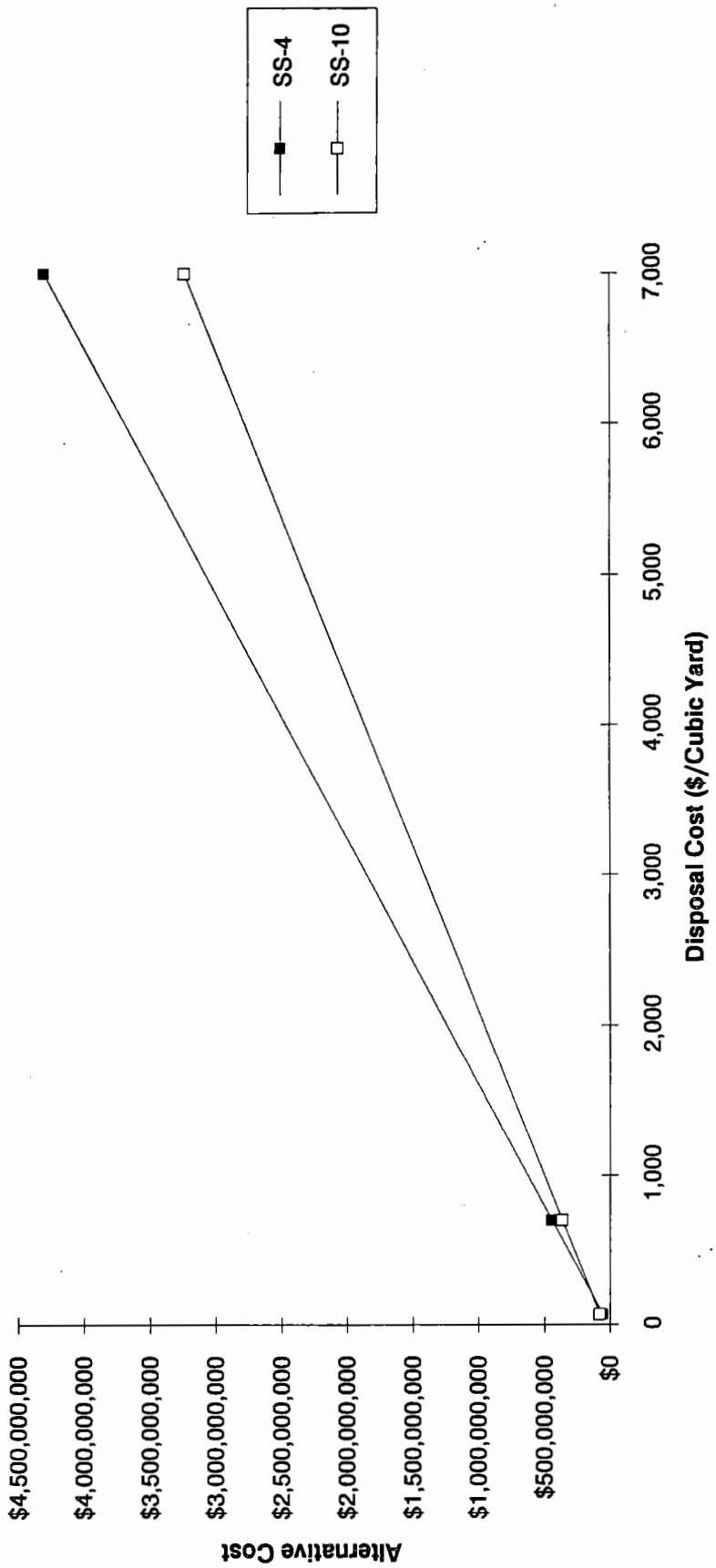

Figure B-3 Pipeline Disposal Cost Comparison

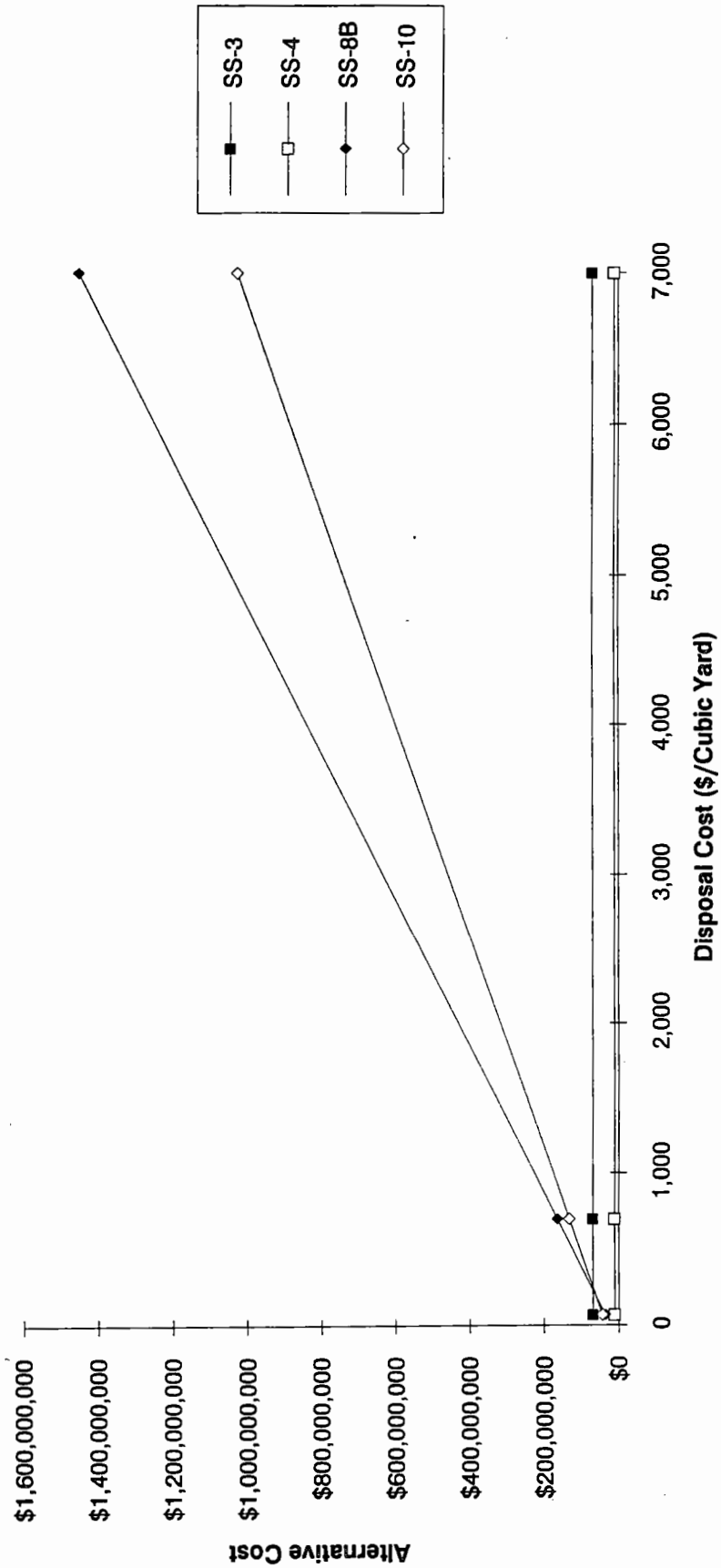

Figure B-4 116-B-1 Process Effluent Trench Disposal Cost Comparison

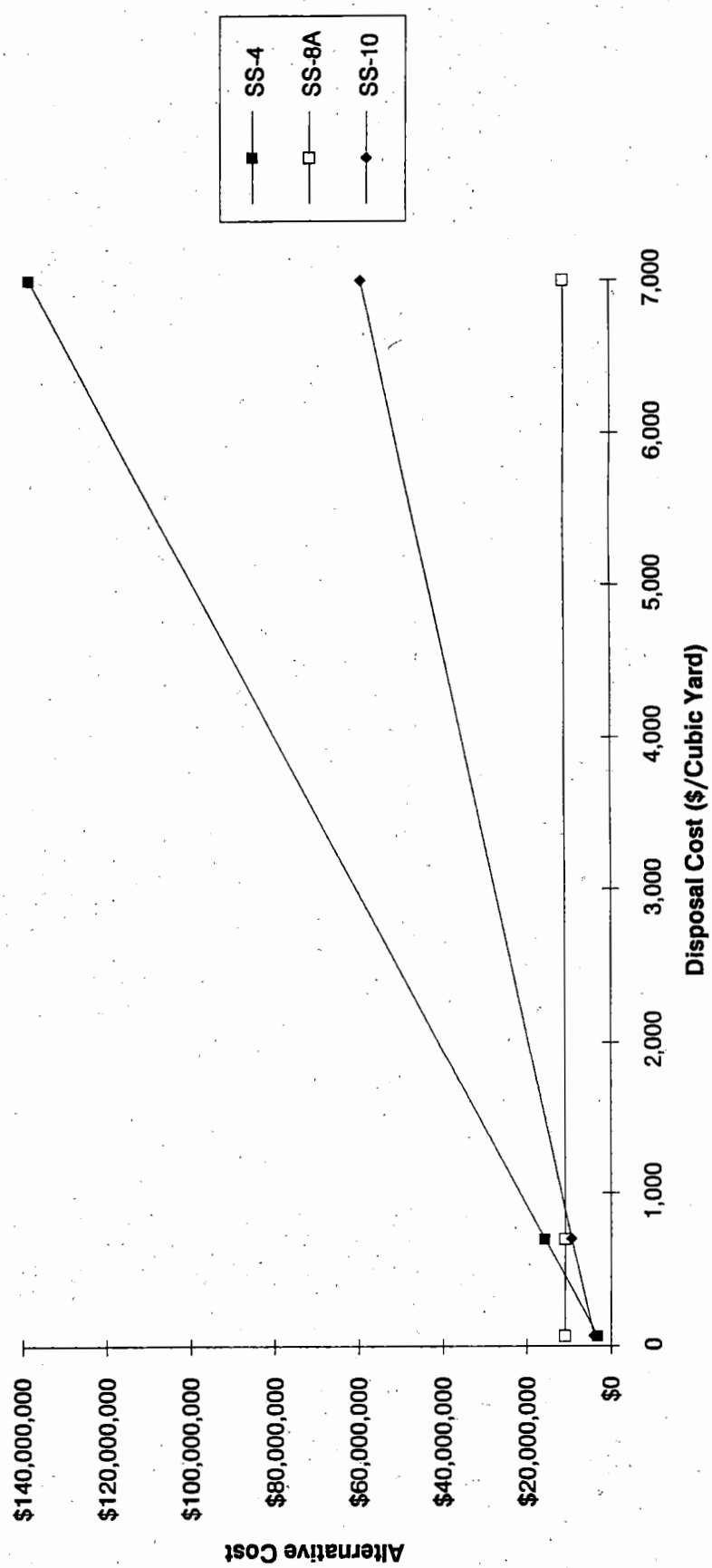

Figure B-5 116-C-1 Process Effluent Trench Disposal Cost Comparison

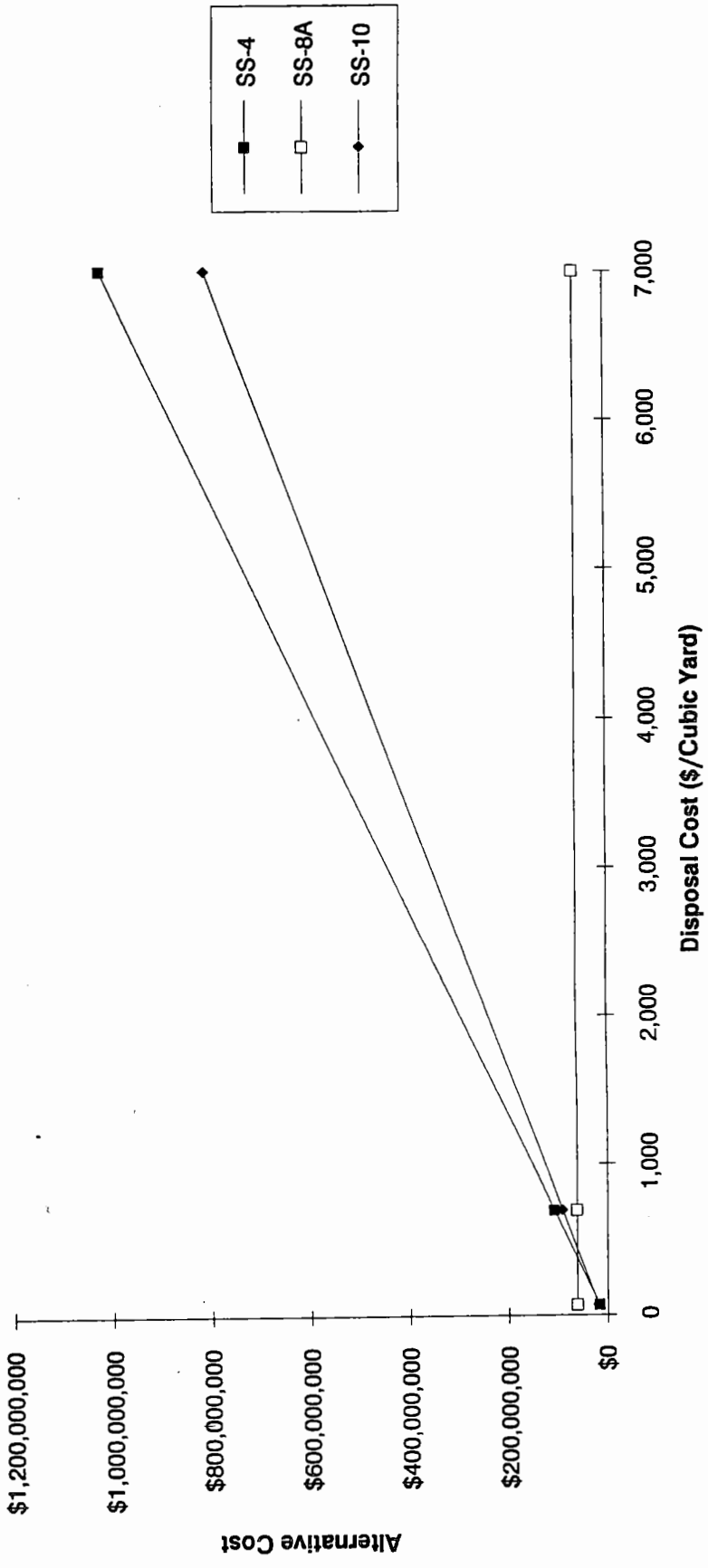

Figure B-6 116-B-13 Sludge Trench Disposal Cost Comparison

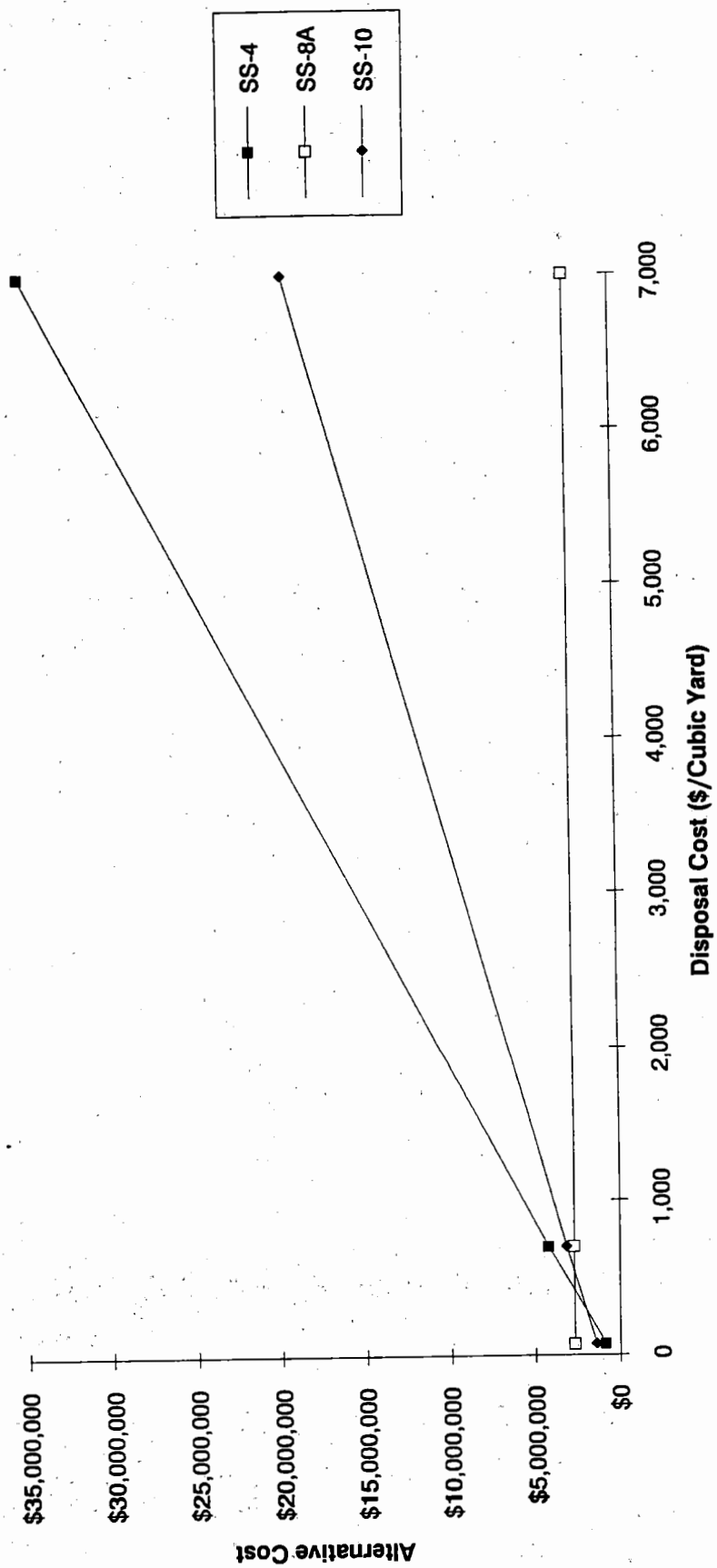

Figure B-7 116-B-14 Sludge Trench Disposal Cost Comparison

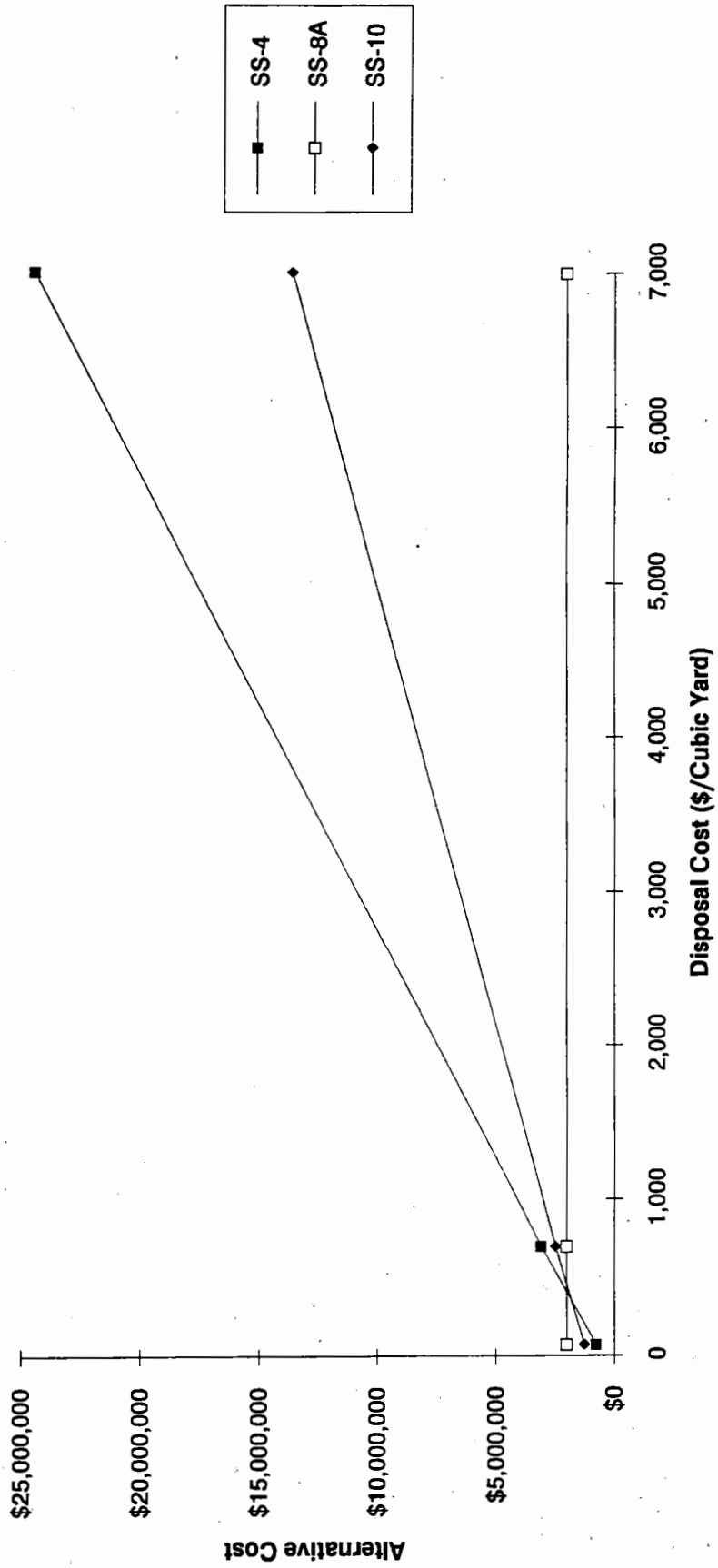

Figure B-8 116-B-4 French Drain Disposal Cost Comparison

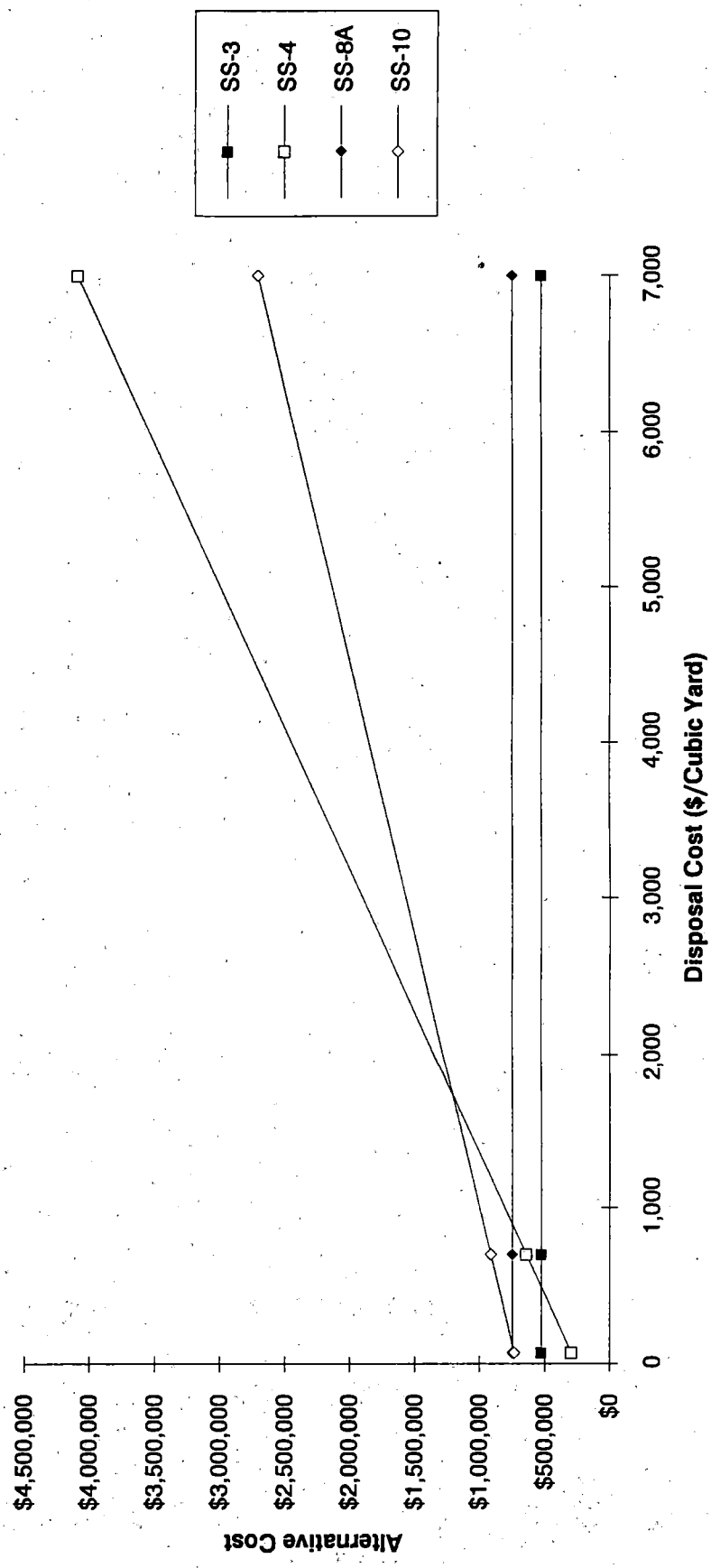

Figure B-9 116-B-5 Crib Disposal Cost Comparison

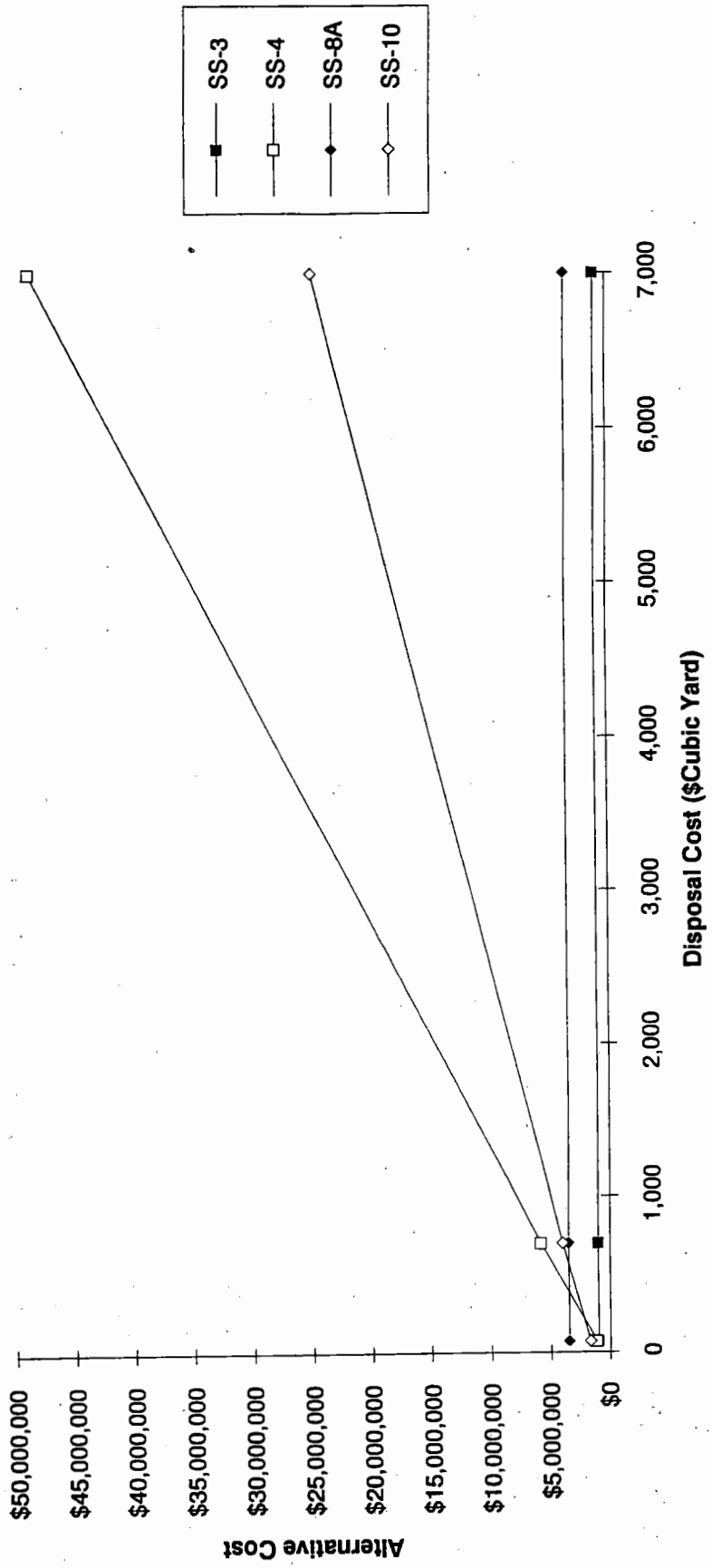

Figure B-10 118-B-5 Burial Ground Disposal Cost Comparison

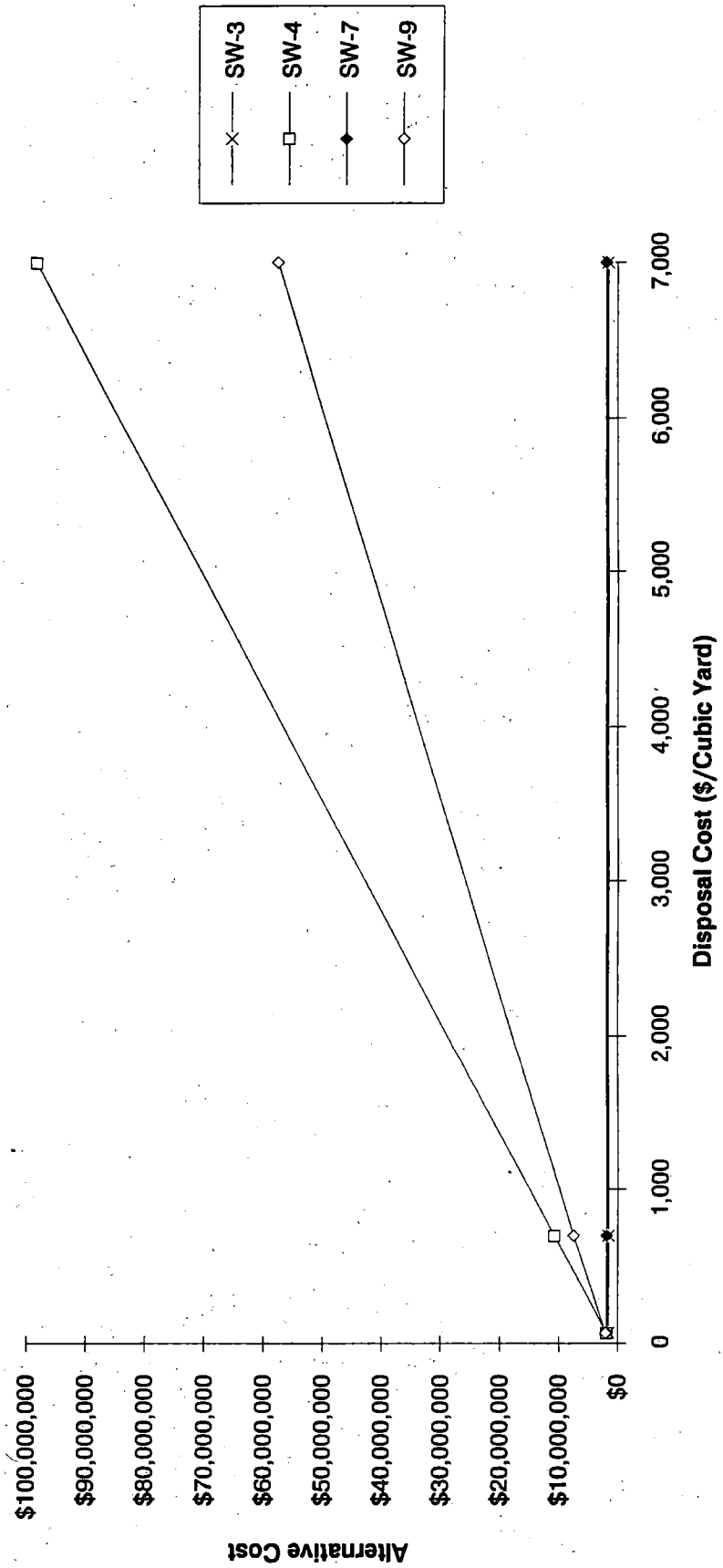

Figure B-11 118-B-7 Burial Ground Disposal Cost Comparison

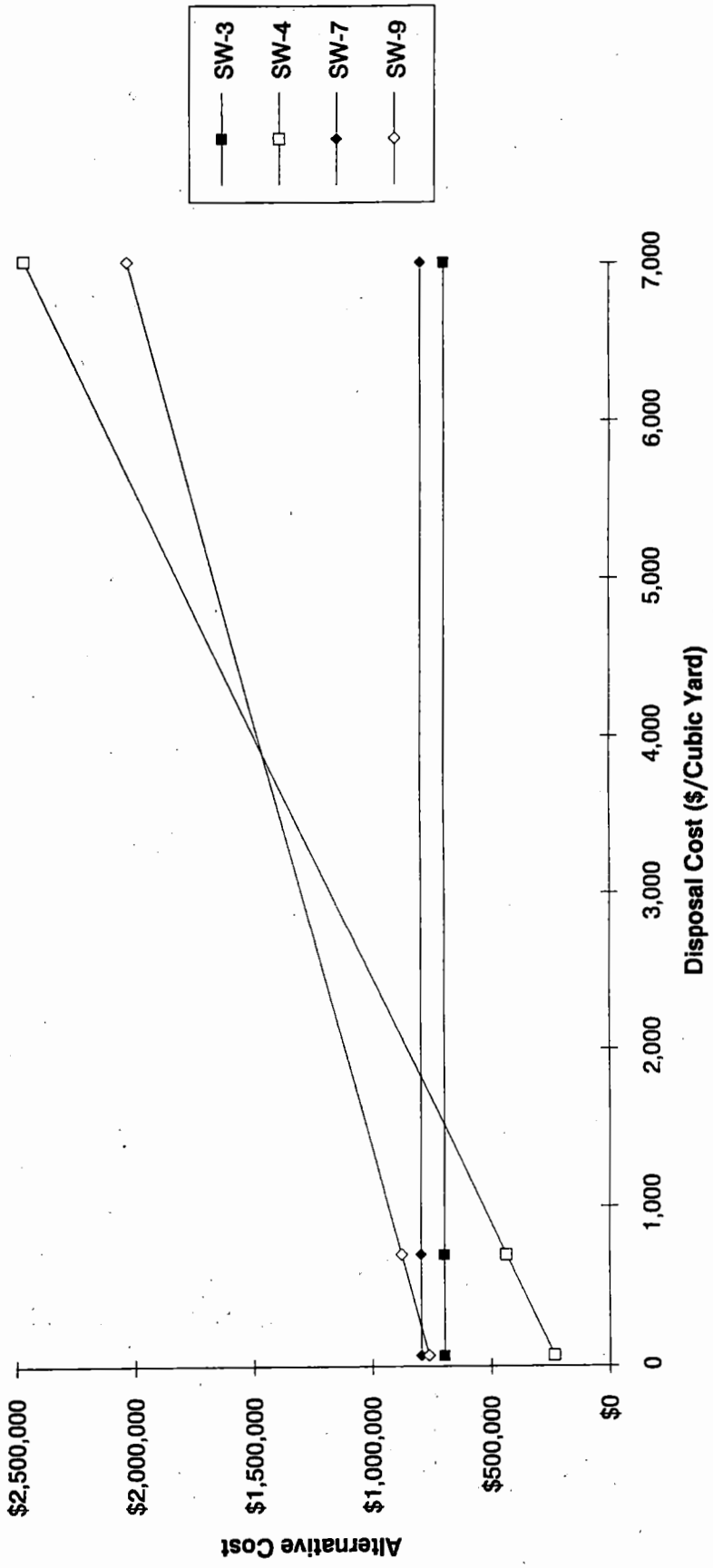

Figure B-12 118-B-10 Burial Ground Disposal Cost Comparison

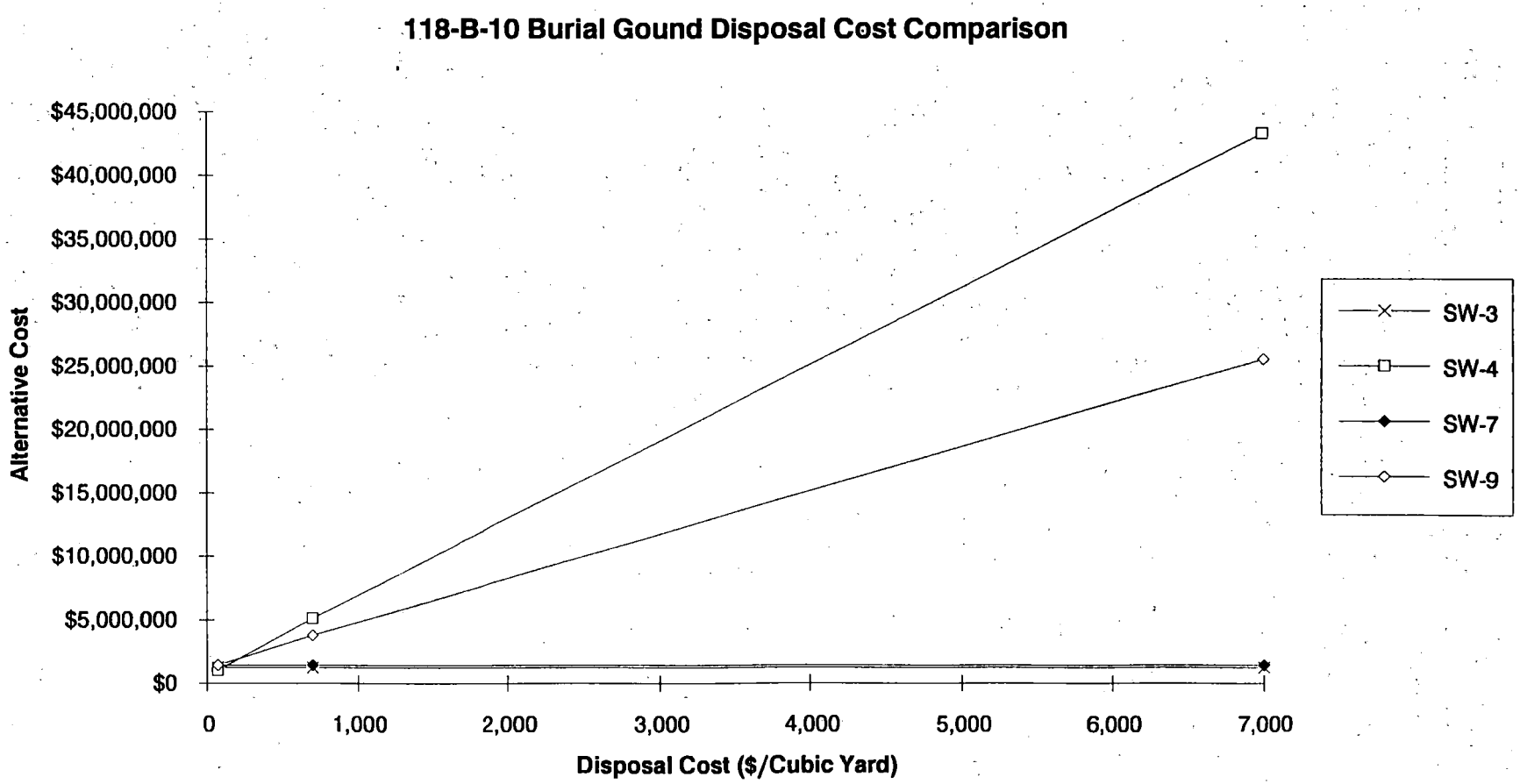

Table B-1 Cost Model Work Breakdown Structure Discussion (page 1 of 4)

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.
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.

ELEMENTS AND LEVELS	DESCRIPTION
SUB:15 Stabilization/Fixation	This level inlcudes in situ vitrification mobilization/setup, personnel training, system operation, demobilization, and pre- and post-construction submittals.
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.
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.

ELEMENTS AND LEVELS	DESCRIPTION
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.

Table B-2 Waste Site Cost Presentation Matrix

Waste Site	Cost Summary Table	Cost Comparison Figure
116-B-11	Table B-3	Figure B-1
116-C-5	Table B-4	Figure B-2
Pipelines	Table B-5	Figure B-3
116-B-1	Table B-6	Figure B-4
116-C-1	Table B-7	Figure B-5
116-B-13	Table B-8	Figure B-6
116-B-14	Table B-9	Figure B-7
116-B-4	Table B-10	Figure B-8
116-B-5	Table B-11	Figure B-9
118-B-5	Table B-12	Figure B-10
118-B-7	Table B-13	Figure B-11
118-B-10	Table B-14	Figure B-12

Table B-3 Cost Summary for 116-B-11 Retention Basin

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	762,010	1,616,640
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	100,780	88,864
SUB:02	Monitoring, Sampling & Analysis	286,780	747,268
SUB:08	Solids Collection & Containment	781,620	1,343,697
SUB:13	Physical Treatment	-	7,846,375
SUB:14	Thermal Treatment	-	-
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	20,326,150	14,289,865
SUB:20	Site Restoration	2,817,330	2,604,200
SUB:21	Demobilization	20,400	18,059
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	572,270	1,504,405
WHC:08	Solids Collection & Containment	51,350	162,143
Subcontractor Materials Procurement Rate		243,330	269,383
Project Management/Construction Management		3,780,000	4,331,139
General & Administration/Common Support Pool		7,389,900	8,467,377
Contingency		13,367,490	16,017,084
Total		50,499,420	59,306,502
Capital		50,499,420	51,616,942
Annual Operations & Maintenance		0	5,126,373
Present Worth		48,100,445	55,520,553

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

Table B-4 Cost Summary for 116-C-5 Retention Basin

Cost Element		SS-4	SS-10
ANA: Offsite Analytical Services			
ANA:02	Monitoring, Sampling & Analysis	774,640	1,801,880
SUB: Fixed Price Contractor			
SUB:01	Mobilization & Preparatory	97,980	88,390
SUB:02	Monitoring, Sampling & Analysis	321,090	882,670
SUB:08	Solids Collection & Containment	839,910	1,519,630
SUB:13	Physical Treatment	-	9,657,400
SUB:14	Thermal Treatment	-	2,592,760
SUB:15	Stabilization/Fixation	-	-
SUB:18	Disposal (Other than Commercial)	24,163,790	17,366,660
SUB:20	Site Restoration	3,112,830	2,901,180
SUB:21	Demobilization	20,000	18,140
WHC: Westinghouse Hanford Company			
WHC:02	Monitoring, Sampling & Analysis	610,680	1,713,400
WHC:08	Solids Collection & Containment	56,630	189,230
Subcontractor Materials Procurement Rate		285,560	2,556,960
Project Management/Construction Management		4,426,270	5,922,960
General & Administration/Common Support Pool		8,653,360	11,579,390
Contingency		15,610,580	21,752,540
Total		58,973,320	80,543,180
Capital		58,973,320	68,660,500
Annual Operations & Maintenance		0	6,989,812
Present Worth		56,170,854	75,152,785

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

Table B-5 Cost Summary for 100 B/C Pipelines

Cost Element		SS-3	SS-4	SS-8B	SS-10
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	412,580	-	766,220
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	27,890	47,282	27,710	47,280
SUB:02	Monitoring, Sampling & Analysis	-	935,521	-	1,014,990
SUB:08	Solids Collection & Containment	20,751,680	2,793,691	3,372,720	2,812,350
SUB:13	Physical Treatment	-	-	-	5,933,280
SUB:14	Thermal Treatment	-	-	-	-
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	7,994,662	-	5,912,960
SUB:20	Site Restoration	2,384,460	4,115,948	68,530	3,951,860
SUB:21	Demobilization	8,680	10,984	8,620	10,980
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	897,000	1,565,798	120,110	1,565,930
WHC:08	Solids Collection & Containment	22,000	219,825	8,800	216,660
Subcontractor Materials Procurement Rate		231,730	158,981	34,780	196,840
Project Management/Construction Management		3,648,510	2,676,404	546,190	3,249,470
General & Administration/Common Support Pool		7,132,850	5,232,369	1,067,800	6,352,710
Contingency		11,935,630	9,942,337	1,786,790	11,851,670
Total		47,040,420	36,106,381	7,042,050	43,883,200
Capital		47,040,420	36,106,381	7,042,050	38,108,100
Annual Operations & Maintenance		1,037,584	0	168,636	2,310,040
Present Worth		54,579,112	32,948,740	8,874,465	40,025,889

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

Table B-6 Cost Summary for 116-B-1 Process Effluent Trench

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	122,090	-	168,400
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	59,910	58,170	65,630
SUB:02	Monitoring, Sampling & Analysis	52,430	31,290	64,500
SUB:08	Solids Collection & Containment	113,580	82,650	121,720
SUB:13	Physical Treatment	-	-	744,860
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	4,463,500	-
SUB:18	Disposal (Other than Commercial)	798,960	-	363,930
SUB:20	Site Restoration	261,830	197,800	223,310
SUB:21	Demobilization	14,880	15,030	14,850
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	129,590	383,870	182,140
WHC:08	Solids Collection & Containment	9,500	60,210	14,070
Subcontractor Materials Procurement Rate		95,020	353,940	116,710
Project Management/Construction Management		230,350	846,970	286,760
General & Administration/Common Support Pool		450,340	1,655,830	560,610
Contingency		795,080	2,770,750	1,083,170
Total		3,133,560	10,920,020	4,010,660
Capital		3,133,560	6,592,270	3,425,540
Annual Operations & Maintenance		0	4,327,750	585,120
Present Worth		2,987,254	10,406,986	3,829,620

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

Table B-7 Cost Summary for 116-C-1 Process Effluent Trench

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	298,910	-	564,140
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	69,430	68,250	75,120
SUB:02	Monitoring, Sampling & Analysis	219,350	88,710	303,450
SUB:08	Solids Collection & Containment	465,380	233,580	525,740
SUB:13	Physical Treatment	-	-	1,611,480
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	27,873,720	-
SUB:18	Disposal (Other than Commercial)	5,895,520	-	4,750,350
SUB:20	Site Restoration	1,145,530	669,110	1,037,890
SUB:21	Demobilization	16,190	16,460	16,170
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	399,560	2,256,070	626,660
WHC:08	Solids Collection & Containment	39,740	370,950	61,200
Subcontractor Materials Procurement Rate		78,110	289,500	83,200
Project Management/Construction Management		1,249,330	4,779,950	1,363,690
General & Administration/Common Support Pool		2,442,430	9,344,810	2,666,010
Contingency		4,188,630	15,636,980	5,063,490
Total		16,508,130	61,628,090	18,748,610
Capital		16,508,130	33,886,890	17,295,880
Annual Operations & Maintenance		0	7,300,316	1,452,730
Present Worth		15,725,648	54,806,062	17,866,453

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

Table B-8 Cost Summary for 116-B-13 Sludge Trench

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	33,680	-	54,730
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	50,530	48,330	56,450
SUB:02	Monitoring, Sampling & Analysis	9,810	4,690	12,860
SUB:08	Solids Collection & Containment	23,530	15,730	25,720
SUB:13	Physical Treatment	-	-	274,500
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	1,071,780	-
SUB:18	Disposal (Other than Commercial)	196,300	-	111,530
SUB:20	Site Restoration	68,830	52,750	61,410
SUB:21	Demobilization	13,550	13,580	13,570
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	33260	91,770	69,280
WHC:08	Solids Collection & Containment	1760	12,940	5,980
Subcontractor Materials Procurement Rate		26470	88,100	40,590
Project Management/Construction Management		63600	209,950	100,780
General & Administration/Common Support Pool		124350	410,460	197,030
Contingency		219530	686,840	379,040
Total		865190	2,706,940	1,403,460
Capital		865190	1,770,240	1,289,280
Annual Operations & Maintenance		0	936,700	114,180
Present Worth		826412	2,584,361	1,346,110

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

Table B-9 Cost Summary for 116-B-14 Sludge Trench

Cost Element		SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services				
ANA:02	Monitoring, Sampling & Analysis	33,680	-	50,520
SUB: Fixed Price Contractor				
SUB:01	Mobilization & Preparatory	51,500	49,280	57,420
SUB:02	Monitoring, Sampling & Analysis	10,450	6,250	12,640
SUB:08	Solids Collection & Containment	24,790	19,410	26,330
SUB:13	Physical Treatment	-	-	238,590
SUB:14	Thermal Treatment	-	-	-
SUB:15	Stabilization/Fixation	-	748,060	-
SUB:18	Disposal (Other than Commercial)	134,650	-	76,420
SUB:20	Site Restoration	67,880	56,890	62,810
SUB:21	Demobilization	13,690	13,710	13,700
WHC: Westinghouse Hanford Company				
WHC:02	Monitoring, Sampling & Analysis	38,890	66,200	70,560
WHC:08	Solids Collection & Containment	2,110	8,580	5,630
Subcontractor Materials Procurement Rate		22,120	65,230	35,620
Project Management/Construction Management		54,910	155,040	89,960
General & Administration/Common Support Pool		107,350	303,110	175,870
Contingency		191,090	507,200	338,950
Total		753,100	1,998,980	1,255,030
Capital		753,100	1,386,230	1,176,760
Annual Operations & Maintenance		0	612,750	78,270
Present Worth		719,704	1,910,152	1,204,792

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

Table B-10 Cost Summary for 116-B-4 French Drain

Cost Element		SS-3	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	43,140	52,730	44,520	52,660
SUB:02	Monitoring, Sampling & Analysis	-	2,680	1,840	2,780
SUB:08	Solids Collection & Containment	108,570	7,700	8,130	9,270
SUB:13	Physical Treatment	-	-	-	171,630
SUB:14	Thermal Treatment	-	-	-	-
SUB:15	Stabilization/Fixation	-	-	247,890	-
SUB:18	Disposal (Other than Commercial)	-	20,150		11,410
SUB:20	Site Restoration	15,770	21,100	19,480	20,340
SUB:21	Demobilization	13,030	13,060	13,030	13,020
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	13,470	12,060	23,970	44,080
WHC:08	Solids Collection & Containment	250	560	1,830	4,220
Subcontractor Materials Procurement Rate		13,180	8,570	24,450	20,520
Project Management/Construction Management		31,110	20,790	57,770	52,490
General & Administration/Common Support Pool		60,820	40,650	112,940	102,620
Contingency		101,770	78,080	188,990	197,770
Total		401,110	294,980	744,850	732,280
Capital		401,110	294,980	632,340	720,850
Annual Operations & Maintenance		5,429	0	112,510	11,430
Present Worth		453,805	283,449	715,494	706,693

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

Table B-11 Cost Summary for 116-B-5 Decontamination Crib

Cost Element		SS-3	SS-4	SS-8A	SS-10
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	33,680	-	54,730
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	46,340	57,310	49,280	57,270
SUB:02	Monitoring, Sampling & Analysis	-	14,040	6,430	16,080
SUB:08	Solids Collection & Containment	233,250	31,990	20,160	38,540
SUB:13	Physical Treatment	-	-	-	328,430
SUB:14	Thermal Treatment	-	-	-	-
SUB:15	Stabilization/Fixation	-	-	1,375,910	-
SUB:18	Disposal (Other than Commercial)	-	272,620	-	144,370
SUB:20	Site Restoration	28,000	85,540	64,260	74,570
SUB:21	Demobilization	13,480	13,720	13,720	13,670
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	19,390	40,280	116,660	76,130
WHC:08	Solids Collection & Containment	490	2,250	17,020	6,330
Subcontractor Materials Procurement Rate		23,440	34,690	111,670	49,130
Project Management/Construction Management		54,660	82,870	266,270	120,680
General & Administration/Common Support Pool		106,860	162,010	520,550	235,930
Contingency		178,810	299,160	871,060	449,870
Total		704,730	1,130,180	3,433,000	1,665,750
Capital		704,730	1,130,180	2,192,390	1,497,390
Annual Operations & Maintenance		11,663	0	1,240,610	168,360
Present Worth		823,207	1,079,111	3,275,912	1,595,944

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

Table B-12 Cost Summary for 118-B-5 Burial Ground

Cost Element		SW-3	SW-4	SW-7	SW-9
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	21,050	-	21,050
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	49,690	52,530	75,280	58,420
SUB:02	Monitoring, Sampling & Analysis	-	21,340	-	20,960
SUB:08	Solids Collection & Containment	412,930	53,940	461,190	52,990
SUB:13	Physical Treatment	-	-	-	72,730
SUB:14	Thermal Treatment	-	-	-	253,200
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	553,380	-	315,970
SUB:20	Site Restoration	46,000	135,030	46,000	131,900
SUB:21	Demobilization	13,960	13,890	13,960	13,640
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	27,060	40,970	47,480	52,170
WHC:08	Solids Collection & Containment	740	4,570	2,950	8,230
Subcontractor Materials Procurement Rate		38,150	60,600	43,540	67,150
Project Management/Construction Management		88,280	140,440	103,560	157,100
General & Administration/Common Support Pool		172,580	274,550	202,460	307,140
Contingency		288,790	507,750	338,780	567,080
Total		1,138,170	1,880,040	1,335,210	2,099,730
Capital		1,138,170	1,880,040	1,335,210	1,999,270
Annual Operations & Maintenance		20,646	0	23,060	100,460
Present Worth		1,351,577	1,793,051	1,571,460	2,012,822

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

Table B-13 Cost Summary for 118-B-7 Burial Ground

Cost Element		SW-3	SW-4	SW-7	SW-9
ANA: Offsite Analytical Services					
ANA:02	Monitoring, Sampling & Analysis	-	8,420	-	8,420
SUB: Fixed Price Contractor					
SUB:01	Mobilization & Preparatory	44,510	46,010	57,300	52,920
SUB:02	Monitoring, Sampling & Analysis	-	920	-	920
SUB:08	Solids Collection & Containment	156,170	5,600	169,810	5,590
SUB:13	Physical Treatment	-	-	-	40,620
SUB:14	Thermal Treatment	-	-	-	203,900
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	11,790	-	6,900
SUB:20	Site Restoration	20,390	15,010	20,390	14,980
SUB:21	Demobilization	13,220	12,970	13,220	12,960
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	15,210	11,730	28,210	15,270
WHC:08	Solids Collection & Containment	250	350	1,690	630
Subcontractor Materials Procurement Rate		17,100	6,740	19,030	24,730
Project Management/Construction Management		40,030	16,670	46,450	56,910
General & Administration/Common Support Pool		78,260	32,580	90,800	111,270
Contingency		130,950	62,450	151,950	205,730
Total		516,090	231,230	598,850	761,750
Capital		516,090	231,230	598,850	746,960
Annual Operations & Maintenance		7,809	0	8,491	14,790
Present Worth		593,951	222,414	682,141	738,462

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

Table B-14 Cost Summary for 118-B-10 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	47,750	50,370	60,650	57,290
SUB:02	Monitoring, Sampling & Analysis	-	13,190	-	13,200
SUB:08	Solids Collection & Containment	304,210	35,070	340,380	35,090
SUB:13	Physical Treatment	-	-	-	54,220
SUB:14	Thermal Treatment	-	-	-	224,710
SUB:15	Stabilization/Fixation	-	-	-	-
SUB:18	Disposal (Other than Commercial)	-	237,160	-	137,960
SUB:20	Site Restoration	35,070	83,490	35,140	83,230
SUB:21	Demobilization	13,680	13,530	13,700	13,540
WHC: Westinghouse Hanford Company					
WHC:02	Monitoring, Sampling & Analysis	21,720	31,220	47,700	39,870
WHC:08	Solids Collection & Containment	490	3,170	3,380	5,700
Subcontractor Materials Procurement Rate		29,250	31,590	32,840	45,200
Project Management/Construction Management		67,820	74,820	80,070	106,500
General & Administration/Common Support Pool		132,600	146,270	156,540	208,210
Contingency		221,880	271,030	261,940	383,820
Total		874,460	1,003,540	1,032,350	1,421,160
Capital		874,460	1,003,540	1,032,350	1,370,040
Annual Operations & Maintenance		15,210	0	17,019	51,120
Present Worth		1,030,496	958,169	1,204,723	1,366,605

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