Appendix D

Cost Estimate Backup

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Terms

AFL-CIO	American Federation of Labor-Congress of Industrial Organizations
ALARA	as low as reasonably achievable
CDF	control density fill
CHPRC	CH2M HILL Plateau Remediation Company
CWC	Central Waste Complex
ERDF	Environmental Restoration Disposal Facility
ET	evapotranspiration
FH	Fluor-Hanford
FICA	*Federal Insurance Contributions Act*
FP	fixed price
FS	feasibility study
G&A	general and administrative
HEPA	high-efficiency particulate air
HSSA	*Hanford Site Stabilization Agreement*
INL	Idaho National Laboratory
ISV	in situ vitrification
MAESTRO Estimator	Estimating Program used by Fluor Hanford
MEESC	maintain and enhance existing soil cover
N/A	not applicable
QA	quality assurance
RCT	radiological control technician
RTD	removal, treatment, and disposal
SVE	soil-vapor extraction
SWB	standard waste box
WAC	*Washington Administrative Code*
WIPP	Waste Isolation Pilot Plant

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Appendix D

Cost Estimate Backup

D1.0 Introduction

The cost estimates for the feasibility study (FS) are developed in accordance with guidance specified in EPA/540/R-00/002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, OSWER 9355.0-75. The cost estimates provide a discriminator for deciding between similar protective and implemental alternatives for a specific waste site. The CH2M HILL Plateau Remediation Company (CHPRC) Project Controls and Estimating department used the MAESTRO Estimator software to develop the cost estimates for the various alternatives presented for each of the waste sites.

The estimates are based on actual pricing information derived from historical experience. The units used may have been factored/adjusted by the estimator and/or task lead, as appropriate, to reflect influences by the contract, work site, or other identified special conditions. Historical information from similar Hanford Site planning and construction well drilling efforts was applied to this estimate.

Tables D-1 through D-30 present the costs for the alternatives as present net worth values. These tables should be used in conjunction with Table 2-17 of the main document to evaluate the costs by waste group. The present net worth value method is used to evaluate costs that occur during different periods and allows for cost comparisons of alternatives based on a single cost number for each alternative. The present net worth value represents the dollars that would need to be set aside today to ensure that funds would be available in the future, as they are needed to execute the remedial alternative.

Present net worth costs are estimated using the real discount rate published in Appendix C of OMB Circular No. A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, effective through January 2008. Programs with durations longer than 30 years use the 30-year interest rate of 3.0 percent. Present net worth costs are discussed for each alternative in the following subsections.

EPA/540/R-00/002 recommends including the non-discounted costs in the FS. Non-discounted constant dollar costs demonstrate the impact of a discount rate on the total present worth cost. The non-discounted costs are calculated for 350- and 1,000-year durations and are presented for comparison purposes only.

This FS does not evaluate the economies associated with implementing multiple sites or groups with a common alternative or aggregated remediation. These aspects will be considered in the future as part of long-range planning and through the post-record of decision activities, such as remedial design. Potential areas of cost sharing to reduce overall remediation costs include the following:

- Remediating all waste sites with a common Preferred Alternative at the same time
- Sharing mobilization/demobilization costs
- Sharing surveillance and maintenance costs
- Sharing barrier performance monitoring costs

Chapter D2.0 provides a basic breakdown of the cost estimates developed for each alternative for each of the waste sites. These cost estimates are based on EPA/540/R-00/002.

Major assumptions are discussed in Chapter D3.0. These assumptions are necessary to provide the level of detail needed for independent review.

D2.0 Cost Estimates of the Alternatives

The remedial alternatives for each of the waste sites are discussed in detail in Chapters 5.0 and 6.0 of this FS. This appendix summarizes the alternatives described in the FS and provides backup information and assumptions used in developing the cost estimates for each of the remedial alternatives.

D2.1 200-PW-1 Operable Unit

Four remedial alternatives are considered for the sites within 200-PW-1 Operable Unit (OU). Activities that are common to all but the No Action Alternative include institutional controls, revegetation of the site, expanded soil-vapor extraction (SVE) operation for an additional 10 years at the High-Salt waste sites (assumed for cost estimating purpose), site-specific monitoring, and groundwater monitoring. Institutional controls, site-specific monitoring, and groundwater monitoring are included in the cost estimates for a duration of 1,000 years. Details of these common activities are presented in Section 5.2.1 of the FS.

The following four alternatives were analyzed as part of the detailed analysis:

- **Alternative 0–No Action:** This action has an assumed cost of $0.
- **Alternative 1–Construct a Physical Barrier with or without CDF Backfill:** This alternative operates an expanded SVE system for 10 years at the High-Salt waste sites. Then, following decommissioning of the SVE wells, barriers will be constructed at each waste site. Physical barriers will be constructed at the High-Salt waste sites to impede intrusion into the contaminants. Evapotranspiration (ET) barriers will also be constructed at each site (except the 216-Z-9 Trench) to limit infiltration. Controlled density fill (CDF) will be used to fill the 216-Z-9 Trench and waste sites with significant subsurface void spaces, where appropriate. Alternative 1 is discussed in Section 5.2.2.
- **Alternative 2–In Situ Vitrification (ISV):** This alternative operates an expanded SVE system for 10 years at the High-Salt waste sites. ISV is performed to create a glass monolith that is 5 to 6 m (16 to 20-ft) thick and covers the dimensions of the waste sites. The waste sites will then be backfilled to grade and revegetated. Additional details are presented in Section 5.2.3.
- **Alternative 3–Partial to Complete Removal, Treatment, and Disposal (RTD):** This alternative operates an expanded SVE system for 10 years at the High-Salt waste sites. Following decommissioning of the SVE system and associated wells at year 11, the sites will be excavated. All the waste designated as transuranic waste and will be packaged for disposal at the Waste Isolation Pilot Plant (WIPP). Waste designated as mixed low-level waste will be managed and packaged as appropriate for disposal at the Environmental Restoration Disposal Facility (ERDF). Additional details are presented in Section 5.2.4. There are five options within this Alternative:
  - **Case 3a:** Remove highest plutonium concentrations by RTD to 0.6 m (2 ft) below the base of wastes site;
  - **Case 3b:** Remove direct contact risk less than 4.5 m (15 ft) below ground surface;
  - **Case 3c:** Remove significant plutonium mass;
  - **Case 3d:** Remove greater than 100 nCi/g transuranic concentrations; and
  - **Case 3e:** Remove plutonium so that long-term institutional controls at a waste site are not needed.

An ET barrier will be constructed over most of the sites after backfilling to grade.

The various components of each alternative are then combined to determine the total cost for each alternative. These values are used in the detailed analysis presented in Chapter 6.0.

Tables D-1, D-2, and D-3 provide an overview of the site information used for the cost estimates. This includes the site information, the volumes that need to be excavated and/or backfilled, and details of any treatment that may be occurring. Tables D-9A, D-9B, D-10A, D-10B, D-11A, and D-11B present capital costs for each alternative. Tables D-17, D-18, and D-19 present capital costs, periodic costs, non-discounted cost, and the total present worth costs for each alternative. Table D-20 compares present net worth and non-discounted costs.

D2.2 200-PW-3 Operable Unit

Three remedial alternatives are considered for the sites within the 200-PW-3 OU. Several activities are common to all the remedial alternatives. They consist of institutional controls, revegetation of the site, site-specific monitoring, and groundwater monitoring. Institutional controls, site-specific monitoring, and groundwater monitoring are included for a duration of 350 years. Details of these common activities are presented in Section 5.2.1 of the FS.

The following four alternatives were analyzed as part of the detailed analysis.

- **Alternative 0 – No Action:** This action has an assumed cost of $0.
- **Alternative 1 – Construct an ET Barrier:** An ET barrier will be constructed over each waste site. The site will then be revegetated. Additional details are presented in Section 5.2.2.

  An alternative barrier which consists of maintaining and enhancing the existing soil cover (MEESC) was also evaluated under this alternative. Under this alternative, additional soil, if required, will be added as cover soil to maintain a 4.5 m (15 ft) depth to the top of the contaminated soil from the surface of the site. Additional topsoil will be added to the site to help promote re-vegetation. Additional language on the MEESC barrier is presented in Section 6.3.
- **Alternative 2 – In Situ Vitrification (ISV):** This alternative is not evaluated for this OU.

Alternative 3 – Partial to Complete Removal, Treatment, and Disposal (RTD): The sites will be excavated and all excavated material designated as regulated waste will be managed and packaged as appropriate for disposal at ERDF. Additional details are presented in Section 5.2.4. The two options within this Alternative include: Case 3b - remove direct-contact risk less than 4.5 m (15 ft) below ground surface and Case 3c–remove significant Cesium-137 mass. ET barriers will be constructed over most of the sites after backfilling.The various components of each alternative then are combined to determine the total cost for each alternative. These values are used in the detailed analysis presented in Chapter 6.0.

An overview of the site information used for the cost estimates is provided in Table D-4 (Barriers) and Table D-5 (Remove, Treat, and Dispose). This includes the site information, the volumes that need to be excavated and/or backfilled, and details of any treatment that may be occurring. Tables D-12 and D-13 present capital costs for each alternative. Tables D-21, D-22, and D-26 present capital costs, periodic costs, non-discounted cost, and the total present worth costs for each alternative. Table D-23 compares present net worth and non-discounted costs.

D2.3 200-PW-6 Operable Unit

Four remedial alternatives are considered for the sites within the 200-PW-6 OU. Several activities are common to all the remedial alternatives and consist of institutional controls, revegetation of the site, site-specific monitoring, and groundwater monitoring. Institutional controls, site-specific monitoring, and groundwater monitoring are included for a duration of 1,000 years. Details of these common activities are presented in Section 5.2.1 of the FS.

The following four alternatives were analyzed as part of the detailed analysis.

- **Alternative 0 – No Action:** This action has an assumed cost of $0.
- **Alternative 1 – Construct a Physical Barrier and CDF Backfill:** The sites with voids will be backfilled with CDF, where appropriate, and then a physical barrier will be constructed over the site. The site will then be revegetated. Additional details are presented in Section 5.2.2.
- **Alternative 2 – In Situ Vitrification (ISV)**: ISV is performed to create a glass monolith that is 5 to 6 m (16- to 20-ft) thick and covers the dimensions of the waste site. The waste site will then be backfilled to grade and revegetated. Additional details are presented in Section 5.2.3.
- **Alternative 3 – Partial to Complete Removal, Treatment, and Disposal (RTD)**: The sites will be excavated. Waste designated as transuranic waste will be packaged for disposal at the WIPP. Waste designated as mixed, low-level waste will be managed and packaged as appropriate for disposal at ERDF. Additional details are presented in Section 5.2.4. The four options within this Alternative include:
  - Case 3a–Remove highest plutonium concentrations by RTD to 0.6 m (2 ft) below the base of wastes site;
  - Case 3c–Remove significant plutonium mass;
  - Case 3d–Remove greater than 100 nCi/g transuranic concentrations; and
  - Case 3e–Remove plutonium so that long-term institutional controls at a waste site are not needed.

  An ET barrier will be constructed over most of the sites after backfilling to grade.

The various components of each alternative are then combined to determine the total cost for each alternative. These values are used in the detailed analysis presented in Chapter 6.0.

Tables D-6, D-7, and D-8 provide an overview of the site information used for the cost estimates. This includes the site information, the volumes that need to be excavated and/or backfilled, and details of any treatment that may be occurring. Tables D-14, D-15, and D-16 present capital costs for each alternative. Tables D-24 and D-25 present capital costs, periodic costs, non-discounted costs, and the total present worth costs for each alternative. Table D-27 compares present net worth and non-discounted costs.

D2.4 241-Z-361 Settling Tank

A previous engineering evaluation and cost assessment was performed on the 241-Z-361 Settling Tank in 2003 (DOE/RL-2003-52, *Tank 241-Z-361 Engineering Evaluation/Cost Analysis*). This report recommended an alternative for sludge removal that employs a Power Fluidic[1] system to loosen and homogenize the sludge and transfer it to standard waste boxes (SWB). WaterWorks SP-400

[1] Power Fluidics is a trademark of NuVision Engineering (formerly AEA Technology Engineering Services, Inc.).

Superabsorbent Crystals[2] are added to the SWB to absorb residual liquids and stabilize the sludge. This SWB then will be transported to the Central Waste Complex (CWC) for storage and certification before shipment to WIPP. The empty tank will be closed in place according to *Washington Administrative Code* requirements by backfilling the tank with CDF. The original cost estimate in DOE/RL-2003-52 has been updated to include current costs and to incorporate shipment of the SWBs to WIPP and the tank closure activities involving the CDF. The tank dimensions are presented in Table D-3. Table D-11A presents capital costs for tank closure activities. Table D-19 presents the alternative costs broken down by capital costs, periodic costs, non-discounted cost, and the total present worth costs.

D2.5 216-Z-9 Trench

This site has several small buildings, a high-efficiency particulate air (HEPA) ventilation system, two glove boxes, a below roof slab control house structure, a below roof slab stairway and retrieval equipment built on, near, on top of, or below the existing trench roof. All of the structures will need to be removed prior to any work being performed at the 216-Z-9 Trench. The CHPRC baseline cost is $6,292,482 for removal and disposal. This cost is not included in the remedial cost for each of the alternatives since it is the same for all the alternatives.

[2] WaterWorks Crystals is a registered trademark of WaterWorks America, Inc.

D3.0 Basis of Estimates

The remedial alternatives for each of the waste sites are summarized in the previous chapter and discussed in detail in Chapters 5.0 and 6.0 of this FS. This chapter provides backup information and assumptions used in developing the cost estimates for each of the remedial alternatives.

D3.1 Global Assumptions

The following sections identify the labor, markups, and general global assumptions for the remedial alternatives cost estimates.

D3.1.1 Labor

- Fixed-price (FP) construction craft labor rates are those listed in Appendix A of the *Site Stabilization Agreement for All Construction Work for the U.S. Department of Energy at the Hanford Site* (commonly known as the Hanford Site Stabilization Agreement [HSSA]). The HSSA rates include base wage, fringe benefits, and other compensation as negotiated with the National Building and Construction Trades Department American Federation of Labor-Congress of Industrial Organizations (AFL-CIO). Other factors to cover additional costs (i.e., Workman's Compensation, *Federal Insurance Contributions Act* [FICA], and state and federal unemployment insurance) to develop a fully burdened rate by craft, have been incorporated. The labor rates used are for 2008.
- CHPRC labor rates for management, engineering, safety oversight, and technical support are based on the approved planning rates for fiscal year 2008.

D3.1.2 Markups

The following sections describe markups of direct and indirect cost factors.

D3.1.2.1 Direct Cost Factors

- Sales tax has been applied to all materials and equipment purchases at 8.3 percent.
- Construction consumables are estimated at 3.5 percent of FP direct craft labor costs to allow for small tools, tape, plastics, gloves, etc.
- A general supervisor factor of 3 percent has been applied to FP craft labor hours.
- A general requirements factor of 5 percent has been applied to cover incidental labor for hauling personnel and materials and to cover other miscellaneous labor.

D3.1.2.2 Indirect Cost Factors

- FP contractor overhead, profit, bond, and insurance costs have been applied at 26.5 percent on FP labor, materials, and equipment.
- CHPRC general and administrative (G&A) of 8.5 percent has been applied to all CHPRC labor, material, and equipment. G&A also is applied to the FP contractor costs.

D3.1.3 General Assumptions

- CHPRC cost estimating templates for site remediation are used as the basis for each waste site cost estimate.

- Construction labor, material, and equipment units are estimated based on standard commercial estimating resources and databases: Means 2001, *ECHOS Environmental Remediation Cost Data-Unit Price*; Means 2007, *Facility Construction Cost Data*; Richardson, 2001, *Process Plant Construction Estimating Standards*; and the EquipmentWatch, 2007, *Rental Rate Blue Book for Construction Equipment*. The units may have been factored or adjusted by the estimator as appropriate to reflect influences by contract, work site, or other identified project or special conditions.
- Quotes from local commercial sources are used for materials that need to be acquired for the construction of barriers or temporary improvements.
- Equipment rates are based on 21 working days per month.
- Equipment operation is based on one shift of 8 hours per day.
- Workweek equals 5 days per week.
- Work stoppages or shutdowns caused by inclement weather are not factored into the estimates or planning schedules for this study.
- Work delays or stoppages caused by waiting for laboratory results or approval for backfilling waste site excavations are not factored into the estimates or planning schedules for this study.
- The cost estimates include costs for design, work plan preparation, or any other preparation costs normally associated with activities occurring before field mobilization.
- Remedial design capital costs are based on EPA/540/R-00/002, Exhibit 5-8. The following guide is used in this study:
  - For projects with construction costs less than $100,000–Remedial design is planned at 20 percent of construction costs.
  - For projects with construction costs from $100,000 to $500,000–Remedial design is planned at 15 percent of construction costs.
  - For projects with construction costs from $500,000 to $2 million–Remedial design is planned at 12 percent of construction costs.
  - For projects with construction costs from $2 million to $10 million–Remedial design is planned at 8 percent of construction costs.
  - For projects with construction costs greater than $10 million–Remedial design is planned at 6 percent of construction costs.
- Escalation has not been included in the calculations. All costs presented in this appendix are derived from fiscal year 2008 rates, unless otherwise noted).
- Contingency rates are based on EPA/540/R-00/002, Section 5.4.
- All borrow source materials are assumed to come from Hanford sources. During the remedial design, the actual borrow source location will be identified and will comply with all *National Environmental Policy Act of 1969* requirements.

D3.2 No Action Alternative

The No Action Alternative represents a situation where no legal restrictions, access controls, or active remedial measures are applied to the waste site. Taking no action implies "walking away from the waste site" and allowing the waste to remain in its current configuration, affected only by natural processes. No maintenance or institutional controls are included in this alternative.

Because the No Action Alternative assumes that no further actions will be taken at a waste site, costs are assumed to be zero. However, there are costs associated with decommissioning 216-Z-10 and 216-Z-8 shown within Table 6-1 of main document.

D3.3 Institutional Controls

Institutional controls, which can have one-time or recurring costs (capital, annual operations and maintenance, or periodic), are non-engineering or legal/administrative measures used to reduce or minimize the potential for exposure to site contamination or hazards by limiting or restricting site access. Examples include institutional controls plans, restrictive covenants, property easements, zoning, deed notices, advisories, groundwater use restrictions, and site information databases. An institutional controls plan would describe the controls for a site and how they would be implemented. A site information database would provide a system for managing data necessary to characterize the current nature and extent of contamination. Institutional controls are project-specific costs that can be an important component of a remedial alternative and, as such, generally should be estimated separately from other costs, usually on a subelement basis. Institutional controls may need to be updated or maintained, either annually or periodically.

The institutional control cost model was developed by the CHPRC Project Controls and Estimating department. The duration for institutional controls only considers the initial, "year-one" period. The annual/periodic activities were based on 350- and 1,000-year durations.

The primary annual/periodic costs are associated with surveillance and cover maintenance, monitored natural attenuation, and long-term groundwater monitoring. The costs for these annual/periodic activities were estimated based on the area of the individual waste sites or groups.

The unit cost for surveillance and maintenance was assumed to be the same as the current unit cost for surveillance and maintenance activities conducted annually on the waste sites. The unit cost accounts for such activities as site radiation surveys, and repair of the existing soil cover on the sites where it is present. Because the existing soil cover is maintained annually, costs for replacing all or large portions of the existing cover at specified intervals (i.e., every 20 years) are considered unnecessary.

The costs associated with natural attenuation monitoring are divided into three components: radiological surveys of surface soils, spectral gamma logging of vadose zone boreholes, and groundwater monitoring. The costs to perform radiological surveys of surface soils at waste sites are assumed to be similar to those for current survey practices at the sites and are included in the surveillance and maintenance costs.

Vadose zone monitoring costs assume spectral gamma logging of one borehole per waste site for the full duration of institutional controls. This monitoring is considered for sites with high concentrations of contaminants in the shallow zone or near the bottom of crib and trench structures. It also assumes that the service life of vadose zone boreholes is 30 years. Costs are included for logging and periodic replacement of these boreholes for the full duration of institutional controls. Groundwater monitoring costs are described in detail in Section D3.3.3.

D3.3.1 General Assumptions

The general assumptions for institutional controls are below:

- Costs were calculated based on the specific area of each site.
- Site areas range from less than 139 m^2 (1,500 ft^2) to more than 4,645 m^2 (50,000 ft^2). Because the size range is not significant, the same-sized construction crews will be used for all sites.
- Fencing and monuments/signs for institutional controls and fencing maintenance are included.
- The proposed institutional controls consist of seven general activities: implementation of institutional controls, site inspection and surveillance, existing cover maintenance, natural attenuation monitoring, reporting, site reviews, and groundwater and vadose zone monitoring.
- The prices that make up the cost estimate were obtained from one of the following sources:
  - Means 2001, *ECHOS Environmental Remediation Cost Data–Unit Price*
  - Means 2007, *Facility Construction Cost Data*
  - Experience on similar projects.

D3.3.2 Special Conditions

The following sections identify issues that apply only to specific sites.

D3.3.3 Long-Term Groundwater Monitoring Costs

Each alternative, except the No Action Alternative, includes annual inspections and maintenance costs for periodic groundwater monitoring to ensure that the proposed vadose-zone remedies are achieving the desired objectives and not impacting groundwater. The cost associated with periodic groundwater monitoring is distributed equally over applicable closure zones. The following is a description of the estimating approach for the groundwater monitoring costs.

Periodic groundwater sampling will be performed in each closure zone located at the facility. Each closure zone will contain three monitoring wells that will be sampled during the periodic sampling event. The present worth cost for the periodic groundwater monitoring program will be the same for each closure zone. That cost then will be divided equally among the sites within that closure zone. A summary of the facility closure zones associated with this FS is presented below.

Closure Zone	Number of Sites in Each Closure Zone
200 East Area Pond	50
PUREX	101
Plutonium Finishing Plant	40

Based on historical information from similar Hanford Site planning, the cost to install a compliant monitoring well is approximately $180,000 per well. It is assumed that this cost includes all required labor and material:

- Cost to install wells (3 wells) = $180,000/well × 3 wells = $540,000

Maintenance will be performed on each of the wells every 5 years. In addition, each of the wells will be replaced once every 30 years:

- Maintenance costs (3 wells) = $5,000/well × 3 wells = $15,000 every 5 years

- Replacement costs (3 wells) = $180,000/well × 3 wells = $540,000 every 30 years

During each sampling event, three groundwater samples will be collected for analysis. The analyses and cost per analysis are listed below:

- Americium-241 = $125/sample × 3 samples/event = $375/event
- Plutonium-238, -239, -240, -241 = $300/sample × 3 samples/event = $900/event
- Volatile organic compounds = $85/sample × 3 samples/event = $255/event
- Technetium-99 = $150/sample × 3 samples/event = $450/event

Total analytical cost per sampling event = $1,980.

The labor cost of doing all the paperwork, labeling, monitoring, and delivery to the laboratory is approximately $300 per well sampled:

- Total labor cost = $300/well × 3 wells = $900/sampling event

Total cost to collect and analyze samples per sampling event = $2,880.

Sampling events will occur at the following frequencies:

- Year 1 through 30 years (life) Semiannually (two sampling events)

The present worth cost to conduct a periodic groundwater monitoring program for each closure zone for 30 years was calculated.

The present worth cost for the long-term groundwater program is estimated at $680,153.

As a comparison, the non-discounted present worth cost for the long-term groundwater program was calculated to compare the effect of a discount rate on the total project cost. The non-discounted cost for the long-term groundwater program is estimated at $4,129,200.

Non-discounted costs are adjusted for each alternative to ensure they are included only once for the entire duration. Because each closure zone has a different number of sites, Table D-29 presents the long-term groundwater monitoring cost per site for each closure zone. The non-discounted long-term groundwater monitoring cost per site is presented in parentheses.

Lastly, Table D-30 lists the sites included in this FS, their associated closure zone, and the cost that will be added into the costs for the alternatives. Non-discounted costs are presented in parentheses.

D3.4 Barriers

Three types of barriers are used in this study, the ET Monofill, Physical Barrier, and MEESC. Monofill ET barriers will be used in conjunction with an Alternative 3 RTD option. The Physical Barrier is the primary design used for Alternative 1 for the High-Salt and Low-Salt waste sites. Several exceptions use CDF backfill with or without an ET Monofill barrier. These exceptions are discussed in the Special Conditions section below. MEESC barriers were considered for the cesium-137 sites.

For planning purposes, the side overlap of barriers will be 6.1 m (20 ft) for all exterior sides. Figures D-1 and D-2 show details of the assumed barrier design for the ET Monofill and Physical barriers.

D3.4.1 General Assumptions

The general assumptions for this alternative are as follows.

All borrow source materials are assumed to come from a Hanford source. During the remedial design, the actual borrow source location will be identified and will comply with all *National Environmental Policy Act of 1969* requirements.

Fieldwork such as mobilization/demobilization, borrow site excavation, barrier fill, revegetation, and some of the post-construction work will be contracted to an FP contractor. Project management, radiological control technician (RCT) support, sampling, and safety oversight will be performed by CHPRC.

Mobilization and startup activities include site training, mobilization of equipment and personnel, installation of temporary construction fences, construction of access roads, and setting up offices and storage trailers with utilities.

Revegetation of the waste site barrier includes planting native dry-land grass using tractors with seed drills and hand broadcasting, hand planting sagebrush seedlings, and irrigation for four times in the spring or early summer. All disturbed areas, such as around the barrier, stockpile, staging areas, and access roads, will be replanted.

The CHPRC Project Management team consists of a part-time project manager, a full-time field supervisor, and part-time engineering support. Quality assurance (QA), radiological control, and safety also provide oversight along with other support for contract management and project controls. Total hours for this staff are planned at 22.5 hours per day. The duration of this work is based on total project duration.

The FP contractor field supervisory team consists of a full-time construction manager and field supervisor, along with part-time QA, construction safety, and clerical support. Two pickup trucks are included in the cost. Total hours for this staff are planned at 21 hours per day. The duration of this work is based on total project duration.

Demobilization will include demobilization of equipment and personnel, and removal of temporary construction fences, access roads, and office/storage trailers.

There are two Hanford sources for the fill materials to construct the three soil/fill layers. The source for engineered fill is located at Pit 30 approximately halfway between the 200 East and 200 West Areas. This pit is assumed to have the sufficient quantity for this project. The source for the silt required for Layers 1 and 2 is located at Area C about 2 mi south of the 200 West Area.

The sand, crushed base course, and fractured basalt will be supplied by offsite vendors or from commercial gravel pits. These materials are delivered to the waste site by the vendor.

All barrier sites are considered to have settled and are compacted enough to support construction of a barrier without further settling. Dynamic compaction is not used to pre-compact the site.

The barrier sites are considered level and will not require additional pre-leveling before the start of construction.

D3.4.2 Evapotranspiration Monofill Barrier

The ET monofill barrier will consist of three different layers (See Figure D-1):

- The bottom layer will be constructed of 20 cm (8 in.) of engineered fill. The construction of the engineered fill requires the excavation of suitable borrow from a Hanford pit source. The estimated time to complete the fill is based on the production rate of a 5-yd^3 loader excavating at the pit. All material is screened with a grizzly mounted on a surge bin to remove 10 cm (4 in.) or larger rocks. Five 16-yd^3 end dump trucks with 16-yd^3 trailers are needed to keep up with the loader. One 4,000-gal. water truck provides dust control at the pit. The production rate for this work is 141 m^3/hr (185 yd^3/hr). The spreading and compaction equipment used at the barrier is a 250- to 300-hp dozer with a U-blade to spread fill, and two 12-ton vibratory tandem rollers. A 4,000-gal. water truck provides dust control.

- To produce a smooth surface to prevent low areas, the surface of engineered fill is fine-graded. Work involves a 5-yd^3 loader, 12-ton vibratory single drum roller, a laser-leveling equipped dozer, and a water truck. The production rate is 2090 m^2/hr (2,500 yd^2/hr) to fine-grade the fill surface area. One laborer supports the grader operator as a grade checker. Two engineer technicians set up the grade and elevation control.

- A biobarrier layer will be constructed over the waste site, before the bottom layer of fill is constructed, when the depth of the cover or overburden soil is less than 4.5 m (15 ft). This layer is made of ballast gravel spread 0.3 m (1 ft) deep over the waste site. The area of the ballast layer covers an additional 3 m (10 ft) on each side of the waste site and a slope distance of 0.9 m (3 ft). On top of the ballast layer is spread 10 cm (4 in.) of 1.6 cm (5/8-in.) crushed-top course gravel. The process for the construction of this layer involves a 5-yd^3 loader, 300-hp dozer, water truck, and vibratory compactor for spreading and compacting the layer over the waste site. The gravel is from a commercial source and has been stockpiled near the waste site before building the layer. The production rate is 229 m^3/hr (300 yd^3/hr) for spreading and compacting the layer. One laborer supports the three equipment operators and the water truck driver.

- The second layer will be constructed of 68 cm (27 in.) of silt fill. The construction of this layer involves excavating and hauling the silt from the Hanford pit to the barrier. This layer is 51 cm (20 in.) deep. The estimated time to complete the fill is based on the production rate of a 5-yd^3 loader excavating at the pit. Five 16-yd^3 end dump trucks with 16-yd^3 trailers are needed to keep up with the loader. One 4,000-gal. water truck provides dust control at the pit. The production rate for this work is 141 m^3/hr (185 yd^3/hr). At the barrier, the silt is spread with two 90- to 120-hp low-ground pressure dozers. The silt is scarified to prevent overcompaction. A truck with a 4,000-gal. water trailer provides dust control at the barrier.

- The top layer will be constructed of 30 cm (12 in.) of silt/pea gravel fill. This layer requires a fill material consisting of silt with 15 percent pea gravel added by weight. The silt is excavated with a 4- to 5-yd^3 loader and hauled from the site silt source by two dump trucks to a process area near the pit. Pea gravel will be provided from a commercial source. The supplier will haul and stockpile the gravel at the silt process area. A 4- to 5-yd^3 loader and a pug mill with belt loader are used to mix the silt and gravel. The hauling from the process area is the same as described for the second layer. Spreading also is the same as the second layer. The side slopes of the barrier will be covered with 0.3 m (1-ft) deep fractured basalt with silt to fill in the void spaces in the rock.

- The side slopes of the barrier will be fine-graded before placing fractured basalt. The work involves a 100- to 150-hp dozer with laser controls, a 4- to 5-yd^3 loader, one 12-ton vibratory single drum roller,

and a water tanker. The production rate is 2,090 m^2/hr (2,500 yd^2/hr) for the engineered fill surface area. One laborer supports the dozer operator and the water truck driver. Two engineer technicians set up the grade and elevation control.

- A geotextile is placed on the side slopes. This item of work covers the placement of needle-punched 120-mil polypropylene geotextile on the side slopes. The production rate is 250 m^2/hr (300 yd^2/hr). Three laborers place and splice the fabric. One operator with a 2.5-yd^3 loader and a truck driver with a flatbed truck support the work.
- The top layer of the side slopes is covered with 30 cm (12-in.) deep fractured basalt with silt. The fractured basalt is from a commercial source and is delivered to the site by the supplier. The silt is from the Hanford pit and is hauled to the barrier. The equipment used to spread the basalt is a 5-yd^3 loader, 300 hp dozer with rippers, and one-quarter-time 4,000 gal. water truck. Two equipment operators and one-quarter-time truck driver operate the equipment. One laborer supports the operators as a grade checker and helps place fractured basalt. The placement of the silt involves excavating at the pit, hauling to the barrier, and spreading on the fractured basalt. This work occurs at the same time as the placement of the fractured basalt to ensure the silt is worked into the basalt. The excavation and hauling from the pit uses one 5-yd^3 loader and three 16-yd^3 end dump trucks with 16-yd^3 trailers. The placement and mixing with the basalt use one 5-yd^3 loader. A 4,000-gal. water truck is used for dust control. Two operators, four truck drivers, and one laborer operate the equipment and support the work. The production rate for this work is 53 m^3/hr (70 yd^3/hr).
- Instrumentation is not included for these barriers.

D3.4.3 Physical Barrier

The Physical barrier will consist of four different layers (see Figure D-2):

- The bottom layer will be constructed of 122 cm (48 in.) of fractured basalt. The top 0.3 m (1 ft) of the fill will be mixed with crushed ballast rock. Fractured basalt and crushed ballast rock will be provided from a commercial source. The supplier will haul and dump the material near or on the waste site. The process for the construction of the basalt layer involves a motor grader, 300 hp dozer, water truck, and vibratory compactor for spreading and compacting the layer over the waste site. The production rate is 114 m^3/hr (150 yd^3/hr) for spreading and compacting the layer. One laborer supports the three equipment operators and the water truck driver. The process for mixing the upper 0.3 m (1 ft) of the fill with crushed ballast rock involves two motor graders, loader, water truck, and two vibratory compactors. The production rate is 159 m^3/hr (208 yd^3/hr) for mixing, spreading, and compacting the layer of crushed ballast.
- The second layer will be 91 cm (36 in.) of engineered fill. The construction process will be the same as described above.
- The third layer will be 68 cm (27 in.) of silt fill. The construction process will be the same as described above.
- The top layer will be constructed of 30 cm (12 in.) of silt/pea gravel fill. The construction process will be the same as described above.
- The side slopes of the barrier will be same as described above.
- Instrumentation is not included for these barriers.

- After completion of the barrier construction work, a 1.2 m (4-ft) steel post with chain fence will be built around the site. The fence location is at the toe of the barrier slope.

Operation and maintenance costs for the Barrier Alternative include barrier performance monitoring and repair costs. For purposes of this FS, all sites will assume annual repairs to the barrier (replacement of 15.2 cm [2 ft] of topsoil layer and revegetation over 10 percent of the barrier area). This is considered a conservative estimate because the barrier has been designed to require minimal maintenance, particularly after vegetation has been established.

During the construction of the barrier, compaction testing will be performed on the different layers. The bottom and sand layers will require that a minimum level of compaction has been reached. The top two layers will be tested to ensure that the fill does not become overcompacted.

D3.4.4 Maintain and Enhance Existing Soil Cover

An alternative to the original ET cover was also considered. Under the MEESC option, the sites will all receive 0.3 m (1 ft) of soil for planting shallow rooting grass and forbs to stabilize the soil cover. If the contamination layer is less than 4.5 m (15 ft) to the surface of the wastes site, additional soil will be added to the waste site prior to the 0.3 m (1 ft) soil for planting. Additional soil (engineered fill) will be added to the existing soil until there is a combined depth of at least 4.5 m (15 ft) to the contamination layer. Prior to the final layer of soil, the waste site will be contoured to promote drainage. For planning purposes, the side overlap of barriers will be 6.1 m (20 ft) for all exterior sides.

The MEESC will consist of

- The bottom layer will be constructed of engineered fill. The depth will vary depend on the depth of the contaminated soil. The construction of the engineered fill requires the excavation of suitable borrow from an onsite pit source. The estimated time to complete the fill is based on the production rate of a 3.8 m^3 (5-yd^3) loader excavating at the pit. All material is screened with a grizzly mounted on a surge bin to remove 10 cm (4 in.) or larger rocks. Five 12 m^3 (16-yd^3) end dump trucks with 12 m^3 (16-yd^3) trailers are needed to keep up with the loader. One 15,142 L (4,000-gal) water truck provides dust control at the pit. The production rate for this work is 141 m^3/h (185 yd^3/h). The spreading and compaction equipment used at the barrier is a 250- to 300-hp dozer with an U-blade to spread fill, and two 12-ton (short) vibratory tandem rollers. A 15,142 L (4,000-gal) water truck provides dust control.

- To produce a smooth surface to prevent low areas, the surface of waste site or engineered fill is fine-graded. Work involves a 3.8 m^3 (5-yd^3) loader, 12-ton (short) vibratory single drum roller, a laser-leveling equipped dozer, and a water truck. The production rate is 2,090 m^2/h (2,500 yd^2/h) to fine-grade the fill surface area. One laborer supports the grader operator as a grade checker. Two engineer technicians set up the grade and elevation control.

- The soil layer will be constructed of 30 cm (12 in.) of soil fill. The construction of this layer involves excavating and hauling the soil from the onsite pit to the barrier. The estimated time to complete the fill is based on the production rate of a 3.8 m^3 (5-yd^3) loader excavating at the pit. Five 12 m^3 (16-yd^3) end dump trucks with 12 m^3 (16-yd^3) trailers are needed to keep up with the loader. One 15,142 L (4,000-gal) water truck provides dust control at the pit. The production rate for this work is 141 m^3/h (185 yd^3/h). The spreading equipment used at the site is a 250- to 300-hp dozer with an U-blade to spread fill. A truck with a 15,142 L (4,000-gal) water trailer provides dust control at the barrier.

- Re-vegetation of the waste site includes planting native dry land grass using tractors with seed drills and hand broadcasting, and irrigation for four times in the spring or early summer. All disturbed areas, such as around the waste site, staging areas, and access roads, will be replanted.
- After completion of the soil layer work, a 1.2 m (4-ft) steel post with chain fence will be built around the site. The fence location is at the edge of the waste site.

Operation and maintenance costs for the MEESC Alternative include monitoring and repair costs. For the purpose of this FS, all sites will assume annual repairs to the soil layer (replacement of 15.2 cm [1 ft] of soil layer and re-vegetation over 10 percent of the waste site area). This is considered a conservative estimate because the soil layer has been designed to require minimal maintenance, particularly after vegetation has been established.

D3.4.5 Special Conditions

The following sections identify issues that apply only to specific sites.

D3.4.5.1 216-Z-1A – Below Ground Physical Barrier

The existing site is a tile drain field that is located approximately 2.4 m (8 ft) below the existing ground surface. The physical barrier will be built inside the depression area. The fractured basalt layer, engineered fill, silt, and pea gravel/silt layers will all be constructed the same as described above and to the same depths. Since the barrier as designed is 3.1 m (10.3 ft) tall and the waste site is 2.4 m (8 ft) deep, approximately 0.7 m (2.3 ft) of silt fill will be above the surrounding area. A shortened fractured basalt side slope will be constructed around the raised silt layer (see Figure D-3).

D3.4.5.2 216-Z-1&2, and 3 – CDF Backfill of Crib and Physical Barrier

The sites are all below ground structures, with 216-Z-1&2 being timber crib structures and 216-Z-3 being constructed of metal culvert sections. Prior to constructing the Physical Barrier over the cribs, each crib is to be backfilled with pumped CDF. If the existing pipe opening cannot be used for pumping, the structures will be excavated and a small opening made into the top of the structures. CDF will then be pumped into the hollow sections of the cribs until CDF has completely filled the voids. After the CDF has hardened, the sites will be backfilled and compacted. The Physical Barrier will then be constructed over the site.

D3.4.5.3 216-Z-9 – CDF Backfill of Trench and Leave Roof in Place with ET Monofill

This site is a below ground trench with a concrete roof. After all buildings and equipment have been removed from the site, the trench will be backfilled with pumped CDF until the void area under the concrete roof is completely filled. There are several openings in the existing trench roof, so no new opening will be required prior to the start of the CDF pumping process. The existing concrete roof will remain in place.

D3.4.5.4 216-Z-1, 2, 3, and Z-1A – Barrier Overlap

The cost estimates for the barrier alternative at each of these waste sites treated each site separately. These four waste sites are located close enough to each other that if individual barriers were constructed over each waste site they would overlap. The potential cost savings from the barrier overlap at these four sites was not quantified because it was expected to be less than the +50 percent to -30 percent accuracy of the cost estimates.

D3.5 Soil Vapor Extraction

An SVE system mainly consists of screened wells located at various depths in the vadose zone and an applied vacuum (e.g., blower) that is used to extract the vapor from the vadose zone.

The number of wells and the depth of the screening are specific to each waste site and will be finalized during remedial design. For estimating purposes, the number of additional wells to increase coverage or target specific known contamination layers has been estimated at 10 wells with a screened depth of 45.7 m (150 ft) for each of the three waste sites.

D3.5.1 General Description and Assumptions

The following sections describe the general description and assumptions of well construction, operation and maintenance, and decommissioning.

D3.5.1.1 Well Construction

The general assumptions for SVE well construction are below.

Work activities include planning and documentation, technical coordination, procurement, labor, subcontracts, materials, equipment, field support during construction, waste management, and project closeout.

Well Planning: Prepare and/or obtain the necessary documentation to support well installations. Where possible, use or modify existing documentation to plan the work. Subtasks include, but are not limited to, the following:

- Stake wells and walk down
- Prepare Description of Work for installation of wells with data sheets
- Prepare Sampling and Analysis Instructions and Data Quality Objective Waste Summary Report
- Conduct cultural resources review
- Conduct ecological resources review
- Perform ground-penetrating radar surveys for underground utilities
- Update Site-Specific Waste Management Instructions
- Prepare drilling contract from Description of Work and data sheets
- Prepare necessary permits (e.g., excavation)
- Prepare preliminary hazard classification, hazard survey, and radiological assessment.

Well Installation: Tasks include the following:

- Prepare subcontract documents
- Prepare well pads
- Drill and install wells
- Conduct civil surveys of well locations
- Provide management support, labor support, and associated documentation
- Close out activities.

Fieldwork such as mobilization/demobilization, site preparation, drilling, well completion, development, and some of the post-construction work will be contracted to an FP contractor. Project management, RCT support, sampling, and safety oversight will be performed by CHPRC.

CHPRC work activities also include planning and documentation, technical coordination, procurement, labor, subcontracts, materials, equipment, field support during construction (e.g., buyer's technical representative), waste management, and project closeout.

Waste management activities include providing management oversight for waste associated with the installation of wells. Waste management includes the disposal of soil, groundwater, and miscellaneous waste sampling as needed during well installations, well operations, and miscellaneous waste disposal. Waste management support includes waste sampling and evaluations, profiling, labeling, disposal costs, and management. Tasks include the following:

- Provide office and field supervision, and RCT/industrial hygiene technicians as required to support waste management activities.
- Provide manual/nonmanual labor, subcontracts, and project management for those activities.
- Collect two soil samples from waste containers from each boring.
- Dispose of cuttings (assumes approximately three-quarters of soil cuttings will be returned to the environment at the wellhead and approximately one-fourth of the soil will be disposed to ERDF).

FP contractor mobilization and startup include site training; mobilization of equipment and personnel; installation of temporary construction fences; and construction of drill pads, access roads, and decontamination areas. The length and width of the access roads and the size of the drill pad will vary as a function of the topography and building/utility constraints. The contractor will clear and grub vegetation for the well pad and road. The roads and drill pads will be constructed of pit run gravel and topped with 3.2 cm (1.25-in.) minus crushed rock.

The FP contractor provides and manages all labor, material, equipment, and testing/ inspection services required to complete a fully functional monitoring well to Hanford Site standards. The drilling equipment will be steam cleaned or decontaminated before use at a drill site and before being removed from the site. The FP contactor will supply and install the temporary and permanent well casing and screens, along with the sand, grout, sealing bentonite clay, and SVE equipment. The FP contractor also will install the concrete well pad, protection post, and locking well cover. The FP contractor will manage the drumming of drilling waste before turnover to waste management. This also will include a forklift operator for drum handling after the drums are turned over to waste management. The contractor will provide crew and equipment for soil sampling during drill operations.

D3.5.1.2 Well Operation and Maintenance

A previous engineering evaluation and cost assessment was performed on the 200-PW-1 Carbon Tetrachloride SVE sites 2007 (SGW-37111 Revision 0, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2007*). This information is the basis for the operation and maintenance costs. The costs shown in the study were averaged and then escalated to 2008 costs. The five activities covered by the study are the Design, Operations and Maintenance, Performance Monitoring, Project Support, and Waste Management. In addition, cost for replacing the flex hose assemblies every 3 years has been estimated and included. It is assumed that an offsite vendor will fabricate the needed replacement parts and install the hose at the well site.

D3.5.1.3 Well Decommissioning

The labor to remove the SVE system is assumed to cost 50 percent of the installation labor. The equipment is to be removed and stored for other projects. The hoses and associated material will be sent

to ERDF for disposal. The wells will be decommissioned by grouting or plugged according to Washington State requirements.

D3.6 In Situ Vitrification

The ISV alternative will be used to vitrify contaminated soils beneath the trench, reducing the risk posed by direct contact with the material, and impeding intrusion into the residual untreated contaminants. The exact number and configuration of melts, and the components and configuration of the offgas treatment system, will be determined in the remedial design phase. Treatability testing most likely will be necessary to support design. Handling or disturbing the soil at these waste sites will require special considerations. Section D3.7.2.1 provides additional information.

D3.6.1 General Assumptions

The general assumptions for the ISV alternative are below.

Fieldwork such as mobilization/demobilization, excavation, backfill, revegetation, and some of the post-construction work will be contracted to an FP contractor. The project management, RCT support, sampling, and safety oversight will be performed by CHPRC. The waste disposal work involved with hauling from the site to ERDF and ERDF dumping cost/fees will be performed by the environmental restoration contractor responsible for ERDF.

Mobilization and startup include site training; mobilization of equipment and personnel; installation of temporary construction fences; construction of staging/container storage areas and access roads; and setting up office, change, and storage trailers with utilities, temporary survey buildings, and decontamination areas.

A layer of clean fill will be placed on top of the base soils to provide a working surface for placement of the electrodes and injection of conductive material between the electrodes. For sites with 1.5 m (5 ft) or more of clean overburden soil on top of a crib or trench, the overburden will be removed and stockpiled nearby. The process used to remove the overburden will be the same as described in Alternative 3.

Melts, including offgas treatment, are assumed to cost $1,775/metric ton ($1,615/ton), based on discussions with AMEC (supplier of the GeoMelt[3] technology). This unit rate includes cost for the melt subcontractor to bring in the melt equipment, hoods, control trailers, electrodes, etc, and personnel to operate the equipment. The cost of demobilization for the melt equipment is included in this unit rate.

The melts would result in a contiguous block of glass at the base of the waste site. Backfilling of the waste site will be required after the melts to match the surrounding ground surface. Backfilling consists of the following operations.

- Moving the stockpiled overburden back to the site will require one crew. The equipment used by a crew is one 5-yd^3 loader and two haul trucks. Labor is one operator and two truck drivers. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).
- Moving borrow material to the site typically is performed by one crew hauling from a Hanford pit source. The equipment used by a crew is one 5-yd^3 loader, five 16-yd^3 end dump trucks with 16-yd^3 trailers, and one 4,000-gal. water truck. Labor is one operator and six truck drivers. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).

[3] GeoMelt is a trademark of AMEC, London, England.

- Spreading and compaction of the backfill at the site is performed by one crew. The equipment used per crew is one 300-hp dozer and one 4,000-gal. water truck. Labor consists of one operator, one truck driver, and one laborer. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).

Revegetation of the waste site includes planting native dry-land grass using tractors with seed drills and hand broadcasting, hand-planting sagebrush seedlings, and irrigation for four times in the spring or early summer. All disturbed areas, such as around the waste site, stockpile, staging areas, and access roads, will be replanted.

The PRC Project Management team consists of a part-time project manager with a full-time field supervisor and part-time engineering support. QA, radiological control, and safety also provide oversight, along with other support for contract management and project controls. Total hours for this staff are planned at 22.5 hours per day. The duration of this work is based on total project duration.

The FP contractor field supervisory team consists of a full-time construction manager and field supervisor, along with part-time QA, construction safety, and clerical support. Two pickup trucks are included in the cost. Total hours for this staff are planned at 21 hours per day. The duration of this work is based on total project duration.

Demobilization includes demobilization of equipment and personnel; removal of temporary construction fences; and construction of staging/container storage areas, access roads, office/change/storage trailers, temporary survey buildings, and decontamination areas.

The cost estimate does not include the following items:

- Additional site characterization to support design
- Treatability studies
- Infrastructure (e.g., line drop for ISV electrical demand, or the cost of electrical power)
- In-process addition of backfill materials to make up for subsidence
- Management/disposal of secondary waste streams from the offgas system
- Post-cooling evaluation of melt (seismics and soil sampling)

D3.6.2 Special Conditions

The following sections identify issues that apply only to specific sites.

D3.6.2.1 216-Z-1, 2, 3, and 5–Removal of Crib and Overburden before ISV

These waste sites are below ground crib structures. Before ISV remediation work can start the timber crib structures will need to be removed. The work will start by first removing all of the clean overburden soil and stockpiling it nearby. The structures will be demolished, removed, and placed in an ERDF container for disposal at ERDF. Any contaminated soil encountered at the sites will remain at the bottom of the excavation. The floor of the excavation will then be smoothed and prepped for the ISV work by spreading and smoothing any contaminated soil. After completion of the ISV work and the required cool-down period, the clean soil will be used to backfill the site. At 216-Z-3, the culverts will be collapsed prior to ISV.

D3.6.2.2 216-Z-9–Removal of Roof and ISV

Before ISV work can start, the roof will be removed from the trench. The process is the same as described in Section D3.7.3.1. At the completion of the ISV work and after the cool-down period, the trench will be backfilled with soil to the elevation of the surrounding ground surface.

D3.7 Removal, Treatment, and Disposal

Cribs, trenches, and other sites are excavated to the required depth, and contaminated material is removed to ERDF or WIPP for disposal. Excavation depth and mixing requirements are different for each of the waste sites.

D3.7.1 General Assumptions

The general assumptions for this alternative are below.

Fieldwork such as mobilization/demobilization, excavation, backfill, revegetation, and some of the post-construction work will be contracted to an FP contractor. Project management, RCT support, sampling, and safety oversight will be performed by CHPRC. The waste disposal work involved with hauling from the site to ERDF and ERDF dumping cost/fees will be performed by the environmental restoration contractor responsible for ERDF.

Mobilization and startup include site training; mobilization of equipment and personnel; installation of temporary construction fences; construction of staging/container storage areas and access roads; and setting up office, change, and storage trailers with utilities, temporary survey buildings, and decontamination areas.

The sites will have contaminated waste removed. The sides of the excavation will be sloped at 1.5:1 to the bottom of the excavation. During the removal process, heavy equipment will be kept out of the excavation.

For excavation sites, overburden will be removed with a 2- to 3-yd^3 excavator and two haul trucks. The soil will be stockpiled near the waste site. A highway truck with a water tank trailer is used to control dust during this activity. The production rate for one crew is 111 m^3/hr (146 yd^3/hr).

Contaminated waste will be excavated using a 2- to 3-yd^3 hydraulic crawler excavator. The contaminated soil will be directly placed into lined ERDF containers and hauled from the excavation site. A highway truck with a water tank trailer is used to control dust during this activity. Depending on the volume of waste to move, one to four crews can be working at a site. Crew labor consists of one operator, one laborer, and one truck driver. The production rate for one crew is 45 m^3/hr (60 yd^3/hr). An RCT supports the work at 1.5 hours per excavation crew hour.

Air sampling will be performed at the start of the remediation, completion of remediation, and every quarter of the year. A minimum of two samples will be taken per each sampling period. The planning cost per sample is $559. The sampling crew consists of one sampler and one RCT.

Soil samples will be taken of the overburden, from ERDF containers, and for verification at the completion of the excavation. The soil-sampling costs are based on the contaminants expected to be found at the sites and are below:

- Noncontaminated soil sampling
  - Maximum of six samples or one sample per 0.7 m^3 (1 yd^3), whichever is less
  - QA sample required: one
  - Planning cost per sample: $2,110
  - The soil being sampled is the overburden that is uncontaminated and will not be removed from the site

- Sampling required for waste going to ERDF
  - One sample is required for every 70 containers
  - There will be a minimum of six samples per site
  - QA samples required: a minimum of 1 sample or 5 percent of total ERDF samples, whichever is greater
  - Planning cost per sample: $486
- Pre-verification process sampling
  - One sample will be required per 2,500 m2 (50 × 50 m) (26,899 ft2)
  - There will be a minimum of six samples per site
  - QA samples required: a minimum of two samples or 5 percent of total the samples, whichever is greater
  - Planning cost per sample: $3,540
  - These are the preliminary samples needed to determine if all of the required waste has been removed from a site being excavated
  - This process is expected to occur twice during the excavation process
  - If the samples show that the site has met the requirement, the verification process will start
- Verification process sampling
  - One sample will be required per 625 m2 (25 × 25 m) (6,724 ft2)
  - There will be a minimum of six samples per site
  - One boring to 30.5 m (100 ft) to confirm the residual contamination at depth with samples collected every 1.5 m (5 ft) and analyzed for final COPCs
  - QA samples required: a minimum of 2 or 5 percent of total the samples, whichever is greater
  - Planning cost per sample: $11,417
  - These samples are the final samples needed to determine if all of the required waste has been removed from a site being excavated
  - This process occurs once during the excavation process
- Sampling crews
  - Verification sampling – 1 hour for each sample taken by a crew consisting of one CHPRC RCT and a sampler technician
  - Other sampling (air, ERDF, noncontaminated) – 2 hours for each sample taken by a crew consisting of one CHPRC RCT and one sampler technician

The ERDF container handling and loading process starts with a site haul truck picking up an empty container at the staging area. The container is moved to a preparation area where laborers install a bed liner, and then the container is inspected by a half-time RCT. The haul truck and container proceed to the loading area. After loading, the liner is sealed and the container is secured by laborers. The container is moved to the survey building where three RCTs inspect and survey the container and truck for contamination. From there, the haul truck and container are driven to the storage area. The container is unloaded from the truck at the storage area. Three trucks are required to support each contaminated excavation crew.

ERDF disposal fee, transportation, and handling costs are estimated at $868.85 per container. An environmental restoration contractor driver and truck/trailer will move a loaded container to ERDF and place an empty container in the staging area. The estimated costs include the rental of the containers used. For planning purposes, the capacity of an ERDF container is 10 m^3 (13 yd^3) of contaminated waste.

Backfilling consists of the following operations:

- Moving the stockpiled overburden back to the excavation site will require one crew. The equipment used by a crew is one 5-yd^3 loader and two haul trucks. Labor is one operator and two truck drivers. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).
- Moving the borrow material to the excavation site typically is performed by one crew hauling from a Hanford pit source. The equipment used by a crew is one 5-yd^3 loader, five 16-yd^3 end dump trucks with 16-yd^3 trailers, and one 4,000-gal. water truck. Labor is one operator and six truck drivers. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).
- Spreading and compaction of the backfill at the site is performed by one crew. The equipment used per crew is one 300-hp dozer and one 4,000-gal. water truck. Labor consists of one operator, one truck driver, and one laborer. The production rate for one crew is 141 m^3/hr (185 yd^3/hr).

Revegetation of the waste site includes planting native dry-land grass using tractors with seed drills and hand broadcasting, hand-planting sagebrush seedlings, and irrigation for four times in the spring or early summer. All disturbed areas, such as around the waste site, stockpile, staging areas, and access roads, will be replanted.

The CHPRC Project Management team consists of a part-time project manager, a full-time field supervisor, and part-time engineering support. QA, radiological control, and safety also provide oversight, along with other support for contract management and project controls. Total hours for this staff are planned at 22.5 hours per day. The duration of this work is based on total project duration.

The FP contractor field supervisory team consists of a full-time construction manager and field supervisor, along with part-time QA, construction safety, and clerical support. Two pickup trucks are included in the cost. Total hours for this staff are planned at 21 hours per day. The duration of this work is based on total project duration.

Demobilization includes demobilization of equipment and personnel; removal of temporary construction fences; and construction of staging/container storage areas, access roads, office/change/storage trailers, temporary survey buildings, and decontamination areas.

The cost estimates for each of the RTD alternative cases treated each of the waste sites separately. Several of the waste sites are located close enough to each other that if the RTD alternative cases were implemented at each of the following waste sites there would be overlap in the amount of overburden to be excavated, stockpiled, and replaced:

- Cases 3a and 3c – 216-Z-1, 2, 3, and Z-1A
- Cases 3d and 3e – 216-Z-1, 2, 3, Z-1A, and Z-18

The potential cost savings from the overlap in the amount of overburden to be excavated, stockpiled, and replaced at these sites was not quantified because it was expected to be less than the +50 percent to -30 percent accuracy of the cost estimates.

D3.7.2 Special Conditions

The following sections identify issues that apply only to specific sites for the RTD alternatives.

D3.7.2.1 200-PW-3 Sites: 216-A-7 Crib, 216-A-8 Crib, 216-A-24 Crib, and 216-A-31 Crib

Because of the nature of the contaminants at the 200-PW-3 sites, mixing of the contaminated soils is required before container loading and disposal. The RTD process will be the same as described above except contaminated soil will be mixed with clean soil from the site at a 2:1 basis.

Contaminated waste will be mixed and excavated using a 2- to 3-yd^3 hydraulic crawler excavator. The contaminated soil, after it has been mixed, will be placed directly into lined ERDF containers and hauled from the excavation site. A highway truck with a water tank is used to control dust during this activity. Crew labor consists of one operator, one laborer, and one truck driver. The production rate for one crew is 23 m^3/hr (30 yd^3/hr). An RCT supports the work at 1.5 hours per excavation crew hour and will ensure that the initial surveys of the soil will meet the requirements of ERDF-bound waste. The rest of the activities at the site will remain unchanged.

D3.7.3 Removal of Soil Containing Transuranic Radionuclides

Excavations at sites that include soil potentially containing transuranic radionuclides will require special handling of the packaged soil and disposal of that soil at WIPP. Excavation includes mobilization/demobilization, removal of clean soil, backfilling the site, and other site work. For the cost estimate, the volume of soil requiring disposal at WIPP was estimated based on the length and width dimensions of the bottom of the waste site and the depth of the dig for each RTD case as described in Chapter 5.0. The following assumptions apply:

- The contaminated soil is placed into WIPP SWB. For planning purposes, each box is expected to handle 1.15 m^3 (1.5 yd^3) of waste.
- The field crews can fill, cover, inspect, sample, radiological survey, and move two SWBs per hour. The boxes are direct-loaded with a small hydraulic excavator at the waste site.
- The filled SWBs are moved to a decontamination area, then to a field survey area before being temporarily staged at the waste-site container storage area.
- The SWB is field screen/surveyed at the site before shipment to the CWC. Two technicians, two scientists, and one equipment operator perform the field-screening work at the site.
- Waste shippers will provide oversight of the field operation and the required waste designation reports to support shipment to the CWC.
- After the initial field screening/survey of the waste, those SWBs determined to contain transuranic radionuclides are moved six SWBs per truckload to the CWC.
- The CWC will perform processing, headspace sampling, nondestructive analysis, and temporary storage. The waste storage rate is $12,872 per SWB.

- After completion and acceptance of the waste profile study, the SWBs are shipped to WIPP for storage. Six SWBs can be loaded on a truck for shipment to WIPP. The planning cost of one truck trip to WIPP is $12,500.
- At this time, there are no handling costs or storage rates for the SWBs after arriving at WIPP.

The cost estimates for each of the RTD alternative cases treated each of the waste sites separately. Several of the waste sites are located close enough to each other that if the RTD alternative cases were implemented at each of the following waste sites there would be overlap in the amount of overburden to be excavated, stockpiled, and replaced:

- Cases 3a and 3c – 216-Z-1, 2, 3, and Z-1A
- Cases 3d and 3e – 216-Z-1, 2, 3, Z-1A, and Z-18

The potential cost savings from the overlap in the amount of overburden to be excavated, stockpiled, and replaced at these sites was not quantified because it was expected to be less than the +50 percent to -30 percent accuracy of the cost estimates.

D3.7.3.1 216-Z-9 Trench Cover Removal

Before the start of the demolition and removal work at the site, it is assumed that all existing structures on the top of the trench cover have been removed. The holes in the concrete cover have been covered and the temporary cover support steel will still be in place.

The cover-removal process is based on removing the concrete cover in sections. The surface of the trench below the cover will be sprayed with a soil fixative that will help control dust from the trench floor during cover removal. The cover will be saw-cut into manageable sections (about 4.5 × 4.5 m [15 × 15 ft]) and lifted out of the waste site with a crane. Each removed section will be saw-cut to fit onto standard highway transport trailers and for easier handling at ERDF. The cover support columns will be saw-cut near the soil line at the base and lifted out by the crane. Each cover section and column will be wrapped in plastic before being placed on a trailer. The remaining lower column sections, column footings, and perimeter stem wall will be demolished, then mixed and removed with the surrounding soil to be hauled to ERDF.

The excavation, sampling, backfilling, and restoration process will follow the typical RTD process.

D3.7.3.2 241-Z-361 and 241-Z-8 Settling Tanks–Retrieve, Treat Sludge, Backfill, and Dispose

As discussed in Section D2.4, DOE/RL-2003-52 was prepared in 2003 for the 241-Z-361 Settling Tank and updated to reflect current costs and include additional scope for backfill and sludge disposal costs to WIPP. The removal action includes only the removal of the sludge, not the tank itself.

The 241-Z-361 Settling Tank will be accessed by removing the top 0.6 m (2 ft) of cover and opening a 8.5 m (28 ft) long by 4.6 m (15 ft) wide excavation. The 241-Z-8 Settling Tank will require removal of the top 1.8 m (6 ft) of clean overburden. The 241-Z-8 excavation area will be 17.7 m (58 ft) long by 7.9 m (26 ft) wide.

Note: An overall adjustment factor of 55 percent was used to address significant uncertainties associated with labor and equipment, inflation, and escalation.

The scope outline of this previous estimate includes the following:

- Procurement

  - Procurement(s)
  - Specification (AEA Technology fluidics equipment)
  - Contract(s)
  - Acceptance test procedure

- Tank Opening
  - Work package preparation and approval
  - Set up area and equipment
  - Cut and remove concrete pad sections
  - Open 241-Z-361 Settling Tank and install in-tank equipment

- Prepare and perform first readiness assessment
  - Prepare equipment for operation
  - Work Package preparation and approval
  - Stage equipment
  - Complete assembly
  - Prepare and perform second readiness assessment
  - Power-up the equipment

- Tank mixing and retrieval
  - Work Package preparation and approval
  - Operations
  - Ship SWBs to CWC

- Demobilize
  - Work Package preparation and approval
  - Dispose of contaminated equipment
  - Prepare and perform third readiness assessment
  - Pull in-tank equipment

- Backfill tank and clean area (CHPRC activity under a work order)
  - Prepare Work Package
  - Backfill and cover tank

The scope for the additional work includes the following:

- Survey
- Sampling analysis
- Transport to WIPP
- Documentation
- CDF backfill of tank
- Project management
- Construction management

- Project closeout

Note: This capital cost was added to the previous DOE/RL-2003-52 cost estimate to represent the full scope of RTD to WIPP.

A temporary tent structure will be constructed over the tank to help control contamination during the retrieval process. The structure will be large enough to house the retrieval system, waste container packaging equipment, and personnel. The waste container used for the sludge containing transuranic radionuclides will be a 1.15 m^3 (1.5-yd^3) SWB that is accepted at WIPP for disposal. The handling of the SWB for WIPP is as described in Section D3.7.2.2.

The SWB is selected as the container of choice to minimize container handling and the total space needed for equipment, containers, and materials near Tank Z-361 and Z-8. SWBs are assumed to cost $4,000 each. Containers should be lined in order to preclude corrosion of the package.

It is assumed that a total of 149 SWBs will be sent to CWC for TRU Waste Packaging and then sent to WIPP for disposal. The 149 SWBs comes from the following calculations:

According to previous reports, Tank Z-8 contains approximately 1,890 L of liquid sludge. It is assumed that an inert sorbent solid will be added to the liquid to stabilize and solidify at a rate of 1 parts liquid to 2 parts sorbent. Therefore, 1,890 L = 5,670 L (1,890 L × 3) = 7.42 yd^3. Each SWB can hold 1.25 yd^3 and, therefore, 7.42/1.25 = ~6 SWBs.

Tank Z-361 contains liquid and sludge layers. According to past reports the liquid layer is equal to approximately 800L = 2,400 L to be placed into SWBs (800 × 3) = 3.14 yd^3 = 3 SWBs. The quantity of sludge in the Z-361 tank is believed to be approximately 76,000 L. Using the AEA Fluidic System (NuVision), it is assumed that there will be approximately 25 percent liquid or quantity added to the sludge in the process of extracting it from the tank. Therefore, 76,000 L = 133,000 L (76,000 L × 1.75) = 173.96 yd^3/1.25 yd^3 (SWB) = 140 SWBs. Using these assumptions, it is assumed that the total for both tanks liquid and sludge is approximate 150 SWBs. The quantity of liquid and sludge from both tanks used to estimate the number of SWBs could be higher by a factor of 50 to 55 percent.

Final tank disposition will be to backfill the tank. It is estimated that 153 m^3 (200 yd^3) of additional backfill will be needed to backfill 241-Z-361 Settling Tank and 57 m^3 (75 yd^3) additional backfill will be needed to backfill 241-Z-8. The tank will be pumped full of CDF to stabilize it. The existing waste site will not require any additional compaction, structure demolition, or waste removal before the start of pumping operations. A concrete pump will be set up near the tank. The existing openings in the tank will be used as pump access points for this work. No new holes will be cut into the tank. An offsite source will be used for making the CDF, which will be hauled to the site by the supplier's trucks. A cure time of 1 week is allowed. Table D-28 presents the capital costs associated with the settling tanks.

It is estimated that 250 days will be required to complete the 241-Z-361 Settling Tank project and 125 days to complete the 241-Z-8 Settling Tank project.

D4.0 References

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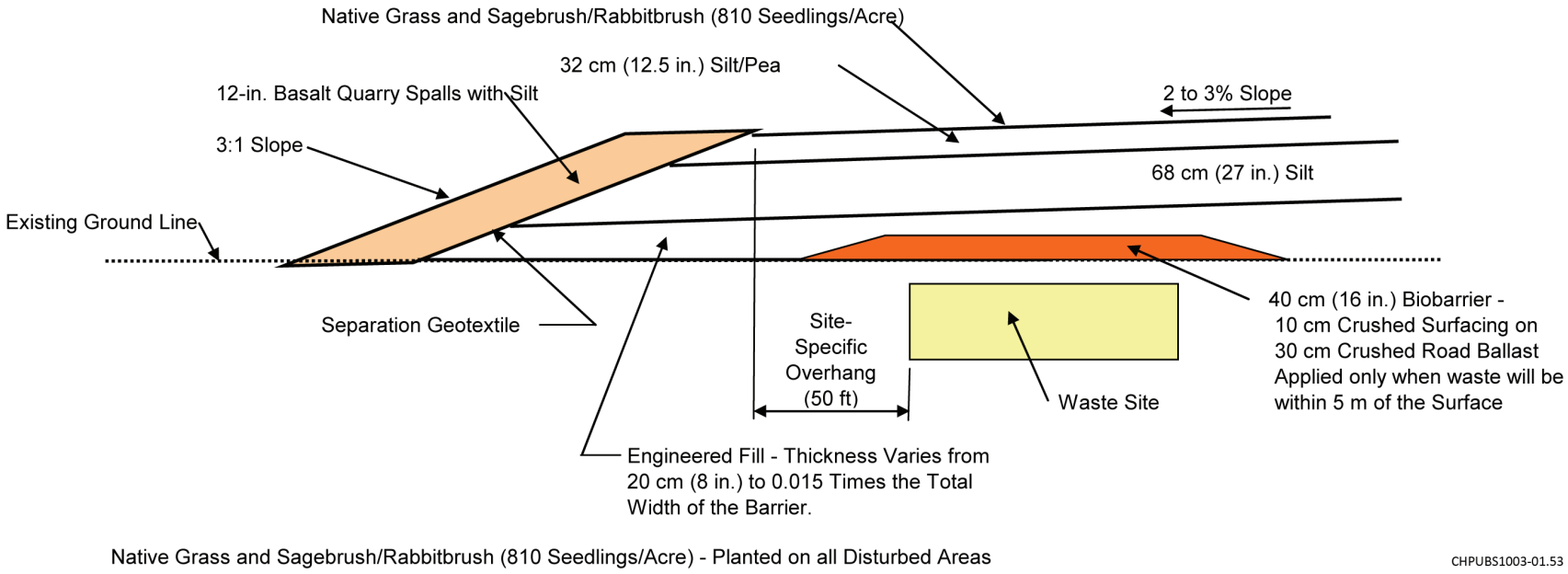

Figure D-1. ET Monofill Barrier

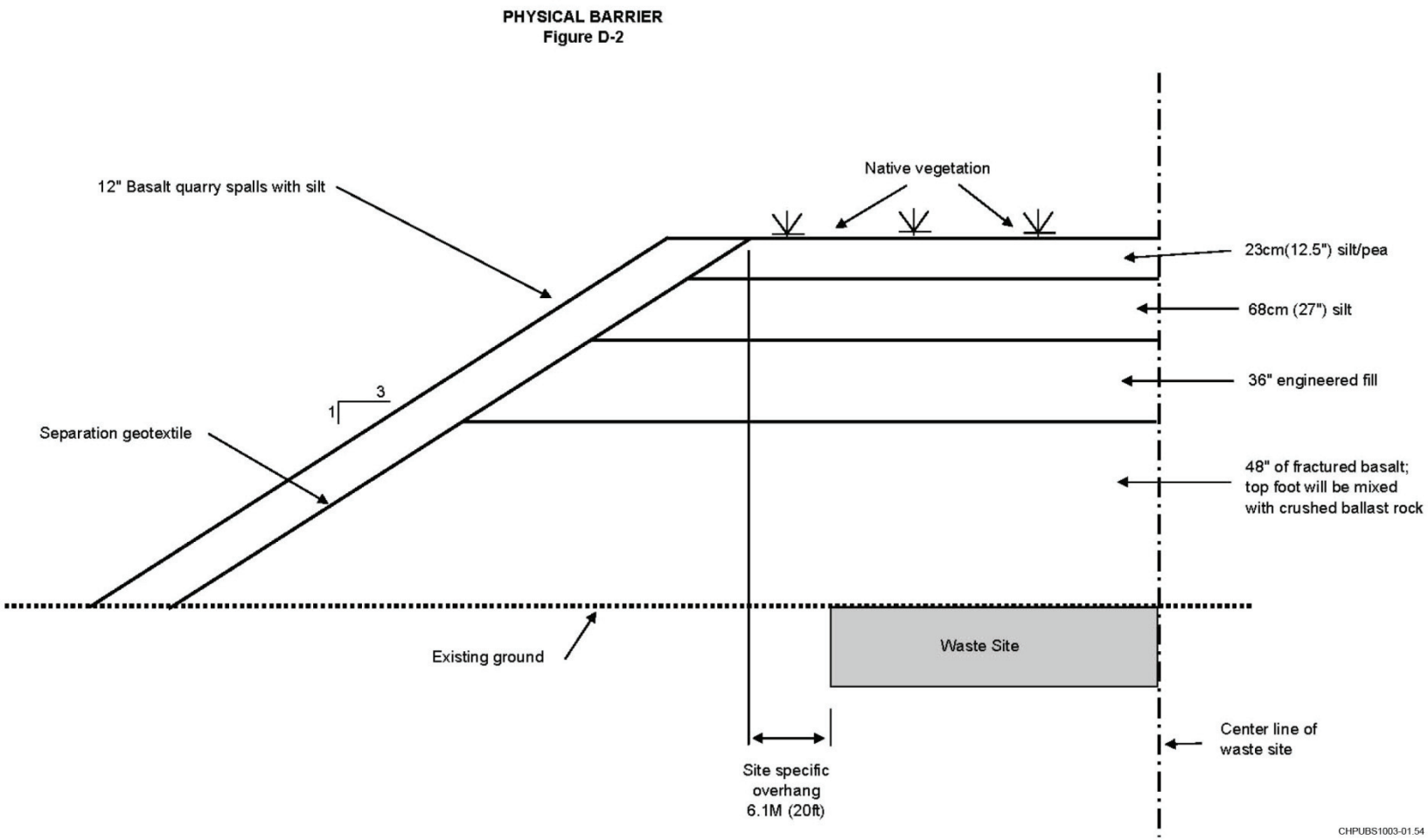

Figure D-2. Physical Barrier

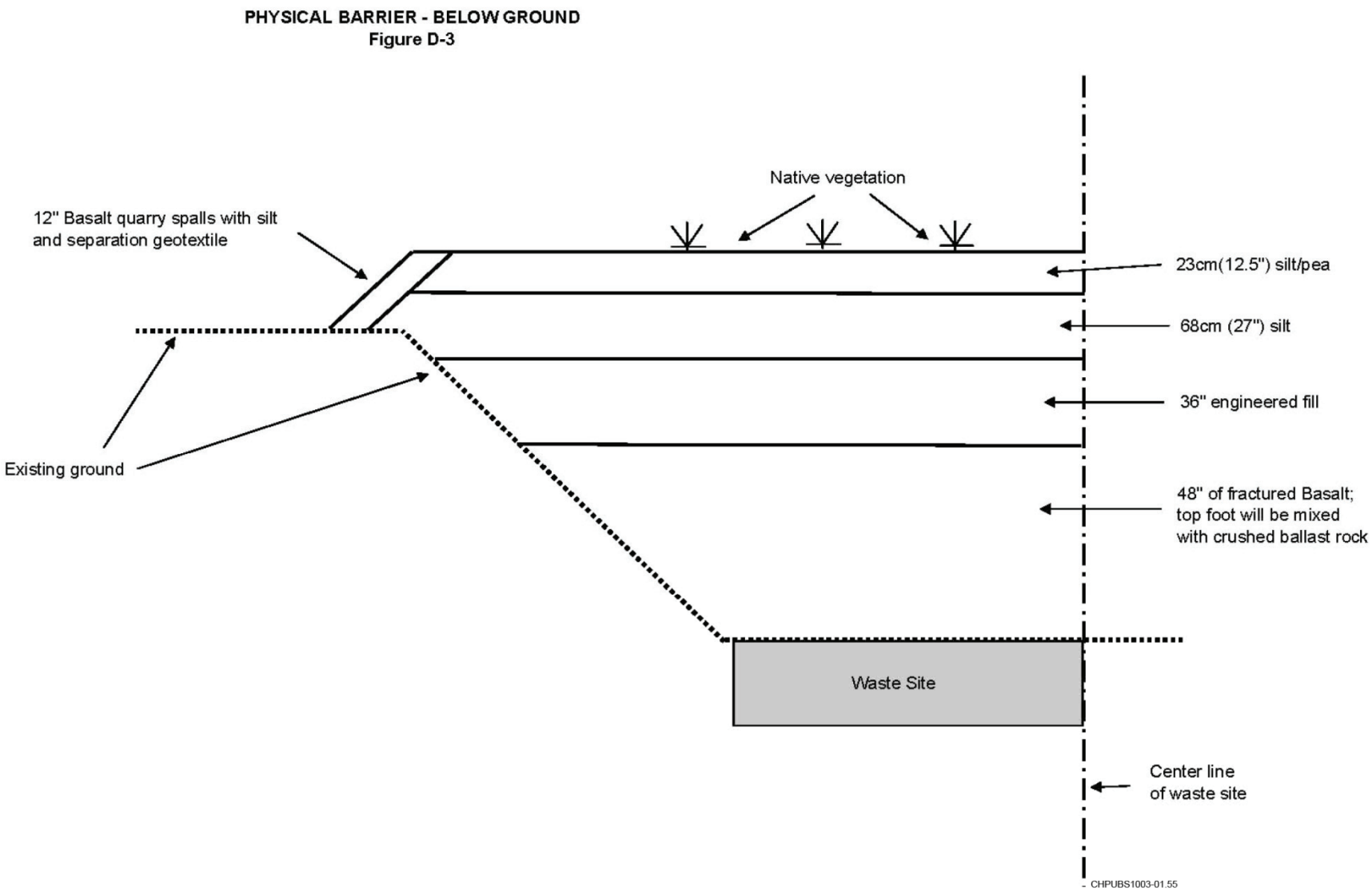

Figure D-3. Physical Barrier–Below Ground

Table D-1. Site Information 200-PW-1 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)				Engineered Barrier								Duration (days)
								Capping Dimensions		Acres of Capping					Cap Type	
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Surface Area (Ac)	Length (ft)	Width (ft)		Engineered Fill (yd^3)	Silt Fill (yd^3)	CDF Fill (yd^3)	Basalt (yd^3)		
216-Z-1A	Tile Field	1	Physical Barrier – Below Ground	100	260	8	0.60	305	155	1.1	4,470	5,701	N/A	4,858	ETBB Barrier	41
216-Z-1[a]	Crib	1	Physical Barrier with CDF Backfill	14	14	7	0.004	249	184	1.05	4,235	3,033	58	6,801	ETBB Barrier	42
216-Z-2[a]	Crib	1	Physical Barrier with CDF Backfill	14	14	7	0.004						58		ETBB Barrier	
216-Z-3[a]	Crib	1	Physical Barrier with CDF Backfill	70	5	4	0.01						35		ETBB Barrier	
216-Z-9	Trench	1	ET Monofill Barrier with CDF Backfill	60	30	20	0.04	133	103	0.3	5,151	1,249	N/A	141	ET Monofill	37
216-Z-12	Crib	1	Physical Barrier	200	20	16	0.09	309	129	0.92	3,483	3,242	N/A	5,823	ETBB Barrier	40
216-Z-18	Crib	1	Physical Barrier	207	185	16	0.88	316	294	2.13	9,519	9,719	N/A	14,077	ETBB Barrier	58
241-Z-361	Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[a]One Physical Barrier covers 216-Z-1, 216-Z-2, and 216-Z-3; barrier quantities listed for 216-Z-1 are for the total barrier.

Table D-2. Site Information 200-PW-1 Alternative 2

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)				ISV								Duration (days)
								Excavation Dimensions (ft)				Contam. Soil & Debris Volume (yd^3)	Overburden Soil Volume (yd^3)	Additional Fill from Pit 30 (yd^3)	ISV Melt (Tons)	
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Surface Area (Ac)	Length (Top) (ft)	Width (Top) (ft)	Excavation Depth (ft)	Clean Overburden Depth (ft)					
216-Z-1A	Tile Field	2	ISV with Backfill	260	100	8	0.60	260	100	0	0	0	0	9,070	18,144	346
216-Z-1	Crib	2	ISV with RTD	14	14	7	0.004	35	35	21	7	50	153	64	118	177
216-Z-2	Crib	2	ISV with RTD	14	14	7	0.004	35	35	21	7	50	153	64	118	177
216-Z-3	Crib	2	ISV with RTD	70	5	4	0.01	97	32	29	4	75	510	35	432	195
216-Z-9	Trench	2	ISV with roof removal and backfill	60	30	20	0.04	60	30	0	0	378	0	5,630	2,160	224
216-Z-12	Crib	2	ISV with RTD	200	20	16	0.09	205	65	16	16	0	4,590	0	1,944	203
216-Z-18	Crib	2	ISV with RTD	207	185	16	0.88	255	233	16	16	0	23,680	0	9,657	470
241-Z-361	Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Table D-3. Site Information 200-PW-1 Alternative 3

OU 200-PW-1, Hanford Site, Richland, Washington.																										
									RTD										Engineered Barrier							
				Site Dimensions (ft)					Excavation Dimensions (ft)										Capping Dimensions (ft)							
Waste Site	Site Description	Option	Description	Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Side Slope (assumed)	Surface Area (Ac)	Length (Top) (ft)	Width (Top) (ft)	Excavation Depth (ft)	Clean Overburden Depth (ft)	Contam. Soil Volume (yd^3)	TRU Contam. Soil Volume (yd^3)	Excav. Vol. (yd^3)	Overburden Soil Volume (yd^3)	Additional Fill (yd^3)	Backfill from Pit 30 (yd^3)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Silt Fill (yd^3)	Basalt (yd^3)	Cap Type	Duration (days)
216-Z-1A	Tile Field	a	RTD with TRU Waste & Barrier	260	23	8	1.5	0.14	304	64	21	8	2701	443	3159	15	15247	18391	339	179	1.4	19559	6179	393	ET Monofill	90
216-Z-1A	Tile Field	b	RTD with TRU Waste & Barrier	260	23	8	1.5	0.14	304	71	24	8	5825	1108	7143	210	15247	22180	339	179	1.4	19559	6179	393	ET Monofill	130
216-Z-1A	Tile Field	c	RTD with TRU Waste & Barrier	260	23	8	step slope	0.14	402	144	37	8	20353	3987	40632	16292	15247	39587	339	179	1.4	19559	6179	393	ET Monofill	311
216-Z-1A	Tile Field	d	RTD with TRU Waste & Barrier	260	23	8	step slope	0.14	684	424	104	8	86389	5316	1595553	1503848	15247	106952	339	179	1.4	19559	6179	393	ET Monofill	522
216-Z-1A	Tile Field	e	RTD with TRU Waste & Barrier	260	23	8	step slope	0.14	533	391	91	8	73871	5316	1298457	1219270	15247	94434	339	179	1.4	19559	6179	393	ET Monofill	489
216-Z-1	Crib	a	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	83	83	23	7	51	65	3018	2902	0	116	85	85	0.17	188	577	95	ET Monofill	48
216-Z-1	Crib	c	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-1	Crib	d	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-1	Crib	e	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-2	Crib	a	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	83	83	23	7	51	65	3018	2902	0	116	85	85	0.17	188	577	95	ET Monofill	48
216-Z-2	Crib	c	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-2	Crib	d	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-2	Crib	e	RTD with TRU Waste & Barrier	14	14	7	1.5	0.004	89	89	25	7	51	80	3758	3627	0	131	85	85	0.17	188	577	95	ET Monofill	48
216-Z-3	Crib	a	RTD with TRU Waste & Barrier	70	5	4	1.5	0.01	163	98	31	4	162	188	9371	9021	0	350	141	76	0.25	269	951	121	ET Monofill	60
216-Z-3	Crib	c	RTD with TRU Waste & Barrier	70	5	4	1.5	0.01	169	104	33	4	162	214	10955	10579	0	376	141	76	0.25	269	951	121	ET Monofill	63
216-Z-3	Crib	d	RTD with TRU Waste & Barrier	70	5	4	1.5	0.01	169	104	33	4	162	214	10955	10579	0	376	141	76	0.25	269	951	121	ET Monofill	63
216-Z-3	Crib	e	RTD with TRU Waste & Barrier	70	5	4	1.5	0.01	169	104	33	4	162	214	10955	10579	0	376	141	76	0.25	269	951	121	ET Monofill	63
216-Z-9	Trench w/roof	a	RTD with TRU Waste & Barrier	60	30	20	1.5	0.04	129	99	23	20	504	267	4712	3941	4670	4937	133	103	0.3	5151	1217	141	ET Monofill	91
216-Z-9	Trench w/roof	c	RTD with TRU Waste & Barrier	60	30	20	1.5	0.04	168	138	36	20	504	1000	35421	33917	4670	5670	133	103	0.3	5151	1217	141	ET Monofill	136
216-Z-9	Trench w/roof	d	RTD with TRU Waste	60	30	20	step slope	0.04	640	610	120	20	5970	1134	2276665	2269561	4670	10136	0	0	0	0	0	0	N/A	221
216-Z-9	Trench w/roof	e	RTD with TRU Waste & Barrier	60	30	20	step slope	0.04	530	500	90	20	4037	1067	1454939	1449835	4670	8203	133	103	0.3	5151	1217	141	ET Monofill	186
216-Z-12	Crib	a	RTD with TRU Waste & Barrier	200	20	16	1.5	0.09	266	86	22	16	296	593	10950	10061	0	889	272	92	0.57	795	2496	215	ET Monofill	74
216-Z-12	Crib	c	RTD with TRU Waste & Barrier	200	20	16	1.5	0.09	272	92	24	16	296	889	12899	11714	0	1185	272	92	0.57	795	2496	215	ET Monofill	86
216-Z-12	Crib	d	RTD with TRU Waste & Barrier	200	20	16	1.5	0.09	272	92	24	16	296	889	12899	11714	0	1185	272	92	0.57	795	2496	215	ET Monofill	86
216-Z-12	Crib	e	RTD with TRU Waste & Barrier	200	20	16	1.5	0.09	272	92	24	16	296	889	12899	11714	0	1185	272	92	0.57	795	2496	215	ET Monofill	86
216-Z-18	Crib	a	RTD with TRU Waste & Barrier	207	185	16	1.5	0.88	267	245	20	16	307	920	38412	37185	0	1227	294	272	1.84	9386	8254	524	ET Monofill	141
216-Z-18	Crib	c	RTD with TRU Waste & Barrier	207	185	16	step slope	0.88	360	338	36	16	22540	5827	336150	307783	0	28367	294	272	1.84	9386	8254	524	ET Monofill	296
216-Z-18	Crib	d	RTD with TRU Waste & Barrier	207	185	16	step slope	0.88	736	714	103	16	115727	7668	2259380	2135985	0	123395	294	272	1.84	9386	8254	524	ET Monofill	562
216-Z-18	Crib	e	RTD with TRU Waste & Barrier	207	185	16	step slope	0.88	677	655	90	16	97289	7668	1829326	1724369	0	104957	294	272	1.84	9386	8254	524	ET Monofill	515

Table D-4A Site Information 200-PW-3 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)				Engineered Barrier							Duration (days)
								Capping Dimensions							
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Surface Area (Ac)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Silt Fill (yd^3)	Basalt (yd^3)	Cap Type	
216-A-7	Crib	1	ET Monofill Barrier w/ BioBarrier	10	10	9	0.002	89	89	0.18	417	608	124	ET Monofill	35
216-A-8	Crib	1	ET Monofill Barrier w/ BioBarrier	20	250	12	0.115	330	100	0.76	1,815	3,246	330	ET Monofill	36
216-A-24	Crib	1	ET Monofill Barrier w/ BioBarrier	20	700	9	0.321	780	100	1.79	4,275	8,032	694	ET Monofill	42
216-A-31	Crib	1	ET Monofill Barrier	10	70	20	0.016	141	81	0.26	290	1,038	124	ET Monofill	34
UPR-200-E-56	Unplanned Release	1	ET Monofill Barrier w/ BioBarrier	110	430	0	1.086	518	198	2.35	9,338	11,147	691	ET Monofill	48

Table D-4B Site Information 200-PW-3 Alternative 1

Alternatives 4 Maintain Existing Soil Cover Site Information														
200-PW-3 OU, Hanford Site, Richland, Washington.														
Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)				Soil Cover						Duration (days)
								Capping Dimensions						
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Surface Area (Ac)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Soil Cover (yd^3)	Cap Type	
216-A-7	Crib	4	Maintain Existing Soil Cover	10	10	9	0.002	100	100	0.2	788	120	Soil Cover	33
216-A-8	Crib	4	Maintain Existing Soil Cover	250	20	12	0.115	345	115	0.9	4679	779	Soil Cover	36
216-A-24	Crib	4	Maintain Existing Soil Cover	700	20	9	0.321	750	70	1.2	0	2132	Soil Cover	34
216-A-31	Crib	4	Maintain Existing Soil Cover	70	10	20	0.016	120	60	0.2	0	285	Soil Cover	33
UPR-200-E-56	Unplanned Release	4	Maintain Existing Soil Cover	430	110	0	1.086	545	225	2.8	23613	3016	Soil Cover	51

Table D-5. Site Information 200-PW-3 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)					Remove, Treat, and Dispose								Engineered Barrier							
									Excavation Dimensions (ft)								Capping Dimensions							
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Side Slope (assumed)	Surface Area (Ac)	Length (Top) (ft)	Width (Top) (ft)	Excavation Depth (ft)	Clean Overburden Depth (ft)	Contam. Soil Volume (yd^3)	Excav. Vol. (yd^3)	Overburden Soil Volume (yd^3)	Backfill from Pit 30 (yd^3)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Silt Fill (yd^3)	Basalt (yd^3)	Cap Type	Duration (days)
216-A-7	Crib	3b	RTD (w/mixing) and ET Monofill Barrier	10	10	9	1.5	0.002	55	55	15	9	22	868	846	22	81	81	0.2	156	522	89	ET Monofill	39
216-A-7	Crib	3c	RTD (w/mixing) and ET Monofill Barrier	10	10	9	1.5	0.002	70	70	20	9	41	1,852	1,811	41	81	81	0.2	156	522	89	ET Monofill	42
216-A-8	Crib	3b	RTD (w/mixing) and ET Monofill Barrier	20	250	12	1.5	0.115	65	295	15	12	556	6,715	6,160	556	322	92	0.7	947	2,995	246	ET Monofill	50
216-A-8	Crib	3c	RTD (w/mixing) and ET Monofill Barrier	20	250	12	1.5	0.115	89	319	23	12	2,037	14,222	12,185	2,037	322	92	0.7	947	2,995	246	ET Monofill	74
216-A-24	Crib	3c	RTD (w/mixing) and ET Monofill Barrier	20	700	9	1.5	0.321	80	760	20	9	5,704	27,704	22,000	5,704	722	92	1.5	2,323	7,481	522	ET Monofill	121
216-A-31	Crib	3c	RTD (w/mixing) and ET Monofill Barrier	70	10	20	1.5	0.016	154	94	28	20	715	7,869	7,662	715	141	81	0.3	290	1,038	124	ET Monofill	52
UPR-200-E-56	Unplanned Release	3b	RTD	110	430	0	1.5	1,086	155	475	15	0	26,278	33,590	7,313	26,278	N/A	N/A	N/A	N/A	N/A	N/A	N/A	136
UPR-200-E-56	Unplanned Release	3c	RTD	110	430	0	1.5	1,086	170	490	20	0	35,037	48,370	13,333	35,037	N/A	N/A	N/A	N/A	N/A	N/A	N/A	179

Table D-6. Site Information 200-PW-6 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)					Engineered Barrier								Duration (days)
									Capping Dimensions (ft)								
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Side Slope (assumed)	Surface Area (Ac)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Silt Fill (yd^3)	CDF Fill (yd^3)	Basalt (yd^3)	Cap Type	
216-Z-5	Two Cribs	1	Physical Barrier w/CDF Backfill	84	14	14	1.5	0.027	193	123	0.5	2,059	1,854	65	4,335	ET BB	41
216-Z-8	French Drain	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
216-Z-10	Well	1	Decommission	10	10	150	N/A	0.002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Grout	5
241-Z-10	Tank	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table D-7. Site Information 200-PW-6 Alternative 2

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)				ISV								Duration (days)
								Excavation Dimensions (ft)				Contam. Soil and Debris Volume (yd^3)	Overburden Soil Volume (yd^3)	Additional Fill from Pit 30 (yd^3)	ISV Melt (Tons)	
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Surface Area (Ac)	Length (Top) (ft)	Width (Top) (ft)	Excavation Depth (ft)	Clean Overburden Depth (ft)					
216-Z-5	Crib – two	2	ISV with RTD	83	18	9	0.034	120	60	18	9	20	2,340	58	235	183
216-Z-8	French Drain	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
216-Z-10	Well	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
241-Z-8	Tank	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table D-8. Site Information 200-PW-6 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Site Dimensions (ft)					RTD										Engineered Barrier							Duration (days)
									Excavation Dimensions (ft)										Capping Dimensions							
				Length (Bottom) (ft)	Width (Bottom) (ft)	Clean Soil Depth (bgs)	Side Slope (assumed)	Surface Area (Ac)	Length (Top) (ft)	Width (Top) (ft)	Excavation Depth (ft)	Clean Overburden Depth (ft)	Contam. Soil Volume (yd^3)	TRU Contam. Soil Volume (yd^3)	Excav. Vol. (yd^3)	Overburden Soil Volume (yd^3)	Additional Fill (yd^3)	Backfill from Pit 30 (yd^3)	Length (ft)	Width (ft)	Acres of Capping	Engineered Fill (yd^3)	Silt Fill (yd^3)	Basalt (yd^3)	Cap Type	
216-Z-5	Two Cribs	3a	RTD with TRU Waste and ET Monofill Barrier	14	14	14	1.5	0.004	74	74	20	14	15	30	2,101	2,056	0	45	85	85	0.17	188	591	95	ET Monofill	43
216-Z-5	Two Cribs	3c	RTD with TRU Waste and ET Monofill Barrier	14	14	14	1.5	0.004	83	83	23	14	15	52	3,018	2,951	0	67	85	85	0.17	188	591	95	ET Monofill	45
216-Z-5	Two Cribs	3d	RTD with TRU Waste and ET Monofill Barrier	14	14	14	1.5	0.004	83	83	23	14	15	52	3,018	2,951	0	67	85	85	0.17	188	591	95	ET Monofill	45
216-Z-5	Two Cribs	3e	RTD with TRU Waste and ET Monofill Barrier	14	14	14	1.5	0.004	83	83	23	14	15	52	3,018	2,951	0	67	85	85	0.17	188	591	95	ET Monofill	45
216-Z-8	French Drain	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
216-Z-10	Well	N/A	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table D-9A. Capital Cost 200-PW-1 Alternative 1

Site	Description	Opt	Alternative	Mobilization/ Demobilization	Monitoring & Sampling	Site Work	Soil Excavation & Treatment	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-1A	Tile Field	N/A	Physical Barrier - Bleow Ground	$142,321	$3,444	$19,661	$0	$534,467	$159,950	$85,616	$945,459	$236,365	$141,819	$1,323,643
216-Z-1	Crib	N/A	Physical Barrier with CDF Backfill	$47,329	$1,148	$6,554	$0	$220,155	$54,530	$29,207	$358,923	$89,731	$67,298	$515,951
216-Z-2	Crib	N/A	Physical Barrier with CDF Backfill	$47,329	$1,148	$6,554	$0	$220,155	$54,530	$29,207	$358,923	$89,731	$67,298	$515,951
216-Z-3	Crib	N/A	Physical Barrier with CDF Backfill	$47,329	$1,148	$6,554	$0	$220,155	$54,530	$29,207	$358,923	$89,731	$67,298	$515,951
216-Z-9	Trench	N/A	ET Monofill Barrier with CDF Backfill	$265,526	$3,214	$24,671	$0	$536,094	$127,980	$79,295	$1,036,780	$259,195	$155,517	$1,451,492
216-Z-12	Crib	N/A	Physical Barrier	$264,283	$3,444	$19,661	$0	$534,529	$156,310	$83,159	$1,061,386	$265,347	$159,208	$1,485,940
216-Z-18	Crib	N/A	Physical Barrier	$272,051	$3,444	$29,491	$0	$1,297,259	$221,839	$120,142	$1,944,226	$486,057	$194,423	$2,624,705
241-Z-361	Tank	N/A	N/A											

Table D-9B. Capital Cost 200-PW-1 Alternative 1 SVE Installation

Site	Description	Opt	Alternative	Well Drilling	Equipment Installation	Project Management	Subtotal	Contingency (25%)	Total Project
216-Z-1A	Tile Field	a, b, c, d, and e	Alternative 1 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-2	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-3	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-9	Trench	a	Alternative 1 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-12	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-18	Crib	a	Alternative 1 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0	$0

Table D-9C. Capital Cost 200-PW-1 Alternative 1 SVE Remove

Site	Description	Opt	Alternative	Well D&D	Project Management	Subtotal	Contingency (25%)	Total Project
216-Z-1A	Tile Field	a, b, c, d, and e	Alternative 1 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-2	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-3	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-9	Trench	a	Alternative 1 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-12	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-18	Crib	a	Alternative 1 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0

Table D-10A. Capital Cost 200-PW-1 Alternative 2

Site	Description	Opt	Alternative	Mobilization/ Demobilization	Monitoring & Sampling	Site Work	Soil Excavation & Treatment	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-1A	Tile Field	N/A	Alternative 2 - ISV with Backfill	$556,292	$11,756	$250,727	$42,937,765	$0	$201,593	$1,031,605	$44,989,738	$11,247,435	$3,374,230	$59,611,403
216-Z-1	Crib	N/A	Alternative 2 - ISV with RTD	$510,052	$21,001	$53,485	$323,924	$0	$172,223	$412,597	$1,493,282	$373,321	$223,992	$2,090,595
216-Z-2	Crib	N/A	Alternative 2 - ISV with RTD	$510,052	$21,001	$53,485	$323,924	$0	$172,223	$412,597	$1,493,282	$373,321	$223,992	$2,090,595
216-Z-3	Crib	N/A	Alternative 2 - ISV with RTD	$515,825	$22,663	$58,667	$1,178,711	$0	$172,223	$440,022	$2,388,111	$597,028	$238,811	$3,223,950
216-Z-9	Trench	N/A	Alternative 2 - ISV with roof removal & backfill	$2,041,928	$11,263	$131,138	$5,426,714	$0	$308,059	$482,078	$8,401,180	$2,100,295	$630,089	$11,131,564
216-Z-12	Crib	N/A	Alternative 2 - ISV with RTD	$1,888,732	$21,186	$96,362	$4,705,075	$0	$197,922	$457,745	$7,367,022	$1,841,756	$736,702	$9,945,480
216-Z-18	Crib	N/A	Alternative 2 - ISV with RTD	$1,960,376	$27,833	$280,821	$24,217,149	$0	$326,415	$1,462,309	$28,274,903	$7,068,726	$2,120,618	$37,464,246
241-Z-361	Tank	N/A	N/A											

Table D-10B. Capital Cost 200-PW-1 Alternative 2 SVE Installation

Site	Description	Opt	Alternative	Well Drilling	Equipment Installation	Project Management	Subtotal	Contingency (25%)	Total Project
216-Z-1A	Tile Field	a, b, c, d, and e	Alternative 2 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-2	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-3	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-9	Trench	a	Alternative 2 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-12	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-18	Crib	a	Alternative 2 – SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0	$0

Table D-10C. Capital Cost 200-PW-1 Alternative 2 SVE Remove

Site	Description	Opt	Alternative	Well D&D	Project Management	Subtotal	Contingency (25%)	Total Project
216-Z-1A	Tile Field	a, b, c, d, and e	Alternative 2 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-2	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-3	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-9	Trench	a	Alternative 2 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-12	Crib	a	N/A	$0	$0	$0	$0	$0
216-Z-18	Crib	a	Alternative 2 – SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0

Table D-11A. Capital Cost 200-PW-1 Alternative 3

Site	Description	Opt	Alternative	Mobilization/ Demobilization	Monitoring & Sampling	Site Work	Soil Excavation & Treatment	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-1A	Tile Field	a	Alternative 3 - RTD with TRU Waste & Barrier	$619,085	$1,212,037	$56,377	$8,088,332	$411,467	$279,274	$167,960	$10,834,532	$2,708,633	$812,590	$14,355,755
216-Z-1A	Tile Field	b	Alternative 3 - RTD with TRU Waste & Barrier	$623,936	$1,218,001	$98,066	$19,561,975	$411,467	$413,003	$242,609	$22,569,057	$5,642,264	$1,692,679	$29,904,001
216-Z-1A	Tile Field	c	Alternative 3 - RTD with TRU Waste & Barrier	$1,293,537	$1,828,587	$104,277	$69,072,811	$411,467	$2,270,299	$615,155	$75,596,133	$18,899,033	$5,669,710	$100,164,876
216-Z-1A	Tile Field	d	Alternative 3 - RTD with TRU Waste & Barrier	$1,351,959	$2,689,388	$5,436,559	$104,357,731	$411,467	$3,998,607	$1,035,529	$119,281,240	$29,820,310	$8,946,093	$158,047,643
216-Z-1A	Tile Field	e	Alternative 3 - RTD with TRU Waste & Barrier	$1,341,664	$2,604,394	$4,465,645	$102,485,753	$411,467	$3,728,303	$969,783	$116,007,009	$29,001,752	$8,700,526	$153,709,287
216-Z-1	Crib	a	Alternative 3 - RTD with TRU Waste & Barrier	$231,983	$245,484	$52,323	$1,485,371	$36,737	$145,330	$86,760	$2,283,988	$570,997	$228,399	$3,083,384
216-Z-1	Crib	c,d, & e	Alternative 3 - RTD with TRU Waste & Barrier	$246,826	$245,484	$57,286	$1,489,359	$36,737	$152,166	$90,493	$2,318,351	$579,588	$231,835	$3,129,774
216-Z-2	Crib	a	Alternative 3 - RTD with TRU Waste & Barrier	$231,983	$245,484	$52,323	$1,485,371	$36,737	$145,330	$86,760	$2,283,988	$570,997	$228,399	$3,083,384
216-Z-2	Crib	c,d, & e	Alternative 3 - RTD with TRU Waste & Barrier	$246,826	$245,484	$57,286	$1,489,359	$36,737	$152,166	$90,493	$2,318,351	$579,588	$231,835	$3,129,774
216-Z-3	Crib	a	Alternative 3 - RTD with TRU Waste & Barrier	$365,822	$293,159	$103,767	$3,541,550	$43,815	$196,603	$114,754	$4,659,470	$1,164,868	$465,947	$6,290,285
216-Z-3	Crib	c,d, & e	Alternative 3 - RTD with TRU Waste & Barrier	$371,564	$307,871	$114,426	$4,007,491	$43,815	$206,858	$120,352	$5,172,377	$1,293,094	$517,238	$6,982,709
216-Z-9	Trench	a	Alternative 3 - RTD with TRU Waste & Barrier	$974,001	$323,130	$120,989	$5,139,468	$115,311	$1,360,102	$183,039	$8,216,040	$2,054,010	$616,203	$10,886,253
216-Z-9	Trench	c	Alternative 3 - RTD with TRU Waste & Barrier	$869,742	$593,555	$306,378	$17,394,452	$108,796	$479,743	$259,062	$20,011,728	$5,002,932	$1,500,880	$26,515,540
216-Z-9	Trench	d	Alternative 3 - RTD with TRU Waste	$1,179,884	$1,722,467	$7,150,026	$26,289,759	$0	$1,661,011	$443,078	$38,446,225	$9,611,556	$2,883,467	$50,941,248
216-Z-9	Trench	e	Alternative 3 - RTD with TRU Waste & Barrier	$1,156,876	$934,546	$4,653,349	$24,268,360	$108,796	$1,310,748	$371,835	$32,804,510	$8,201,128	$2,460,338	$43,465,976
216-Z-12	Crib	a	Alternative 3 - RTD with TRU Waste & Barrier	$816,923	$447,357	$143,123	$10,189,513	$77,002	$244,459	$140,881	$12,059,258	$3,014,815	$904,444	$15,978,517
216-Z-12	Crib	c,d, & e	Alternative 3 - RTD with TRU Waste & Barrier	$844,342	$557,418	$133,818	$15,037,409	$77,002	$285,478	$163,276	$17,098,743	$4,274,686	$1,282,406	$22,655,834
216-Z-18	Crib	a	Alternative 3 - RTD with TRU Waste & Barrier	$1,278,563	$629,414	$336,424	$15,827,136	$293,822	$468,228	$265,918	$19,099,505	$4,774,876	$1,432,463	$25,306,844
216-Z-18	Crib	c	Alternative 3 - RTD with TRU Waste & Barrier	$1,806,059	$2,579,626	$1,191,734	$100,682,575	$293,822	$2,209,786	$589,311	$109,352,913	$27,338,228	$8,201,468	$144,892,610
216-Z-18	Crib	d	Alternative 3 - RTD with TRU Waste & Barrier	$1,981,508	$4,048,329	$8,320,584	$149,937,505	$293,822	$4,703,284	$1,195,815	$170,480,847	$42,620,212	$12,786,064	$225,887,122
216-Z-18	Crib	e	Alternative 3 - RTD with TRU Waste & Barrier	$1,961,741	$3,854,906	$6,795,695	$146,525,801	$293,822	$4,289,813	$1,095,247	$164,817,025	$41,204,256	$12,361,277	$218,382,558

Table D-11B. Capital Cost 200-PW-1 Alternative 3 SVE Installation

Site	Description	Opt	Alternative	Well Drilling	Equipment Installation	Project Management	Sub Total	Contingency (25%)	Total Project
216-Z-1A	Tile Field	a	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1A	Tile Field	b	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1A	Tile Field	c	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1A	Tile Field	d	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1A	Tile Field	e	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-1	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-2	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-3	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-9	Trench	a	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-9	Trench	c	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-9	Trench	d	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-9	Trench	e	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-12	Crib	a	N/A	$0	$0	$0	$0	$0	$0
216-Z-18	Crib	a	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-18	Crib	c	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-18	Crib	d	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
216-Z-18	Crib	e	Alternative 3 - SVE Installation	$1,530,589	$120,129	$42,285	$1,693,003	$423,251	$2,116,254
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0	$0

Table D-11C. Capital Cost 200-PW-1 Alternative 3 SVE Remove

Waste Site	Site Description	Alternative	Alternative Description	Well D&D	Project Management	Subtotal	Contingency (25%)	Total Project
216-Z-1A	Tile Field	3a	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1A	Tile Field	3b	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1A	Tile Field	3c	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1A	Tile Field	3d	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1A	Tile Field	3e	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-1	Crib	3	N/A	$0	$0	$0	$0	$0
216-Z-2	Crib	3	N/A	$0	$0	$0	$0	$0
216-Z-3	Crib	3	N/A	$0	$0	$0	$0	$0
216-Z-9	Trench	3a	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-9	Trench	3c	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-9	Trench	3d	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-9	Trench	3e	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-12	Crib	3	N/A	$0	$0	$0	$0	$0
216-Z-18	Crib	3a	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-18	Crib	3c	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-18	Crib	3d	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
216-Z-18	Crib	3e	SVE Decommissioning	$108,486	$38,187	$146,673	$36,668	$183,341
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0	$0

Table D-12. Capital Cost 200-PW-3 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Mobilization/ Demobilization	Monitoring and Sampling	Site Work	Soil Excavation	Cap	Site Improvements	Construction Staff	Project Management	Subtotal	Contingency (25%)	Remedial Design	Total Project
216-A-7	Crib	1	ET Monofill w/ BioBarrier	$256,999	$3,214	$24,119	$0	--	$53,520	$110,623	$68,098	$516,573	$129,143	$77,486	$723,203
216-A-8	Crib	1	ET Monofill w/ BioBarrier	$257,405	$3,214	$34,036	$0	--	$137,961	$113,516	$69,964	$616,096	$154,024	$92,414	$892,535
216-A-24	Crib	1	ET Monofill w/ BioBarrier	$265,819	$3,214	$53,354	$0	--	$294,509	$130,873	$81,583	$829,351	$207,338	$124,403	$1,161,092
216-A-31	Crib	1	ET Monofill Barrier	$257,488	$3,214	$24,538	$0	--	$45,443	$107,730	$160,743	$599,157	$149,789	$89,874	$838,820
UPR-200-E-56	Unplanned Release	1	ET Monofill w/ BioBarrier	$268,407	$3,214	$36,758	$0	--	$474,257	$148,230	$93,201	$1,024,067	$256,017	$153,610	$1,433,694
216-A-7	Crib	MESC	Soil Barrier	$272,187	$3,401	$23,015	$0	$0	$32,154	$110,924	$68,103	$509,784	$127,446	$76,468	$713,698
216-A-8	Crib	MESC	Soil Barrier	$273,954	$3,401	$25,633	$0	$0	$97,000	$120,107	$74,027	$594,122	$148,531	$89,118	$831,771
216-A-24	Crib	MESC	Soil Barrier	$280,559	$3,401	$43,259	$0	$0	$46,312	$113,985	$70,523	$558,039	$139,510	$83,706	$781,255
216-A-31	Crib	MESC	Soil Barrier	$271,716	$3,401	$24,627	$0	$0	$25,706	$110,924	$68,103	$504,477	$126,119	$75,672	$706,268
UPR-200-E-56	Unplanned Release	MESC	Soil Barrier	$281,797	$3,401	$42,756	$0	$0	$399,762	$166,020	$104,091	$997,827	$249,457	$149,674	$1,396,958

Adjusted for FY09 G&A Change from 14.3 to 8.5

Table D-13. Capital Cost 200-PW-3 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Mobilization/ Demobilization	Monitoring & Sampling	Site Work	Soil Excavation	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-A-7	Crib	3b	RTD(w/mixing) & ET Monofill Barrier	$400,711	$175,997	$29,878	$27,276	$34,561	$124,150	$75,141	$867,714	$216,929	$130,157	$1,214,800
216-A-7	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$400,711	$175,997	$36,588	$44,525	$34,561	$131,038	$78,901	$902,322	$225,580	$135,348	$1,263,251
216-A-8	Crib	3b	RTD(w/mixing) & ET Monofill Barrier	$404,321	$175,997	$87,719	$317,813	$86,809	$168,922	$99,585	$1,341,166	$335,292	$201,175	$1,877,632
216-A-8	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$409,214	$180,615	$167,171	$1,043,561	$86,809	$244,690	$140,951	$2,273,012	$568,253	$227,301	$3,068,566
216-A-24	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$426,816	$252,761	$352,535	$2,791,124	$181,827	$404,267	$229,631	$4,638,960	$1,159,740	$463,896	$6,262,597
216-A-31	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$401,373	$176,229	$77,485	$173,705	$45,106	$168,922	$99,585	$1,142,405	$285,601	$171,361	$1,599,367
UPR-200-E-56	Unplanned Release	3b	RTD	$386,518	$271,837	$472,671	$4,228,617	$0	$478,412	$259,793	$6,494,419	$1,623,605	$487,081	$8,605,105
UPR-200-E-56	Unplanned Release	3c	RTD	$396,571	$303,804	$629,262	$5,668,464	$0	$626,503	$340,645	$7,965,249	$1,991,312	$597,394	$10,553,955
Adjusted for FY09 G&A Change from 14.3 to 8.5														

Table D-14. Capital Cost 200-PW-6 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Mobilization/ Demobilization	Monitoring and Sampling	Site Work	Soil Excavation	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-5	Two Cribs	1	Physical Barrier w/CDF Backfill	$248,560	$3,255	$18,582	$0	$346,964	$151,172	$80,490	$849,023	$212,256	$127,353	$1,188,632
216-Z-8	French Drain	N/A	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
216-Z-10	Well	1	Decommission	$45,394	$13,052	$8,143	$16,424	$0	$18,359	$11,335	$112,707	$28,177	$21,133	$162,017
241-Z-8	Tank	N/A	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Adjusted for FY09 G&A

Table D-15. Capital Cost 200-PW-6 Alternative 2

Waste Site	Site Description	Alternative	Alternative Description	Mobilization/ Demobilization	Monitoring and Sampling	Site Work	Soil Excavation and Treatment	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-5	Two Cribs	2	ISV with RTD	$175,143	$1,955	$6,160	$59,523	$0	$17,060	$35,923	$295,764	$73,941	$29,576	$399,281
216-Z-8	French Drain	N/A	No Action	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
216-Z-10	Well	N/A	No Action	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
241-Z-8	Tank	N/A	No Action	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Adjusted for FY09 G&A

Table D-16. Capital Cost 200-PW-6 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Mobilization/ Demobilization	Monitoring and Sampling	Site Work	Soil Excavation	Site Improvements	Construction Staff	Project Management	Sub Total	Contingency (25%)	Remedial Design	Total Project
216-Z-5	Two Cribs	3a	RTD with TRU Waste and ET Monofill Barrier	$610,005	$232,404	$43,539	$902,210	$36,335	$137,918	$82,657	$2,045,070	$511,268	$204,507	$2,760,845
216-Z-5	Two Cribs	3c	RTD with TRU Waste and ET Monofill Barrier	$625,724	$235,967	$50,011	$1,025,155	$36,335	$144,804	$86,417	$2,204,415	$551,104	$220,442	$2,975,960
216-Z-5	Two Cribs	3d	RTD with TRU Waste and ET Monofill Barrier	$625,724	$235,967	$50,011	$1,025,155	$36,335	$144,804	$86,417	$2,204,415	$551,104	$220,442	$2,975,960
216-Z-5	Two Cribs	3e	RTD with TRU Waste and ET Monofill Barrier	$625,724	$235,967	$50,011	$1,025,155	$36,335	$144,804	$86,417	$2,204,415	$551,104	$220,442	$2,975,960
216-Z-8	French Drain	N/A	No Action	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
216-Z-10	Well	N/A	No Action	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Table D-17. Present Worth Costs 200-PW-1 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Discounted Annual and Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-1A	Tile Field	1	Physical Barrier–Below Ground	$3,623,238	$35,836,349	$39,459,588	$6,015,931
216-Z-1	Crib	1	Physical Barrier with CDF Backfill	$515,951	$33,977,533	$34,493,484	$1,686,671
216-Z-2	Crib	1	Physical Barrier with CDF Backfill	$515,951	$33,977,533	$34,493,484	$1,686,671
216-Z-3	Crib	1	Physical Barrier with CDF Backfill	$515,951	$33,977,533	$34,493,484	$1,686,671
216-Z-9	Trench	1	ET Monofill Barrier with CDF Backfill	$3,751,088	$35,836,349	$39,587,437	$6,110,288
216-Z-12	Crib	1	Physical Barrier	$1,485,940	$33,977,533	$35,463,474	$2,656,660
216-Z-18	Crib	1	Physical Barrier	$4,924,301	$35,836,349	$40,760,650	$6,976,158
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0

Table D-18. Present Worth Costs 200-PW-1 Alternative 2

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Discounted Annual and Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-1A	Tile Field	2	ISV with Backfill	$61,910,998	$35,786,639	$97,697,637	$48,410,918
216-Z-1	Crib	2	ISV with RTD	$2,090,595	$33,977,533	$36,068,128	$3,261,314
216-Z-2	Crib	2	ISV with RTD	$2,090,595	$33,977,533	$36,068,128	$3,261,314
216-Z-3	Crib	2	ISV with RTD	$3,223,950	$33,977,533	$37,201,483	$4,394,669
216-Z-9	Trench	2	ISV with roof removal and backfill	$13,431,159	$35,836,349	$49,267,509	$13,254,499
216-Z-12	Crib	2	ISV with RTD	$9,945,480	$33,977,533	$43,923,013	$11,116,199
216-Z-18	Crib	2	ISV with RTD	$39,763,842	$35,786,639	$75,550,481	$32,288,189
241-Z-361	Tank	N/A	N/A	$0	$0	$0	$0

Table D-19. Present Worth Costs 200-PW-1 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Disounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-1A	Tile Field	3a	RTD with TRU Waste & ET Monofill Barrier	$16,655,351	$35,836,349	$52,491,700	$15,634,059
216-Z-1A	Tile Field	3b	RTD with TRU Waste & ET Monofill Barrier	$32,203,596	$35,836,349	$68,039,946	$27,109,176
216-Z-1A	Tile Field	3c	RTD with TRU Waste & ET Monofill Barrier	$102,464,472	$35,786,639	$138,251,111	$77,933,112
216-Z-1A	Tile Field	3d	RTD with TRU Waste & ET Monofill Barrier	$160,347,239	$2,196,051	$162,543,289	$117,648,760
216-Z-1A	Tile Field	3e	RTD with TRU Waste & ET Monofill Barrier	$156,008,883	$2,196,051	$158,204,933	$116,050,212
216-Z-1	Crib	3a	RTD with TRU Waste & ET Monofill Barrier	$3,083,384	$33,977,533	$37,060,917	$4,254,103
216-Z-1	Crib	3c	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-1	Crib	3d	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-1	Crib	3e	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-2	Crib	3a	RTD with TRU Waste & ET Monofill Barrier	$3,083,384	$33,977,533	$37,060,917	$4,254,103
216-Z-2	Crib	3c	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-2	Crib	3d	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-2	Crib	3e	RTD with TRU Waste & ET Monofill Barrier	$3,129,774	$0	$3,129,774	$3,129,774
216-Z-3	Crib	3a	RTD with TRU Waste & ET Monofill Barrier	$6,290,285	$33,977,533	$40,267,818	$7,461,004
216-Z-3	Crib	3c	RTD with TRU Waste & ET Monofill Barrier	$6,982,709	$0	$6,982,709	$6,982,709
216-Z-3	Crib	3d	RTD with TRU Waste & ET Monofill Barrier	$6,982,709	$0	$6,982,709	$6,982,709
216-Z-3	Crib	3e	RTD with TRU Waste & ET Monofill Barrier	$6,982,709	$0	$6,982,709	$6,982,709
216-Z-9	Trench	3a	RTD with TRU Waste & ET Monofill Barrier	$13,185,849	$35,836,349	$49,022,198	$13,073,452
216-Z-9	Trench	3c	RTD with TRU Waste & ET Monofill Barrier	$28,815,135	$35,836,349	$64,651,485	$24,608,380
216-Z-9	Trench	3d	RTD with TRU Waste	$53,240,844	$2,196,051	$55,436,895	$41,748,953
216-Z-9	Trench	3e	RTD with TRU Waste & ET Monofill Barrier	$45,765,571	$2,196,051	$47,961,622	$36,231,956
216-Z-12	Crib	3a	RTD with TRU Waste & ET Monofill Barrier	$15,978,517	$33,977,533	$49,956,050	$17,149,236
216-Z-12	Crib	3c	RTD with TRU Waste & ET Monofill Barrier	$22,655,834	$0	$22,655,834	$22,655,834
216-Z-12	Crib	3d	RTD with TRU Waste & ET Monofill Barrier	$22,655,834	$0	$22,655,834	$22,655,834
216-Z-12	Crib	3e	RTD with TRU Waste & ET Monofill Barrier	$22,655,834	$0	$22,655,834	$22,655,834
216-Z-18	Crib	3a	RTD with TRU Waste & ET Monofill Barrier	$27,606,440	$35,836,349	$63,442,789	$23,716,323
216-Z-18	Crib	3c	RTD with TRU Waste & ET Monofill Barrier	$147,192,205	$35,786,639	$182,978,844	$110,494,092
216-Z-18	Crib	3d	RTD with TRU Waste & ET Monofill Barrier	$228,186,718	$2,196,051	$230,382,769	$166,365,197
216-Z-18	Crib	3e	RTD with TRU Waste & ET Monofill Barrier	$220,682,154	$2,196,051	$222,878,205	$160,976,070

Table D-20. Present Worth Costs 200-PW-1 Summary

Net Present Worth Cost Estimates. (1000 Years)									
WASTE SITE/GROUP		No Action	ALTERNATIVE 1: Capping and Institutional Controls	ALTERNATIVE 2: ISV and Institutional Controls	ALTERNATIVE 3A: Remove and Dispose with Capping and Institutional Controls	ALTERNATIVE 3B: Remove and Dispose with Capping and Institutional Controls	ALTERNATIVE 3C: Remove and Dispose with Capping	ALTERNATIVE 3D: Remove and Dispose with Capping	ALTERNATIVE 3E: Remove and Dispose with Capping
216-Z-1A	Present Worth Cost	$0	$6,015,931	$48,410,918	$15,634,059	$27,109,176	$77,933,112	$117,648,760	$116,050,212
	Non-discounted cost	$0	$39,459,588	$97,697,637	$52,491,700	$68,039,946	$138,251,111	$162,543,289	$158,204,933
216-Z-1	Present Worth Cost	$0	$1,686,671	$3,261,314	$4,254,103	$0	$3,129,774	$3,129,774	$3,129,774
	Non-discounted cost	$0	$34,493,484	$36,068,128	$37,060,917	$0	$3,129,774	$3,129,774	$3,129,774
216-Z-2	Present Worth Cost	$0	$1,686,671	$3,261,314	$4,254,103	$0	$3,129,774	$3,129,774	$3,129,774
	Non-discounted cost	$0	$34,493,484	$36,068,128	$37,060,917	$0	$3,129,774	$3,129,774	$3,129,774
216-Z-3	Present Worth Cost	$0	$1,686,671	$4,394,669	$7,461,004	$0	$6,982,709	$6,982,709	$6,982,709
	Non-discounted cost	$0	$34,493,484	$37,201,483	$40,267,818	$0	$6,982,709	$6,982,709	$6,982,709
216-Z-9	Present Worth Cost	$0	$6,110,288	$13,254,499	$13,073,452	$0	$24,608,380	$41,748,953	$36,231,956
	Non-discounted cost	$0	$39,587,437	$49,267,509	$49,022,198	$0	$64,651,485	$55,436,895	$47,961,622
216-Z-12	Present Worth Cost	$0	$2,656,660	$11,116,199	$17,149,236	$0	$22,655,834	$22,655,834	$22,655,834
	Non-discounted cost	$0	$35,463,474	$43,923,013	$49,956,050	$0	$22,655,834	$22,655,834	$22,655,834
216-Z-18	Present Worth Cost	$0	$6,976,158	$32,288,189	$23,716,323	$0	$110,494,092	$166,365,197	$160,976,070
	Non-discounted cost	$0	$40,760,650	$75,550,481	$63,442,789	$0	$182,978,844	$230,382,769	$222,878,205

Table D-21A. Present Worth Costs 200-PW-3 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Disounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-A-7	Crib	1	ET Monofill Barrier w/ BioBarrier	$723,203	$12,152,271	$12,875,473	$1,937,074
216-A-8	Crib	1	ET Monofill Barrier w/ BioBarrier	$862,535	$12,152,271	$13,014,806	$2,076,406
216-A-24	Crib	1	ET Monofill Barrier w/ BioBarrier	$1,161,092	$16,224,653	$17,385,745	$2,790,485
216-A-31	Crib	1	ET Monofill Barrier	$838,820	$12,152,271	$12,991,091	$2,052,691
UPR-200-E-56	Unplanned Release	1	ET Monofill Barrier w/ BioBarrier	$1,433,694	$19,085,432	$20,519,126	$3,354,984

Table D-21B. Present Worth Costs 200-PW-3 Alternative 1

Alternative MESC - Soil Barrier Capital Costs, Periodic Costs, Non-Discounted Costs and Present Worth Costs							
200-PW-3 OU Feasibility Cost Study							
Site	Site Description	Opt#	Alternative	Total Capital Cost	Non-Discounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-A-7	Crib	MESC	Soil Barrier	$713,698	$12,014,340	$12,728,038	$1,902,210
216-A-8	Crib	MESC	Soil Barrier	$831,771	$12,220,989	$13,052,760	$2,052,000
216-A-24	Crib	MESC	Soil Barrier	$781,255	$14,753,352	$15,534,607	$2,244,000
216-A-31	Crib	MESC	Soil Barrier	$706,268	$12,119,139	$12,825,407	$1,916,000
UPR-200-E-56	Crib	MESC	Soil Barrier	$1,396,958	$17,044,441	$18,441,399	$3,109,000

Table D-22. Present Worth Costs 200-PW-3 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Disounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-A-7	Crib	3b	RTD(w/mixing) & ET Monofill Barrier	$1,214,800	$12,225,638	$13,440,438	$2,434,338
216-A-7	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$1,263,251	$12,225,638	$13,488,889	$2,482,789
216-A-8	Crib	3b	RTD(w/mixing) & ET Monofill Barrier	$1,877,632	$12,225,638	$14,103,271	$3,097,171
216-A-8	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$3,068,566	$12,225,638	$15,294,204	$4,288,105
216-A-24	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$6,262,597	$14,686,093	$20,948,690	$7,733,185
216-A-31	Crib	3c	RTD(w/mixing) & ET Monofill Barrier	$1,599,367	$12,152,271	$13,751,638	$2,813,238
UPR-200-E-56	Unplanned Release	3b	RTD	$8,605,105	$12,624,604	$21,229,709	$9,865,351
UPR-200-E-56	Unplanned Release	3c	RTD	$10,553,955	$12,624,604	$23,178,559	$11,814,201

Adjusted for FY09 G&A Change from 14.3 to 8.5

Table D-23. Present Worth Costs 200-PW-3 Summary

Net Present Worth Cost Estimates. (350 Years)					
WASTE SITE/GROUP		No Action	ALTERNATIVE 1: Capping and Institutional Controls	ALTERNATIVE 3B: Remove and Dispose with Capping and Institutional Controls	ALTERNATIVE 3C: Remove and Dispose with Capping and Institutional Controls
216-A-7 Crib	Present Worth Cost	$0	$1,937,074	$2,434,338	$2,482,789
	Non-discounted cost	$0	$12,875,473	$13,440,438	$13,488,889
216-A-8 Crib	Present Worth Cost	$0	$2,076,406	$3,097,171	$4,288,105
	Non-discounted cost	$0	$13,014,806	$14,103,271	$15,294,204
216-A-24 Crib	Present Worth Cost	$0	$2,790,485	$0	$7,733,185
	Non-discounted cost	$0	$17,385,745	$0	$20,948,690
216-A-31 Crib	Present Worth Cost	$0	$2,052,691	$0	$2,813,238
	Non-discounted cost	$0	$12,991,091	$0	$13,751,638
UPR-200-E-56 Unplanned Release [1]	Present Worth Cost	$0	$3,354,984	$9,865,351	$11,814,201
	Non-discounted cost	$0	$20,519,126	$21,229,709	$23,178,559

Table D-24. Present Worth Costs 200-PW-6 Alternative 1

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Discounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-5	Two Cribs	1	Physical Barrier w/CDF Backfill	$1,188,632	$35,120,358	$36,308,990	$2,411,057
216-Z-8	French Drain	N/A	N/A	$0	N/A	N/A	N/A
216-Z-10	Well	1	Decommission	$162,017	$0	$162,017	$162,017
241-Z-10	Tank	N/A	N/A				

Table D-25. Present Worth Costs 200-PW-6 Alternative 2

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Discounted Annual and Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-5	Two Cribs	2	ISV with RTD	$399,281	$35,120,358	$35,519,639	$1,621,705
216-Z-8	French Drain	N/A	No Action	N/A	N/A	N/A	N/A
216-Z-10	Well	N/A	No Action	N/A	N/A	N/A	N/A
241-Z-10	Tank	N/A	No Action	N/A	N/A	N/A	N/A

Table D-26. Present Worth Costs 200-PW-6 Alternative 3

Waste Site	Site Description	Alternative	Alternative Description	Total Capital Cost	Non-Disounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
216-Z-5	Two Cribs	3a	RTD with TRU Waste & ET Monofill Barrier	$2,760,845	$35,120,358	$37,881,203	$3,983,269
216-Z-5	Two Cribs	3c	RTD with TRU Waste & ET Monofill Barrier	$2,975,960	$0	$2,975,960	$2,975,960
216-Z-5	Two Cribs	3d	RTD with TRU Waste & ET Monofill Barrier	$2,975,960	$0	$2,975,960	$2,975,960
216-Z-5	Two Cribs	3e	RTD with TRU Waste & ET Monofill Barrier	$2,975,960	$0	$2,975,960	$2,975,960
216-Z-8	French Drain	N/A	No Action	N/A	N/A	N/A	N/A
216-Z-10	Well	N/A	No Action	N/A	N/A	N/A	N/A

Table D-27. Present Worth Costs 200-PW-6 Summary

Net Present Worth Cost Estimates. (1000 Years)						
WASTE SITE/GROUP		No Action	ALTERNATIVE 1: Capping and Institutional Controls	ALTERNATIVE 2: ISV and Institutional Controls	ALTERNATIVE 3A: Remove and Dispose with Capping and Institutional Controls	ALTERNATIVE 3C,D,E: Remove and Dispose with Capping
216-Z-5	Present Worth Cost	$0	$2,411,057	$1,621,705	$3,983,269	$2,975,960
	Non-discounted cost	$0	$36,308,990	$35,519,639	$37,881,203	$2,975,960
216-Z-8	Present Worth Cost	$0	N/A	N/A	N/A	N/A
	Non-discounted cost	$0	N/A	N/A	N/A	N/A
216-Z-10	Present Worth Cost	$0	$162,017	N/A	N/A	N/A
	Non-discounted cost	$0	$162,017	N/A	N/A	N/A

Table D-28. Capital Costs Settling Tank Summary

Site	Description	Opt	Alternative	Mobilization/ Demobilization	Monitoring & Sampling	Site Work	Soil Excavation & Treatment	Site Improvements	Construction Staff	Subtotal	Contingency	Subtotal	Professional Mgmt	Remedial Design	Construction Mgmt	Total Project
241-Z-361	Sludge Tank	0	Alternative 3 - Drain TRU Waste and CDF backfill	-	-	584,300	9,884,628	-	-	10,468,928	5,757,910.24	16,226,837.96	811,342	1,298,147	973,610	19,309,937
241-Z-8	Sludge Tank	0	Alternative 3 - Drain TRU Waste and CDF backfill	-	-	24,600	7,611,163	-	-	7,635,763	4,199,669.84	11,835,433.18	591,772	946,835	710,126	14,084,165
														Total for both tanks		33,394,103

Table D-29. Groundwater Monitoring Costs for Each Closure Zone

Closure Zone	Number of Sites in Each Closure Zone	Cost per Site
200 East Area Ponds	50	$13,603 ($82,854)
PUREX	101	$6,734 ($40,883)
Plutonium Finishing Plant	40	$17,004 ($103,230)

Table D-30. Incremental Costs for Groundwater Sampling for Each Closure Zone

Closure Zone: 200 East Pond	**Cost per site: $13,603 ($82,854)**
216-A-7 Crib	216-A-8 Crib
216-A-24 Crib	UPR-200-E-56
Closure Zone: PUREX	**Cost per site: $6,734 ($40,883)**
216-A-31 Crib	
Closure Zone: Plutonium Finishing Plant	**Cost per site: $17,004 ($103,230)**
216-Z-1A Tile Field	216-Z-1 Crib
216-Z-2 Crib	216-Z-3 Crib
216-Z-9 Trench	216-Z-12 Crib
216-Z-18 Crib	214-Z-361 Tank
216-Z-5 Crib	216-Z-8 French Drain
216-Z-10 Injection/Reverse Well	241-Z-10 Tank