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Western New York Nuclear Service Center

Sitewide Removal Alternative Technical Report

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West Valley, New York

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ACRONYMS AND ABBREVIATIONS

02 Building	Former Low-Level Waste Treatment Building
ALARA	as low as reasonably achievable
CDDL	Construction and Demolition Debris Landfill
CLSM	Controlled Low-Strength Material
Cs	cesium
DCGLs	derived concentration guideline levels
DCSA	Dry Cask Storage Area
DOE	U.S. Department of Energy
DS	Deployment System
EIS	Environmental Impact Statement
GTCC	Greater Than Class C
HEPA	high-efficiency particulate air
HLW	high-level waste
HSM	horizontal storage module
LLW2	Low-Level Waste Treatment Building
LSA 1	Lag Storage Addition 1
LSA 2	Lag Storage Addition 2
LSA 3	Lag Storage Addition 3
LSA 4	Lag Storage Addition 4
LTF	Leachate Treatment Facility
LWPC	Liquid Waste Processing Cell
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MSEE	Modular Shielded Environmental Enclosure
NDA	Nuclear Regulatory Commission-Licensed Disposal Area
NFS	Nuclear Fuel Services, Inc.
NPP	North Plateau Plume
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSERDA	New York State Energy Research and Development Authority
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PRB	Permeable Reactive Barrier
PVS	Permanent Ventilation System
PTW	Permeable Treatment Wall

ACRONYMS AND ABBREVIATIONS *(concluded)*

RHCLA	Remote-Handled Cask Loading Area
RHWF	Remote-Handled Waste Facility
SDA	State-Licensed Disposal Area
SDF	Soil Drying Facility
SPDES	State Pollutant Discharge Elimination System
STS	Supernatant Treatment System
TRU	Transuranic
USEPA	United States Environmental Protection Agency
WCS	Waste Conveyance System
WDCS	Waste Dislodging and Conveyance System
WDEE	Waste Dislodging End Effector
WMA	Waste Management Area
WNYNSC	Western New York Nuclear Service Center
WPDA	Waste Packaging Decontamination Area
WTF	Waste Tank Farm
WTFCA	Waste Tank Farm Confinement Area
WVDP	West Valley Demonstration Project

UNITS

Ci	curie
dB	decibel
ft^2	square feet
ft^3	cubic feet
g	gram
gpd	gallons per day
hr	hour
kg	kilogram
kW-hr	kilowatt per hour
MCF	million cubic feet
mL	milliliter
mrem	0.001 Roentgen equivalent man
mR/hr	milliroentgen per hour
µCi	1.0E-06 curie
µCi/ml	microcuries per milliliter
pCi	1.0E-12 curie
R	Roentgen
R/hr	Roentgen per hour
yd^3	cubic yards

1.0 INTRODUCTION

The Western New York Nuclear Service Center (WNYNSC) occupies 3,338 acres of land in northern Cattaraugus County and southern Erie County, NY, as shown on Figure 1-1. Primary drainage at the WNYNSC is via Buttermilk Creek, which joins Cattaraugus Creek at the northern end of the property. Cattaraugus Creek flows in a northwest direction into Lake Erie about 30 miles south of Buffalo, NY.

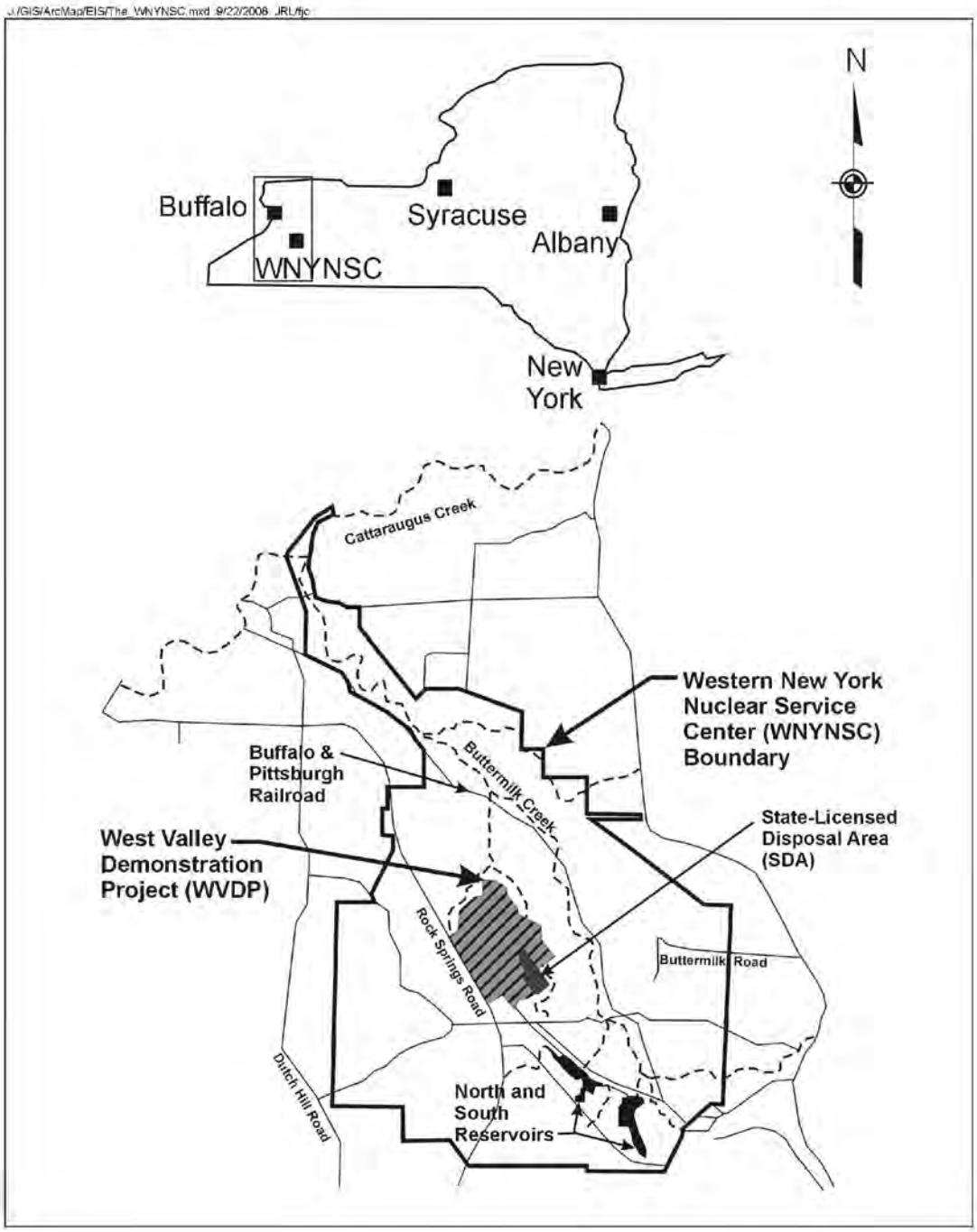


Figure 1-1. The Western New York Nuclear Service Center

The primary facilities at the WNYNSC consist of:

- A former irradiated nuclear fuel reprocessing plant;
- Four associated underground radioactive waste storage tanks; and
- Two radioactive waste disposal areas.

One of the radioactive disposal areas is licensed by the NRC (NDA in WMA 7). The other disposal area is licensed by the New York State Department of Health (NYSDOH) and permitted by the New York State Department of Environmental Conservation (NYSDEC) (SDA in WMA 8).

The WNYNSC has been divided into 12 Waste Management Areas (WMAs) listed below. The locations of WMA 1 through WMA 10 and WMA 11 and WMA 12 are shown on Figures 1-2 and 1-3, respectively.

- WMA 1: Main Plant Process Building and Vitrification Facility Area;
- WMA 2: Low-Level Waste Treatment Facility Area;
- WMA 3: Waste Tank Farm Area;
- WMA 4: Construction and Demolition Debris Landfill;
- WMA 5: Waste Storage Area;
- WMA 6: Central Project Premises;
- WMA 7: NRC-Licensed Disposal Area (NDA) and Associated Facilities;
- WMA 8: State-Licensed Disposal Area (SDA) and Associated Facilities;
- WMA 9: Radwaste Treatment System Drum Cell;
- WMA 10: Support Services Area;
- WMA 11: Bulk Storage Warehouse and Hydrofracture Test Well Area; and
- WMA 12: Balance of Site.

The Technical Reports (TRs) are being prepared as data inputs to the final Decommissioning and/or Long-Term Stewardship Environmental Impact Statement (EIS). The TRs describe several site-wide closure alternatives and potential conceptual engineering approaches to implement the closure alternatives. All engineered approaches presented are conceptual, typical designs that could be applied to the WNYNSC facilities and are considered to be representative of the alternative being evaluated.

The Sitewide Removal Alternative described in this report consists of the removal of all structures and waste disposal areas associated with the 12 WMAs at the WNYNSC such that the entire site would be available for unrestricted release. Removal activities would include, but not be limited to the following:

- Main Plant Process Building and Vitrification Facility Area;
- Waste Tank Farm;
- NRC-Licensed Disposal Area;
- State-Licensed Disposal Area;
- North Plateau Groundwater Plume;
- Cesium Prong; and
- Contaminated Soil

Baseline assumptions of the status of various WMA elements at the starting point of the EIS, prior to the implementation of removal activities are presented in Table 1-1.

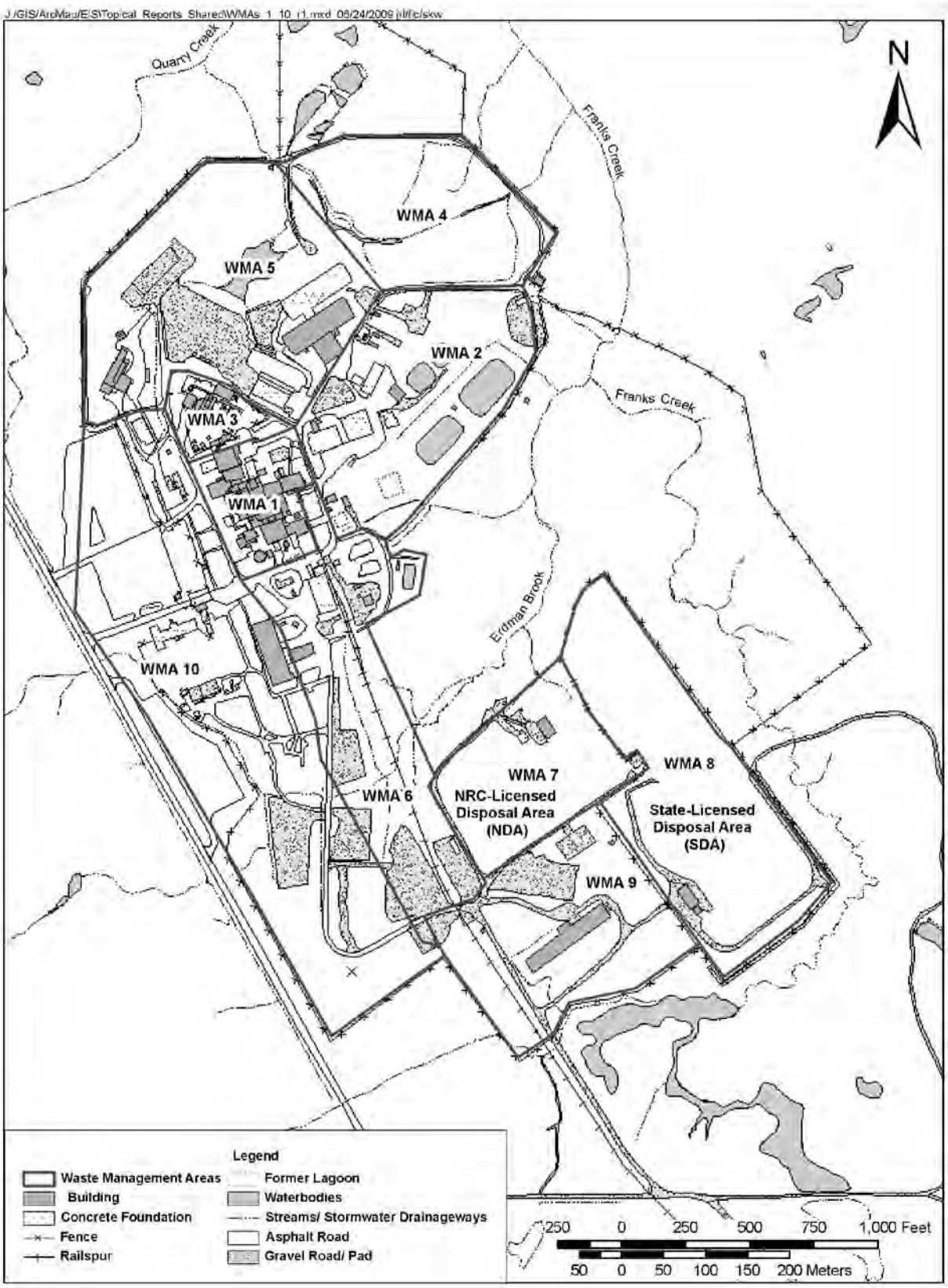


Figure 1-2. Location of Waste Management Areas 1 through 10

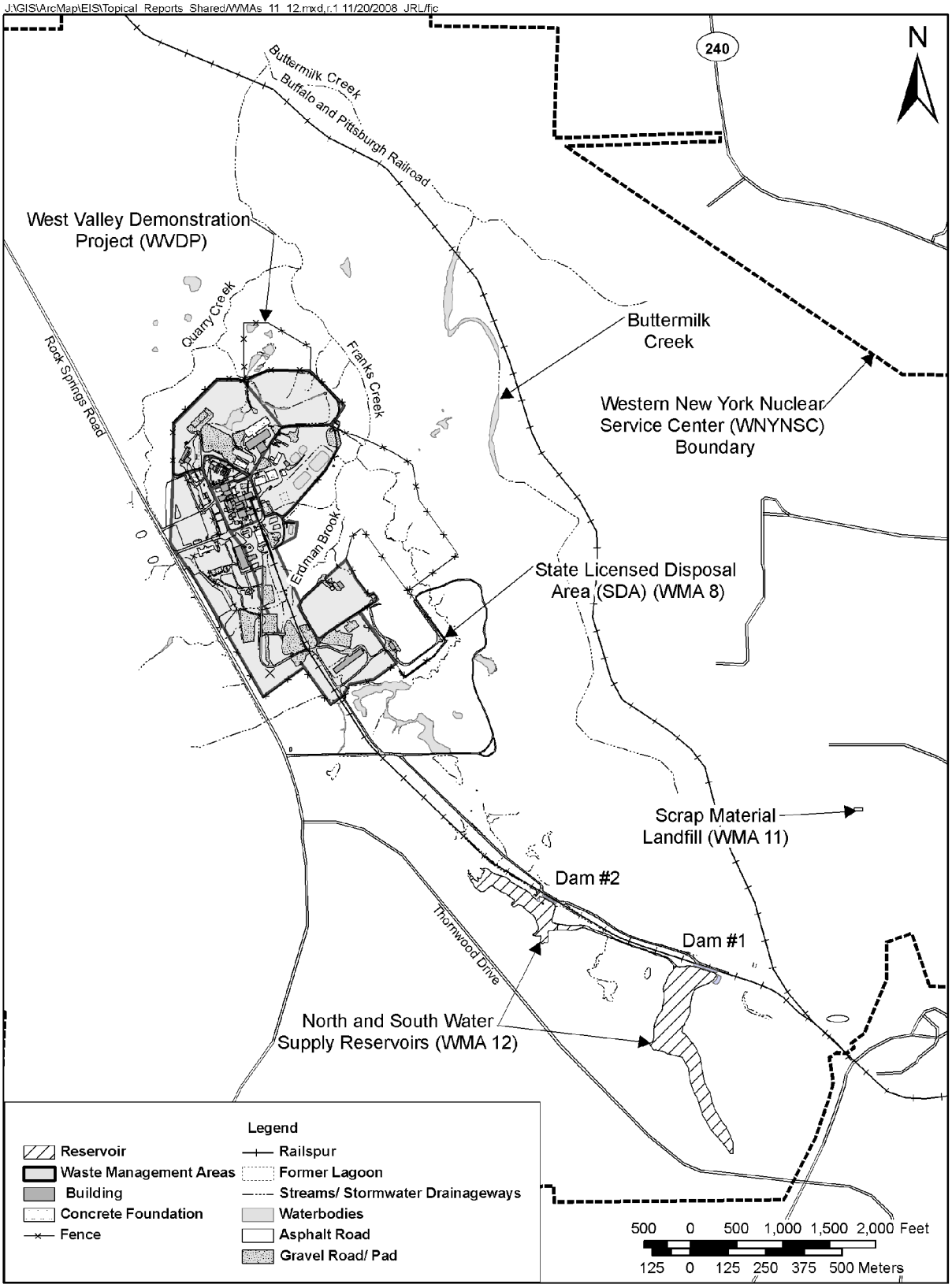


Figure 1-3. WMA 11 and 12 – Waste Management Areas 11 and 12

Table 1-1. Status of WNYNSC Facilities at the EIS Starting Point and Removal Alternative Actions

Area	Facility	EIS Starting Point Assumption	Removal Alternative Action[1]
WMA 1	Main Plant Process Building	Deconned to Demolition-Ready	Remove
	Plant Office Building	Operational	Remove
	01-14 Building	Deconned to Demolition-Ready	Remove
	Load-In/Load-Out Facility	Operational	Remove
	Recirculation Vent System Building	Removed to Floor Slab	Remove Floor Slab
	Contact Size-Reduction Facility	Removed to Floor Slab	Remove Floor Slab
	Emergency Vehicle Shelter	Removed to Floor Slab	Remove Floor Slab
	Radwaste Process (Hittman) Bldg.	Removed to Floor Slab	Remove Floor Slab
	Main Plant Basements, Underground Process Pipelines, and NPP Source Area	In Place	Remove
	Underground Tanks 35104, 7D-13, 15D-6	Operational	Remove
	Off-Gas Trench	In Place	Remove
	Utility Room and URE	Operational	Remove
	Fire Pump House & Storage Tank	Operational	Remove
	Laundry Room	Removed to Floor Slab	Remove Floor Slab
	Electrical Substation	Operational	Remove
	Vitrification Facility	Deconned to Demolition-Ready	Remove
	MSM Repair Shop Floor Slab	In Place	Remove Floor Slab
	Cold Chemical Facility Floor Slab	In Place	Remove
WMA 2	02 Building Floor Slab	In Place	Remove Floor Slab
	Low-Level Waste Treatment Building (LLW2)	Operational	Remove
	Lagoon 1	Inactive	Remove down to two feet into the Lavery till
	Lagoons 2–3	Operational	Remove sediment and one foot of underlying till
	Lagoons 4–5	Operational	Remove liners and one foot of underlying till
	Neutralization Pit	Operational	Remove
	Old and New Interceptors	Operational	Remove
	Test and Storage Building Floor Slab	In Place	Remove Floor Slab
	Solvent Dike	Inactive	Remove
	Vitrification Test Facility	Removed to Floor Slab	Remove Floor Slab
	Maintenance Shop Floor Slab	In Place	Remove Floor Slab
	Maintenance Storage Area	Removed to Floor Slab	Remove Floor Slab
	Vehicle Maintenance Shop	Removed to Floor Slab	Remove Floor Slab

Table 1-1. Status of WNYNSC Facilities at the EIS Starting Point and Removal Alternative Actions

Area	Facility	EIS Starting Point Assumption	Removal Alternative Action[1]
	Maintenance Shop Leach Field	Inactive	Remove
	Vitrification Hardstand	Removed to Grade	Remove Gravel Pad
	Fire Brigade Training Area	Inactive	Remove
	Industrial Waste Storage Area	Removed to Grade	Remove
	Well Purge Water Storage Locations	Inactive	Remove
	Wastewater Pipelines	Operational/Inactive	Remove
WMA 3	Tanks 8D-1,8D-2, 8D-3, 8D-4	Isolated with tank and vault drying system in place to evaporate remaining liquids	Remove
	High-Level Waste Tank Pump Storage Vaults	Transfer pipelines and pumps remaining	Remove
	High-Level Waste Transfer Trench	Inactive	Remove
	Permanent Ventilation System Building	Operational	Remove
	Supernatant Treatment System Support Building	Operational	Remove
	WTF Equipment Shelter & Condensers	Inactive	Remove
	Con-Ed Building	Inactive	Remove
WMA 4	Construction and Demolition Debris Landfill	Inactive (previously closed)	Remove
WMA 5	Remote-Handled Waste Facility	Deactivated Awaiting Demolition	Remove
	Lag Storage Building	Removed to Floor Slab	Remove Floor Slab
	Lag Storage Area 1	Removed to Floor Slab	Remove Floor Slab
	Lag Storage Area 2 Hardstand	Removed to Grade	Remove
	Lag Storage Area 3	Removed to Floor Slab	Remove Floor Slab
	Lag Storage Area 4/Shipping Depot	Operational	Remove
	Hazardous Waste Storage Lockers	Removed to Grade	Remove Gravel Pad
	Chemical Process Cell Waste Storage Area	Removed to Grade	Remove Gravel Pad
	Cold Hardstand Area	Removed to Grade	Remove Gravel Pad
	Construction and Demolition Area	Inactive	Remove Gravel Pad
	Vitrification Vault and Empty Container Hardstand	Removed to Grade	Remove Gravel Pad
	Old/New Hardstand Storage Area	Removed to Grade	Remove Gravel Pad
WMA 6	Rail Spur	Operational	Remove
	Old Warehouse	Removed to Floor Slab	Remove Floor Slab
	Sewage Treatment Plant	Operational	Remove
	Cooling Tower	Removed to Foundation	Remove Below Grade

Table 1-1. Status of WNYNSC Facilities at the EIS Starting Point and Removal Alternative Actions

Area	Facility	EIS Starting Point Assumption	Removal Alternative Action[1]
			Structure
	Equalization Basin	Operational	Remove
	Equalization Tank	Operational	Remove
	Demineralizer Sludge Ponds	Inactive	Remove
	WTF Test Towers	North Tower Removed, South Tower Operable	Remove South Tower and Concrete Floor Slab
	Road-Salt & Sand Storage Shed	Removed to Asphalt	Remove Asphalt Pad
	Product Storage Area	Inactive	Remove Asphalt Pad
	Low-Level Waste Rail Packaging and Staging Area	Operable, Waste Removed	Remove
WMA 7	NDA Interceptor Trench	Operational	Remove
	SDA Leachate Transfer Pipeline	Operational	Remove
	Liquid Pretreatment System	Operable	Remove
	NDA Hardstand Staging Area	Removed to Grade	Remove Slab/Gravel
	NFS Deep Holes	Inactive, Geomembrane Cap, and Barrier Wall	Remove
	NFS Special Holes	Inactive, Geomembrane Cap, and Barrier Wall	Remove
	Former NDA Lagoon	Inactive, Geomembrane Cap, and Barrier Wall	Remove
	WVDP Disposal Area Removal (trenches/caissons)	Inactive, Geomembrane Cap, and Barrier Wall	Remove
WMA 8	Mixed Waste Storage Facility	Operational	Remove
	SDA Disposal Trenches	Inactive, Geomembrane Cap, Barrier Wall	Remove
	Former Filled SDA Lagoons	Inactive, Geomembrane Cap, Barrier Wall	Remove
WMA 9	Radwaste Treatment System Drum Cell	Operable	Remove
	Subcontractor Maintenance Area	In Place	Remove
	NDA Trench Soil Container Area	Inactive	Remove Gravel Pad
WMA 10	Administration Building	Removed to Floor Slab	Remove Floor Slab
	Expanded Environmental Lab	Removed to Floor Slab	Remove Floor Slab
	New Warehouse	Operational	Remove
	Meteorological Tower	Operational	Remove
	Security Gatehouse and Fences	Operational	Remove
	Construction Fabrication Shop	Removed to Floor Slab	Remove Floor Slab
	Vitrification Diesel Fuel Oil Storage Tank and Building	Removed to Floor Slab	Remove Floor Slab

Table 1-1. Status of WNYNSC Facilities at the EIS Starting Point and Removal Alternative Actions

Area	Facility	EIS Starting Point Assumption	Removal Alternative Action[1]
WMA 11	Scrap Material Landfill	Inactive	Remove
WMA 12	Railroad Spur (beyond WMA 6)	In Place	Remove
	Dams and Reservoirs	Operational	Remove
	Stream Sediments	In Place	Remove
	Parking Lots and Roadways	In Place	Remove
	Contaminated Soil	In Place	Remove
NPP	North Plateau GW Recovery System	Operational	Remove
	North Plateau Plume (Non-Source Area)	In Place	Remove to Lavery till
	Pilot-Scale Permeable Treatment Wall	Operational	Remove
	Full-Scale Permeable Treatment Wall	Operational	Remove
MISC	Cesium Prong	In Place	Remove

[1] MARSSIM Final Status Surveys to be completed at the end of EIS Action on each WMA

2.0 IMPLEMENTATION ACTIVITIES

2.1 WMA 1: Main Plant Process Building and Vitrification Facility Area

WMA 1 consists of the buildings and structures shown in Figures 2-1 and 2-2. Due to its complexity, the Sitewide Removal Alternative for this area can be separated into significant support activities, four primary remediation activities, and several closeout activities. In general, all structures, piping, and subsurface contamination would be removed, characterized, packaged, and disposed of off site.

There are significant volumes of structural demolition debris that would be generated under this alternative.

2.1.1 Remediation Support Activities

Prior to decontamination or demolition, a number of preparatory activities would be completed, and they comprise modification of the Load-In/Load-Out Facility, Dry Cask Storage Area (DCSA) construction, HLW canister transfer, acquisition of specialized equipment, and installation of a barrier wall. Other conventional setup efforts would be completed as well, such as characterization and design measures, applications for necessary regulatory approvals, and the installation and maintenance of storm water controls around the construction site.

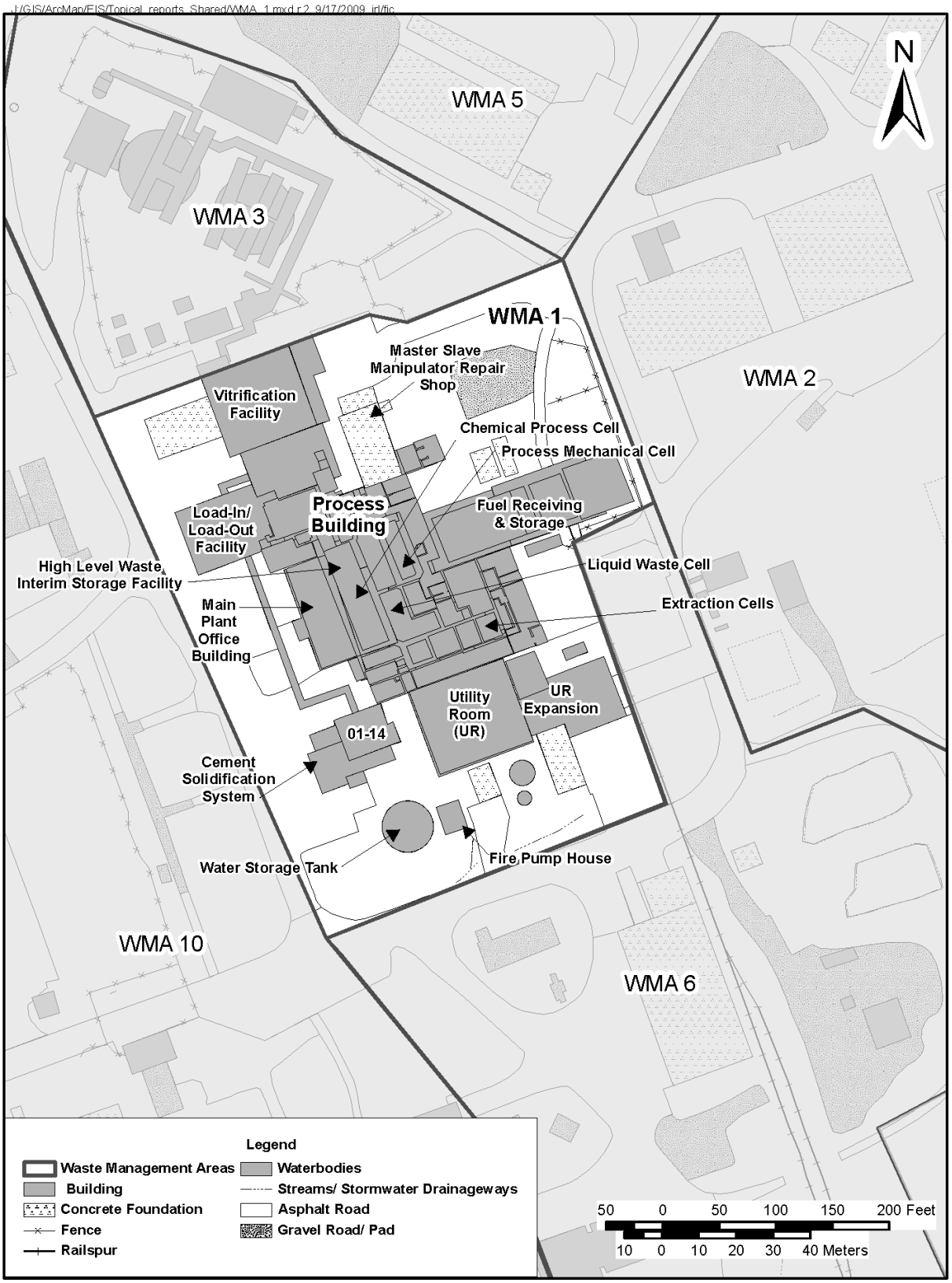
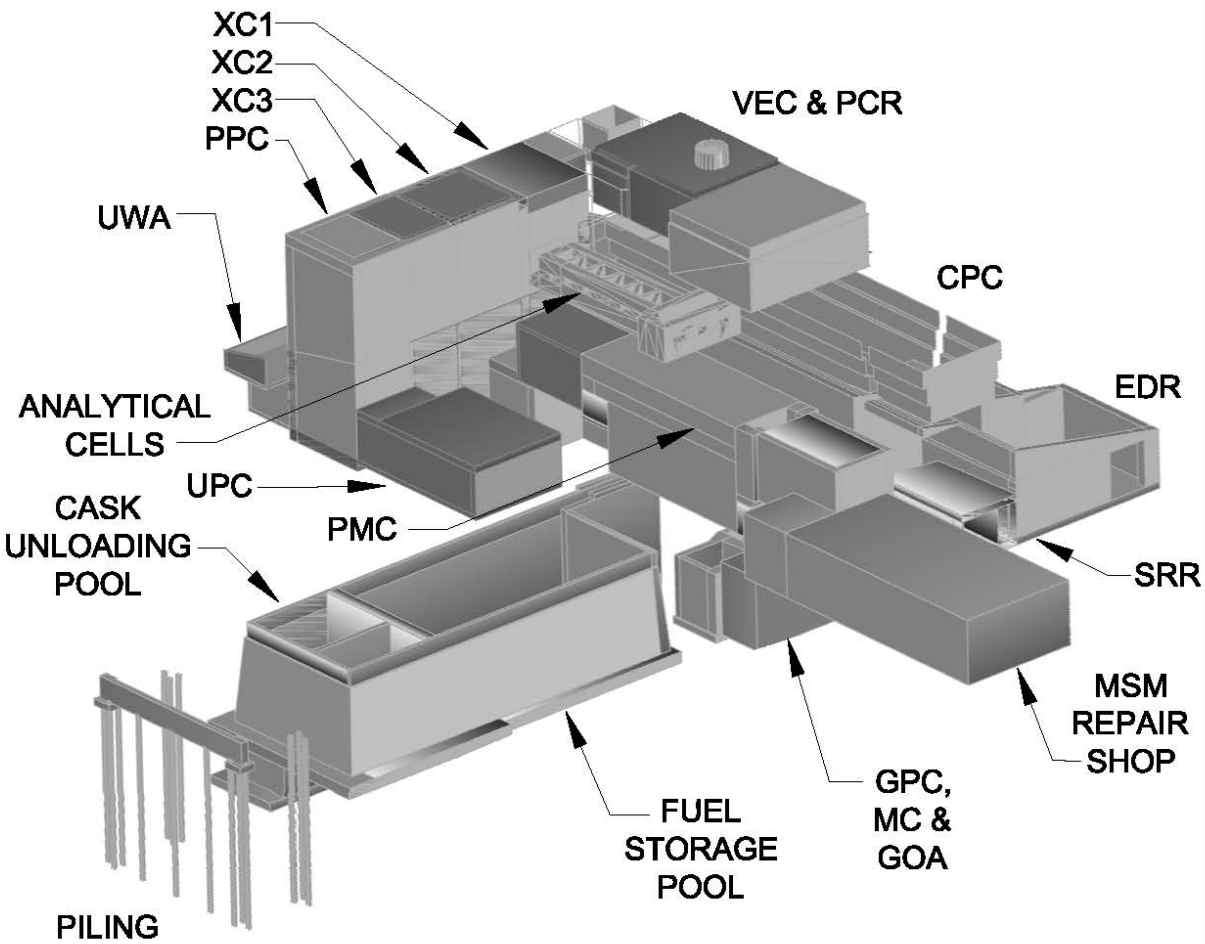


Figure 2-1. WMA 1 - Main Plant Process Building and Vitrification Facility Area



CPC = Chemical Process Cell	PPC = Product Purification Cell
EDR = Equipment Decontamination Room	SRR = Scrap Removal Room
GOA = General Purpose Operating Aisle	UPC = Uranium Product Cell
GPC = General Purpose Cell	UWA = Upper Warm Aisle
PMC = Process Mechanical Cell	VEC = Ventilation Exhaust Cell
MSM = Master-Slave Manipulator	XC1 = Extraction Cell 1
MC = Miniature Cell	XC2 = Extraction Cell 2
PCR = Process Chemical Room	XC3 = Extraction Cell 3

Figure 2-2. Isometric View of the Main Plant Process Building

Load-In/Load-Out Facility Modification

The Load-In/Load-Out Facility (LILO) would be modified to support the removal of the HLW canisters from the Main Plant Process Building to an on-site storage area. Equipment that would be installed to modify the facility consists of a shielded transfer cell, a canister handling system, and a ventilation system.

The shielded transfer cell would be used for performing canister surface decontamination and swipe sampling without exposing workers to high doses of radiation. A canister handling system would assist in the transfers of the canisters from the cell into the storage casks. Incidental equipment would also be needed for additional canister handling, weighing, and size verification.

These modifications are based on a truck-mounted, transportation and storage cask that holds at least four stainless-steel canisters filled with vitrified high-level radioactive waste. The canisters would be decontaminated, loaded in their storage casks, and transported to an on-site cask storage area, awaiting off-site disposal.

Canister Relocation – DCSA

A Dry Cask Storage Area would be constructed within WMA 6 on the South Plateau near the rail spur. Figure 2-3 illustrates the location proposed for construction of the DCSA. The configuration of the storage area was based on the geometry of horizontal storage modules (HSMs) from Transnuclear, Inc. (refer to Figure 2-4). The Transnuclear HSM (refer to Figure 2-4) complies with the requirements of 10 CFR 50 Appendix B, 10 CFR 71 Subpart H, and 10 CFR 72 Subpart G. The conceptual layout of the DCSA assumes that the Transnuclear HSM or an HSM of similar size and capacity would be used as storage modules for the HLW canisters while providing radiation shielding and mechanical protection.

The modification of existing facilities was considered in lieu of new construction of the DCSA. One existing facility that appeared to be a candidate for the long-term storage of the HLW canisters was the Vitrification Cell in the Vitrification Facility. However, use of the Vitrification Cell was deemed impractical since it could delay removal of that and adjacent facilities. Use of the Radwaste Treatment System Drum Cell was also considered. This existing facility would require major work in order to complete a retrofit, and since the layout/dimensions were not the most efficient, the drum cell was also no longer considered to be a candidate. With no other existing facilities demonstrating a good match for the necessary characteristics of the DCSA, a new facility was assumed. The desired location of the new facility would be on the South Plateau close to the rail line and away from the facilities and decommissioning activities on the North Plateau. With no other existing facilities demonstrating a good match for the necessary characteristics of the DCSA, a new facility was planned.

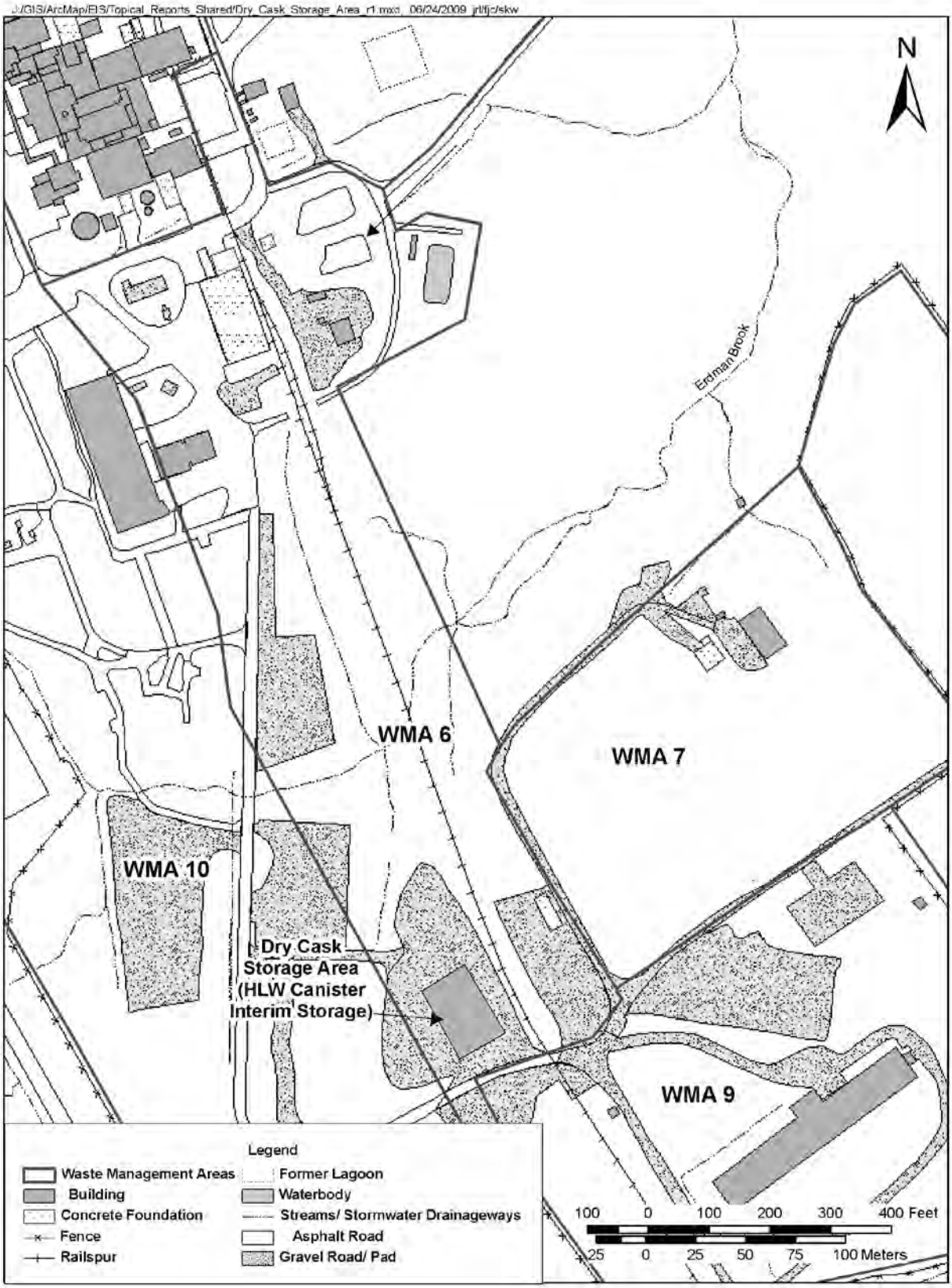
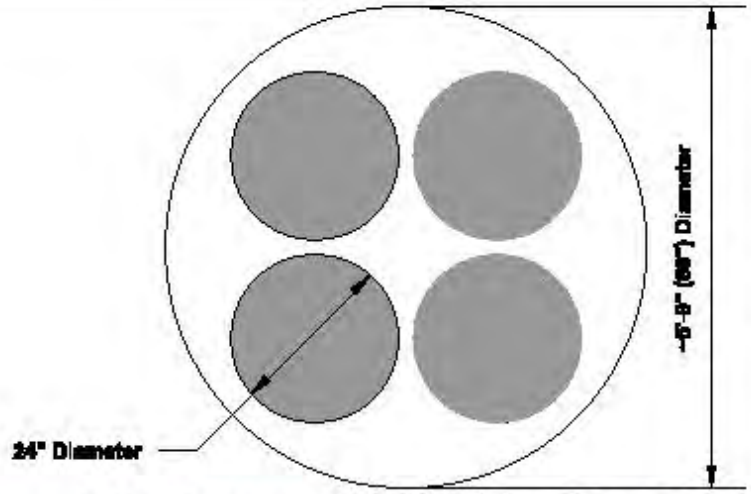


Figure 2-3. Dry Cask Storage Area Location



Packing Arrangement Of HLW Canisters in Transfer Casks

Transfer Cask Being Moved

Filled, Sealed Horizontal Storage Modules

Figure 2-4. High-Level Waste Canister Transportation and Storage

The DCSA footprint would be optimized by placing the HSMs back-to-back, allowing common aisle access for loading and unloading of the modules. Loading "skirts" and appropriately sized aisles would provide adequate space for truck and trailer maneuverability. Since the HSMs can hold at least four canisters each, a total of 69 HSMs would be used to store the 275 vitrified HLW canisters. Based upon these specifications, the DCSA would measure approximately 370 feet by 110 feet.

This report contains an estimate of one high-level radioactive waste canister being removed from the Load-In/Load-Out Facility, transferred to the Interim Storage Facility (Dry Cask Storage Area), and unloaded into a storage unit in an 8-hour shift. Although this estimate is presented in terms of one canister, the canisters would be moved in groups of four; each group would be moved completely within a period of approximately 40 hours of work. This estimate is based on experience gained during the removal and placement of material with high and very high dose rates (greater than 100 milliroentgen per hour) contained in lead-shielded containers at Brookhaven National Laboratory and Oak Ridge National Laboratory and compares favorably with the *Diablo Canyon Independent Spent Fuel Storage Installation Safety Analysis Report* estimate of time required for similar activities (17 hours for transferring a loaded cask to the Independent Spent Fuel Storage Installation). While these events are similar to those proposed for the high-level radioactive waste canister transfer, there are differences in loading configuration and waste disposition that could affect duration and cost estimates.

The conceptual DCSA pad design is based on recommendations from the module vendor. The recommendations are consistent with installations currently in operation in the eastern U.S., including:

- Monticello Nuclear Generating Plant – 18-inch-thick and 24-inch-thick concrete pads;
- Point Beach Units 1 and 2 (Wisconsin Electric Company) – 36-inch-thick concrete pad; and
- Carolina Power and Light, HB Robinson Unit – 36-inch-thick concrete pad.

In addition, based upon discussions with Transnuclear and NRC personnel, design features required for a DCSA containing these types of wastes would also require the following:

- Inner and outer security fencing; and
- Storage modules and cask similar to those currently being used for the storage of spent nuclear fuel.

Uncontaminated surface soil excavated during pad construction would be used to create earthen berms around the storage area to provide storm water controls, and security. A two-foot-thick engineered base would be placed under a three-foot-thick reinforced concrete pad. Two sets of security fencing would be installed around the perimeter to control access to the area.

Operational requirements for the area would be minimal. These storage units, which are commonly used throughout the U.S. for interim storage of spent nuclear fuel, would be totally passive, requiring little, if any, maintenance over the storage lifetime. Labor would be limited to security and HSM inspections and repairs.

Specialized Equipment

Structures within WMA 1 would be demolished using hydraulic machines with interchangeable tools, such as hammers, grapples, and shears. For example, the Brokk BM330 is an electric demolition machine manufactured in Sweden by Holmhed Systems AB that is track mounted and can be remotely operated (Figure 2-5). A number of these machines, or equivalent, would be used during demolition activities throughout WMA 1.

Because of the extensive amount of reinforcement, piping, and steel in the structures within WMA 1, a diamond wire saw would also be used during demolition activities (Figure 2-6). This technology, which uses diamonds bonded to a wire to cut concrete, has been used to cut stone blocks in quarries for many decades. Two small holes would be drilled at opposite ends of a proposed cut, and the diamond wire would be placed under tension through the holes and drawn by a motor-driven pulley system. As the section is cut, concrete dust and debris is removed using water.

Barrier Wall Installation

To facilitate removal of WMA 1 underground structures and the contaminated soil beneath the Main Plant Process Building (i.e., source area), a barrier wall would be installed around the footprint of the WMA 1 buildings. Since the barrier would be installed to support the subsurface excavation, illustrations and sections depicting the barrier wall are included in Section 2.1.5. The wall would extend approximately two feet into the underlying Lavery till to isolate the subsurface structures and reduce infiltration of groundwater from outside the source area. The upgradient and crossgradient portions of the barrier wall would be constructed of sheet pile, while the downgradient section would consist of a soil-cement-bentonite backfill mixture that would remain in-place after remediation of WMA 1 is completed.

The total length of barrier wall would be approximately 2,400 feet, 750 feet of which would be soil-cement-bentonite and 1,650 feet of which would consist of sheet pile. The section of soil-cement-bentonite wall adjacent to the excavation (approximately 500 feet) would be approximately 13 feet wide, while the remainder would be a typical three feet in width. The extra-thick barrier wall with cement would provide the stability necessary to accommodate the adjacent excavation. The designed maximum hydraulic conductivity of the soil-cement-bentonite barrier wall is $1x10^{-7}$ cm/s.

Construction of the barrier walls would involve use of a conventional pile driver and hydraulic excavator for the sheet pile and bentonite wall, respectively. Approximately 7,300 yd^3 of soil would be excavated for the soil-cement-bentonite wall, 6,500 yd^3 of which is assumed to be contaminated and half of that volume would be saturated. Only clean and/or imported soil will be used to prepare the backfill mixture. The slurry and backfill mixtures for the soil-cement-bentonite wall would be prepared in contained areas, and the trench would be kept filled with slurry to support the walls of the trench during excavation. The slurry used to support the trench, as well as leftover unused slurry, would be evaporated and the residual material disposed of off site.

Figure 2-5. Brokk BM330 Demolition Machine

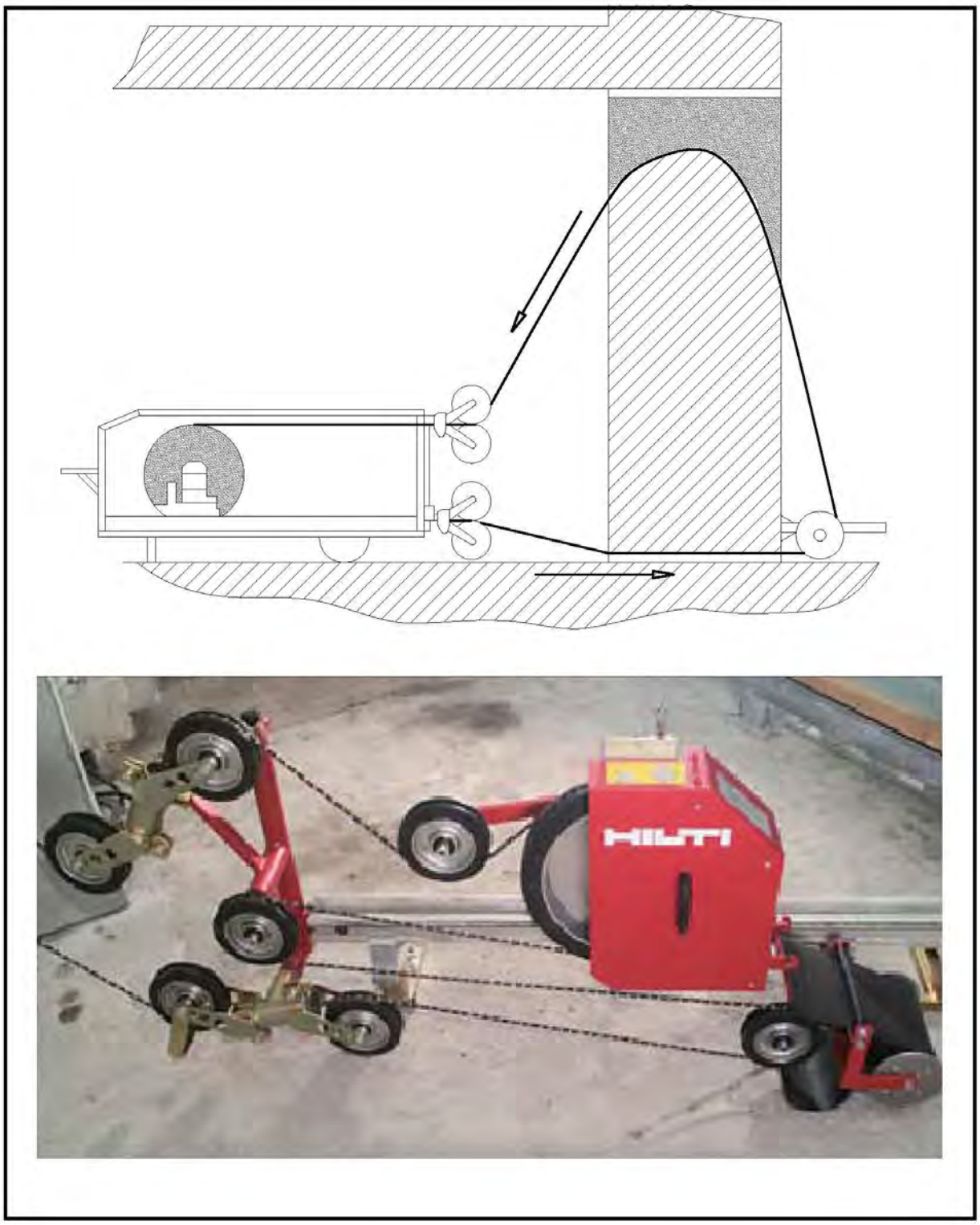


Figure 2-6. Diamond Wire Saw

2.1.2 Vitrification Facility Demolition

It is assumed that WMA 1 would have been decontaminated to a demolition-ready condition prior to commencing this alternative. It is also assumed that stainless-steel liners would be left in place, to be removed during implementation.

Radiation surveys would be performed, as needed, to assess radiation levels associated with equipment, piping, and structural components remaining in the extraction cells. These surveys could include sampling and analysis of residual materials for safety planning and waste characterization purposes. Should areas within WMA 1 structures contain significant residual radioactivity (i.e., radioactive dust), then they would be vacuumed prior to surveying. Ultimately, the survey efforts would assess whether or not subsequent demolition activities could continue under unconfined conditions. Any removable contamination that remains after surveying and vacuuming would be sprayed with a fixative to secure the radioactivity prior to demolition.

Since the Vitrification Facility is connected to the Main Plant Process Building, demolition activities on this structure would be coordinated with the status of the Main Plant Process Building to ensure safety and stability. Similar to all structures within WMA 1, the Vitrification Facility would be demolished to grade level using a method that involves interior gutting followed by an outside-in demolition approach.

Once the cells/rooms have been vacuumed, any equipment and piping remaining in the Vitrification Facility would be removed, segmented, and packaged. Asbestos-containing insulation that exists would be removed according to applicable federal and state regulations and managed as asbestos-containing waste. Although these tasks would be considered in the planning, the Vitrification Facility is not expected to contain any asbestos wastes or any equipment/process wastes.

Stainless-steel liners that cover certain floors and walls found in radioactive process areas are typically 304L stainless-steel plate, and could cover up residual radioactivity. As a result, the liners would be removed and the exposed surfaces would be decontaminated as necessary. The liners themselves would also be surveyed and decontaminated, if necessary, to remove surface contamination. Once decontaminated, the liners would be removed (manually or remotely depending on the radiological conditions), segmented, packaged, and managed as Class A waste. Contamination controls, such as portable containment tents and HEPA ventilation units, would be installed in liner removal areas.

Building demolition would be the final stage in Vitrification Facility remediation, and it would be performed without confinement but using controlled demolition methods to minimize airborne releases. The nine lead-glass viewing windows, containing approximately 3,000 pounds of lead, would be removed from the building before demolition of the structure and managed as hazardous or mixed waste. The steel frame and sheet metal elements of the structure would be demolished first and then the reinforced concrete Vitrification Cell. Conventional equipment with fog spraying and specialized equipment as discussed above

would be used to dismantle and segment the thick concrete structures. The steel shield doors would also be segmented as necessary for disposal. Demolition debris from the Vitrification Cell would be managed as Low Specific Activity (LSA) waste. Demolition debris from the ExCell concrete demolition would be segregated, to the extent practical, and managed as CDD.

2.1.3 Miscellaneous Facilities Remediation

The more significant support facilities within WMA 1 consist of the Load-In/Load-Out Facility, 01-14 Building, Utility Room, Utility Room Expansion, and Plant Office Building. These buildings possess less radioactive contamination compared to the Vitrification Facility and Main Plant Process Building, and would therefore be demolished using more conventional methods. In addition to these facilities/structures, several floor slabs would remain from the Recirculation Vent System Building, the Contact Size-Reduction Facility and the MSM Repair Shop, Cold Chemical Facility Floor Slab, the Emergency Vehicle Shelter, Fuel Receiving and Storage High-Integrity Container (HIC) Storage Area, and the Radwaste Process (Hittman) Building. These floor slabs would also be demolished during this task.

For each building, a characterization survey would be performed to quantify the contamination. Where necessary, utilities would be isolated, equipment would be removed, drains and sumps would be sealed, and vacuuming/applying spray fixative activities would be performed. Excavators equipped with shear, grapple, and hammer attachments would mainly be used for demolition of the buildings. Equipment and concrete debris (including slab demolition debris) would be segmented as necessary, and managed as CDD or LSA waste.

The Load-In/Load-Out Facility would be demolished once the HLW canisters have been relocated to the DCSA. Standard construction equipment would be used, as the internal wall surfaces of the structure should not be contaminated. The demolition debris, as well as the dismantled shielded transfer cell, canister handling system, and high capacity crane, would be managed as LSA waste.

The 01-14 Building is expected to be cleared of all equipment, including the Vitrification Off-Gas System and the Cement Solidification System during the deactivation phase (prior to implementing the Sitewide Removal Alternative). The building is also expected to be decontaminated and ready for demolition. The 01-14 Building contains a single lead-glass viewing window containing approximately 500 pounds of lead. This window would be removed from the building before demolition of the structure and managed as hazardous or mixed waste. The corrugated steel within the 01-14 Building would be removed before the concrete structure. The steel waste is not expected to be radioactively contaminated and would be managed as construction and demolition debris. Removal of the concrete would involve methods similar to those used for the Load-In/Load-Out Facility, and the building debris would be managed as LSA waste.

The Utility Room, Utility Room Expansion, and the Plant Office Building are also relatively simple structures, and would be demolished using conventional equipment after they are no longer needed for support activities. Asphalt roofing material would be removed first using equipment such as skid steer loaders and

hand tools. Wastes would be placed in temporary containers, which would be decontaminated (as necessary) and removed by crane to ground level. Material containing asbestos would be managed in accordance with federal and state regulations. Steel decking underlying the asphalt roofing would be removed, size-reduced with a mobile shear attached to a demolition machine, and placed into boxes. Ultimately, the roofing materials would be managed as LSA waste.

Masonry and concrete walls would also be demolished with the demolition machine equipped with either a shear or demolition hammer. The hammer would be used to pulverize the concrete, and the shear would be used to cut through the steel reinforcement in the concrete and structural steel members. In addition, a concrete crusher plant would be employed at the site on a full time basis to assist in concrete crushing and rebar removal. Water mists would be used, as needed, to mitigate airborne dusts. A skid steer loader would be used to load demolition debris into waste containers. The concrete and steel demolition debris from these three facilities is assumed to be managed as LSA waste.

2.1.4 Main Plant Process Building Demolition

Main Plant Process Building (refer to Figure 2-2) demolition would be performed using similar techniques to Vitrification Facility demolition. Rooms/cells containing loose, residual radioactivity, would be vacuumed, and equipment and piping would be removed, segmented, and packaged. Asbestos-containing insulation would also be removed and managed by certified workers according to applicable federal and state regulations. Under the Sitewide Removal Alternative, several of the process cells are assumed to be found containing process equipment. The waste generated from the equipment removal is assumed to be classified as Class A, B, C and transuranic (TRU) wastes (as described in 40 CFR 191.02). Specifically, Class A wastes only, are assumed to be generated in the CPC. However, the Head End Ventilation system, the Liquid Waste Cell, the Off-Gas Blower Room, the Off-Gas Cell, the Uranium Load-Out Area, the Uranium Process Cell, and the Ventilation Wash Room are all assumed to contain equipment which would be packaged as Class A, B, C, or TRU wastes.

Stainless-steel liners similar to those in the Vitrification Facility would be surveyed and decontaminated (as necessary) and removed manually or with remotely-operated equipment in high radiation cells. Portable containment tents and HEPA ventilation units would be used to control contamination. Decontamination of these liners is generally assumed to be very effective, and the liners would be managed as Class A waste.

The 32 lead-glass viewing windows, containing a total of approximately 22,000 pounds of lead, would be removed from the building before demolition of the structure, and processed to remove the lead and lead containing components, these components would then be managed as hazardous or mixed waste.

The steel frame and sheet metal structures would be demolished first, followed by concrete and reinforced concrete cells. Conventional demolition equipment and diamond wire cutting machines would be used to demolish the Main Plant Process Building in an unconfined but controlled manner to minimize radioactive airborne releases. It is anticipated that demolition debris resulting from the stack

removal and from the cranes removed from the process areas would be managed as Class A waste. The remainder of the demolition debris from the process building would be managed as LSA waste.

Demolishing the Main Plant Process Building would occur using an exterior to interior methodology, where the support structures would be managed first, followed by the larger, self-supporting buildings. The multitude of room/cells could be separated into four types of structures, which would be demolished differently: miscellaneous facilities, framework cells, reinforced concrete framework cells, and tower cells.

Miscellaneous facilities associated with the Main Plant Process Building comprise structures such as the stack, the Fire Pump House, the Laundry Room Concrete Floor Slab, and the Electrical Substation. The stack structure is about 160 feet tall, varying four to ten feet in diameter, and composed of Type 304L stainless steel and Gunite. This structure would be removed in sections, and the pieces would be lowered to the ground by a crane. To prevent the spread of contamination, the sections would be temporarily wrapped with plastic sheeting, and eventually segmented, and managed as Class A waste. The RHWF may be suitable for some segmentation tasks performed during this remediation. If available and found to be suitable and cost effective, the RHWF could be considered to assist with these tasks.

Removal of the equipment and piping from the fire pump house, and demolition of the superstructure itself, would be accomplished by conventional methods and the wastes generated would be managed as Construction and Demolition Debris (CDD) waste. The steel water storage tank would be drained, segmented using conventional cutting equipment, and managed as CDD.

The concrete floor slab of the Laundry Room would be demolished with a hydraulic excavator and managed as CDD waste. The transformer within the electrical substation would be disconnected and removed by the electrical utility company, and the remaining structure and foundation would be demolished and managed as CDD waste.

Framework Cells of the MPPB were designed and constructed with masonry or concrete supported by a structural steel framework and decking. The asphalt roofing material, which is thought to contain asbestos, would be removed first using skid steer loaders and hand tools. The debris would be packaged and managed according to the local, state and federal laws.

The steel roof decking would be removed and segmented with a mobile shear attached to a demolition machine. The shear attachment would cut through the roof decking and place the segments into boxes. The masonry and concrete walls would also be demolished with a demolition machine, equipped with a shear or demolition hammer. The hammer would break the concrete, while the shear would cut through the steel reinforcement and structural members. A fog spray or similar dust-suppression technique would be used during concrete demolition. Debris removed from high elevations would be lowered to the ground using a crane, and a skid steer loader would place rubble into waste containers. The demolition debris is assumed to be managed as LSA waste.

Reinforced Concrete Framework Cells were constructed with high-density concrete up to three feet thick to provide shielding from high activity radiation. The cells are located within and above the framework cells, and thus, would be demolished concurrently with the framework cells.

The five analytical cells, sample cell, and sample storage cell are located at a plant elevation of 131 feet. Similarly to the other framework cells at this height, the concrete and steel would be removed using demolition machines, lowered to the ground with a crane, and placed into containers using a skid steer loader. The demolition debris generated from the reinforced framework cells would be managed as LSA waste.

The Tower Cells are the fundamental and most robust structures of the MPPB that are made of reinforced concrete and are structurally self-sufficient. In general, the walls, floors, and ceilings consist of high-density reinforced concrete up to 5.5 feet thick. These components would be demolished using controlled techniques with diamond wire saws, similar to other high-density reinforced concrete.

The ceilings of tower cells would be segmented and removed first with a diamond wire saw that would cut through the concrete and steel. A crane would be used to support each ceiling segment and safely lower it to the ground level following cutting operations. The walls would be demolished in a similar fashion, and all tower cell segments would be sized to fit directly into waste containers, such as lift liners or B-25 boxes. Conventional demolition equipment would be used to remove the floor slabs once the walls were removed. The demolition debris from the tower cells is assumed to be managed as LSA waste.

2.1.5 Subsurface Remediation

All structures and contaminated media in the subsurface would be excavated following the removal of the above grade facilities. Figures 2-7 though 2-9 illustrate the details of the excavation, which would address tanks and piping, the NPP Source Area, and any remaining subsurface structures. To remove these items, the excavation footprint would cover approximately three acres, and it would be bounded by the barrier wall described previously. The contour lines shown on Figure 2-8 represent the approximate base of the excavation prior to the removal of one foot of Lavery till.

The tanks and piping in the subsurface of WMA 1 would vary in contamination from highly radioactive off-gas and waste transfer pipelines (e.g., 7P120-3) to non-radioactive utility pipelines and equipment. All piping would be characterized using appropriate sampling protocols for radiological and RCRA heavy metal constituents, and pipelines found to be contaminated would be grouted prior to removal to stabilize residual liquids, secure removable contamination, and eliminate internal voids. An excavator would expose the piping and cut them using a hydraulic shear to seal the ends and mitigate potential releases. The sealed pipelines would be removed and packaged, and it is anticipated that the waste would be managed as Class A waste. The off-gas trench would be demolished with an excavator and the debris would be managed as CDD waste. Any non-radioactive utility pipelines that do not interfere with subsurface remediation activities would be left in place, and ultimately removed during the mass excavation.

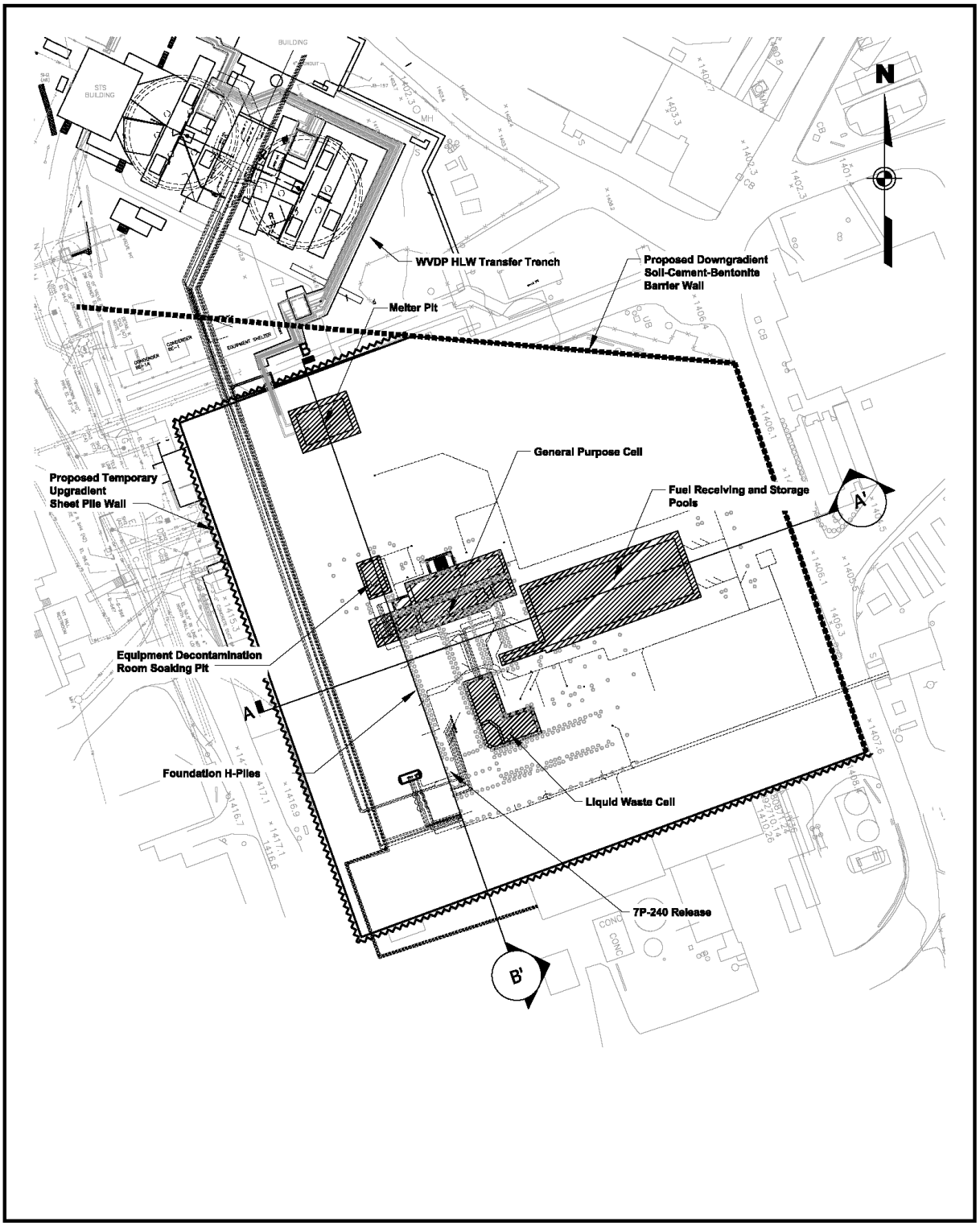


Figure 2-7. Main Plant Process Building Area Subgrade Facility Excavation

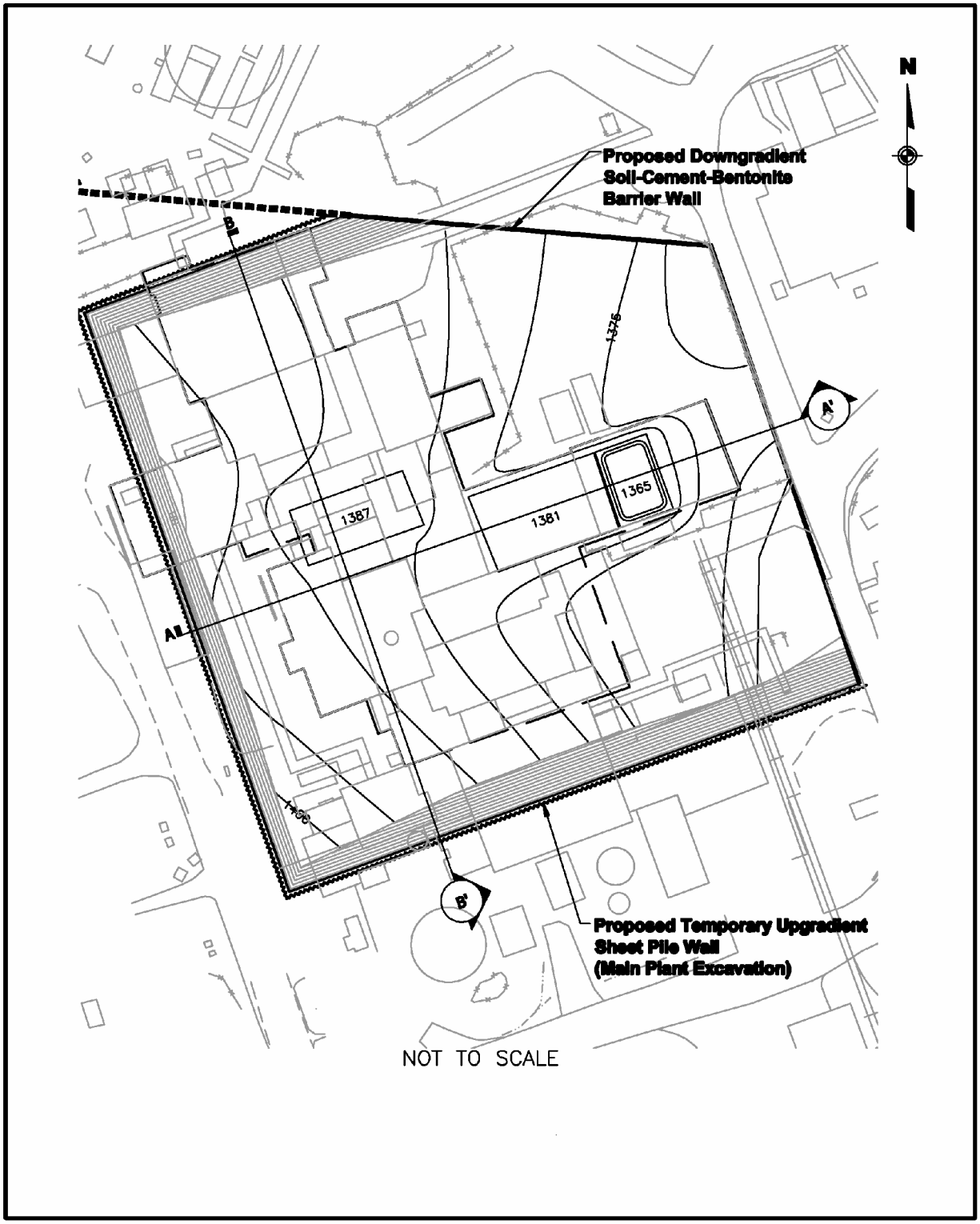


Figure 2-8. Main Plant Process Building Area Excavation Extent

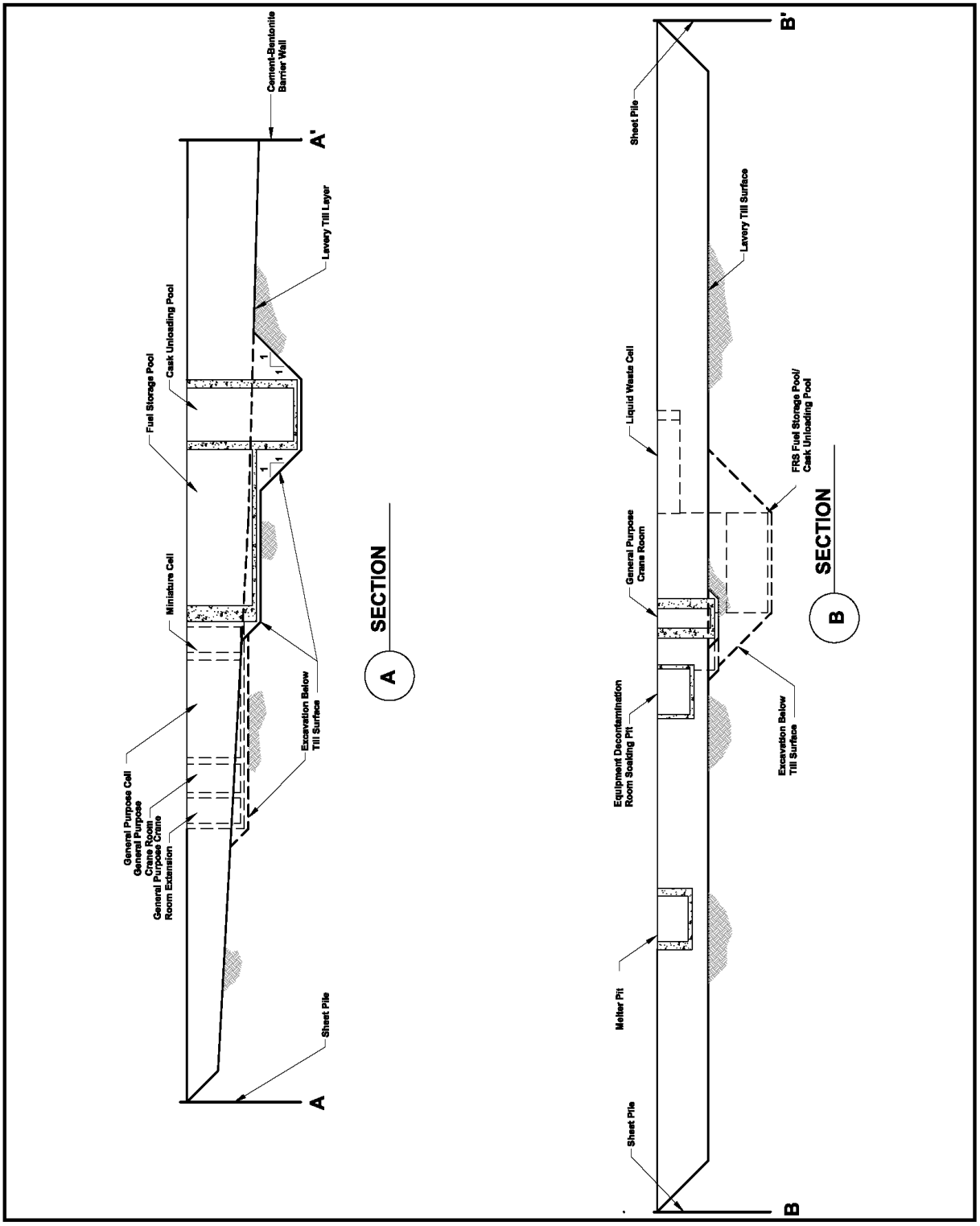


Figure 2-9. Main Plant Process Building Area Sections

The three underground tanks (35104, 7D-13, and 15D-6), which are expected to be radioactively contaminated, would be removed regardless of the degree of contamination. The soil surrounding the tanks would be removed, and the tank shells would be segmented by an excavator equipped with torch or shear cutting tools. The tank segments would be transferred to a surface staging area where they would be additionally segmented and managed as LSA waste. Based on operating history, associated with Tank 7D-13, soil excavated from the vicinity of the tanks is also assumed to be contaminated, and managed as LSA waste. If determined to be feasible and cost effective, tanks and associated equipment removed during these tasks might be segmented in the RHWF.

The North Plateau Plume is primarily the result of a release that occurred near the southwest corner of the Main Plant Process Building. The soil and groundwater within this area are expected to contain elevated levels of less mobile radionuclides (e.g., Cs-137) that require shielding and confinement controls. The release area would therefore be isolated with a subsurface sheet pile barrier wall and confinement structure, and dewatered using pumping wells. Once dewatered, the contaminated soil would be removed using conventional excavation equipment, operating within the confinement structure.

Groundwater from within the Main Plant excavation area would be removed using approximately 15 extraction wells/sumps. If deemed necessary, the contaminated groundwater would be pretreated using a skid-mounted ion-exchange system. The ion-exchange materials would be selected to process the mixture of radionuclides present in the source area. It is anticipated that the system would consist of two parallel units capable of treating approximately 100 gallons per minute. If necessary, the effluent from the skid-mounted system would be directed to the existing LLW Treatment Facility for additional treatment.

The confinement structure would be a single-span structure that would extend over the southwest corner of the Main Plant Process Building for weather protection and airborne radioactivity control. Vadose zone soil would be removed first using conventional excavation equipment, and this soil is assumed to be clean and suitable for use as on-site backfill.

Excavation of saturated soil would commence once the confined area is dewatered, and any free liquid encountered during excavation would be removed with common sumps and pumps. Soil removal activities would extend approximately one foot into the Lavery till or until a subsurface structure is removed. The saturated soil would be directed to a Soil Drying Facility (discussed in Section 2.13.1) where drying, processing, characterization, and packaging would take place. It is anticipated that the soils removed from the immediate vicinity of the spill site (excavation work conducted within the enclosure) would be managed as Class A waste. Once the Class A soils are removed, the enclosure would be demolished and managed as LSA waste.

The remaining excavation necessary to complete the source removal and remove the remaining subsurface facilities and basements would be performed without confinement. The remainder of the soil removed from within the barrier wall would be managed as LSA waste.

The WMA 1 below-grade structures (Figures 2-8 and 2-9), including the Melter Pit, EDR Soaking Pit, Liquid Waste Cell, General Purpose Cell, and the Fuel Receiving and Storage Pools, are designed and constructed similarly to the Tower Cells described above. These components are also composed of either high or standard density reinforced concrete of up to three feet in thickness. The demolition of these structures would be coordinated with the removal of source area soils, and would be performed with conventional demolition equipment and diamond wire saws.

As contaminated source soil is removed and placed in lift liners, the ceilings of the underground cells would be segmented with diamond wire saws and removed using cranes. The walls would also be segmented using diamond wire saws, and all segments would be sized to fit into lift liners. Conventional demolition equipment would be used to remove the floor slabs and foundations. It is anticipated that all debris would be managed as LSA waste.

It is assumed that the Main Plant is supported on nearly 500 foundation piles constructed with steel H sections. The foundation piles would be exposed and cut at least 3 feet below the base of the excavation. Additional piling removal would be considered, as warranted, based on post-removal characterization results. The remaining depression would be filled with cement-benonite grout. In addition, the groundwater extraction wells would be removed as they are encountered. The removed piles and extraction wells would be managed as LSA waste.

Once the below grade structures are removed, soil excavation would continue until a combination of field screening and surveys determine that DCGLs are achieved. All contaminated soil encountered that exceeds DCGLs would be managed as LSA waste. As discussed, the excavation is estimated to end at a depth of one foot below the Lavery till contact. If field screening and surveys indicate that contamination extends beyond the sheetpile barrier, sections of the sheetpile can be removed, and the excavation continued, as needed, to satisfy the cleanup objectives.

2.1.6 Remediation Completion and Closeout Activities

The typical containers to support off-site shipping of waste from WMA 1 are shown in Figures 2-10 through 2-12. The HLW canisters at the DCSA would be removed from the HSMs, placed on a cask transfer trailer, and transported to the rail spur. It is anticipated that the canisters would be shipped via rail for disposal at a federal repository. The HSMs that housed the canisters in storage would be removed from the DCSA and disposed of as CDD. A backhoe loader or similar equipment would be used to remove the fencing around the DCSA, while the reinforced concrete pad would be demolished and removed using hydraulic hammers and front-end loaders. None of this debris would be expected to be radiologically contaminated, and so it is assumed to be managed as CDD waste. The rock/soil base would be left in-place, and the area (including the berms and barriers) would be graded and seeded.

In general, all contaminated demolition waste (i.e., soil and debris) would be removed from WMA 1 and disposed of off site. Once demolition activities have ceased, a MARSSIM Final Status Survey would be performed over this WMA to verify that residual radioactivity levels do not exceed the Derived Concentration Guidelines Levels (DCGLs). After verification surveys, backfilling and grading would be performed with approved soil, as necessary, to restore the area.

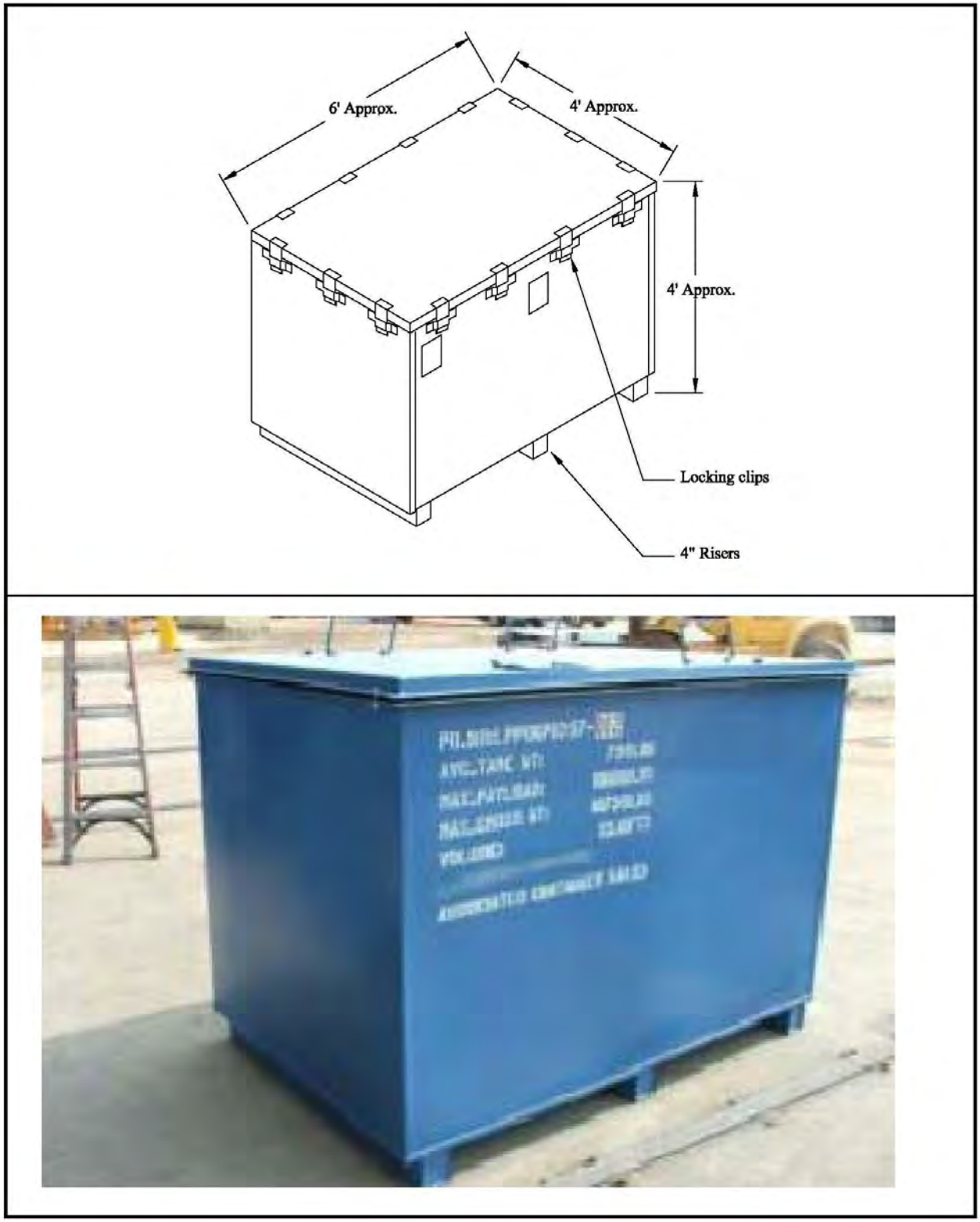
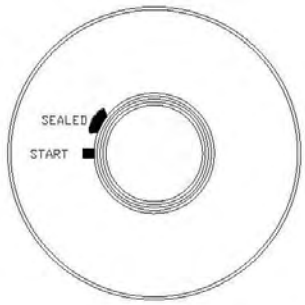
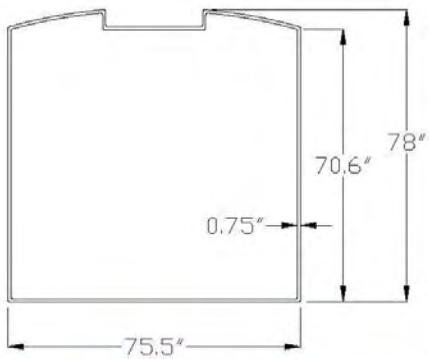


Figure 2-10. B-25 Box





Note: Picture provided for illustrative purposes only.

Figure 2-11. NUHIC-205 High-Integrity Container

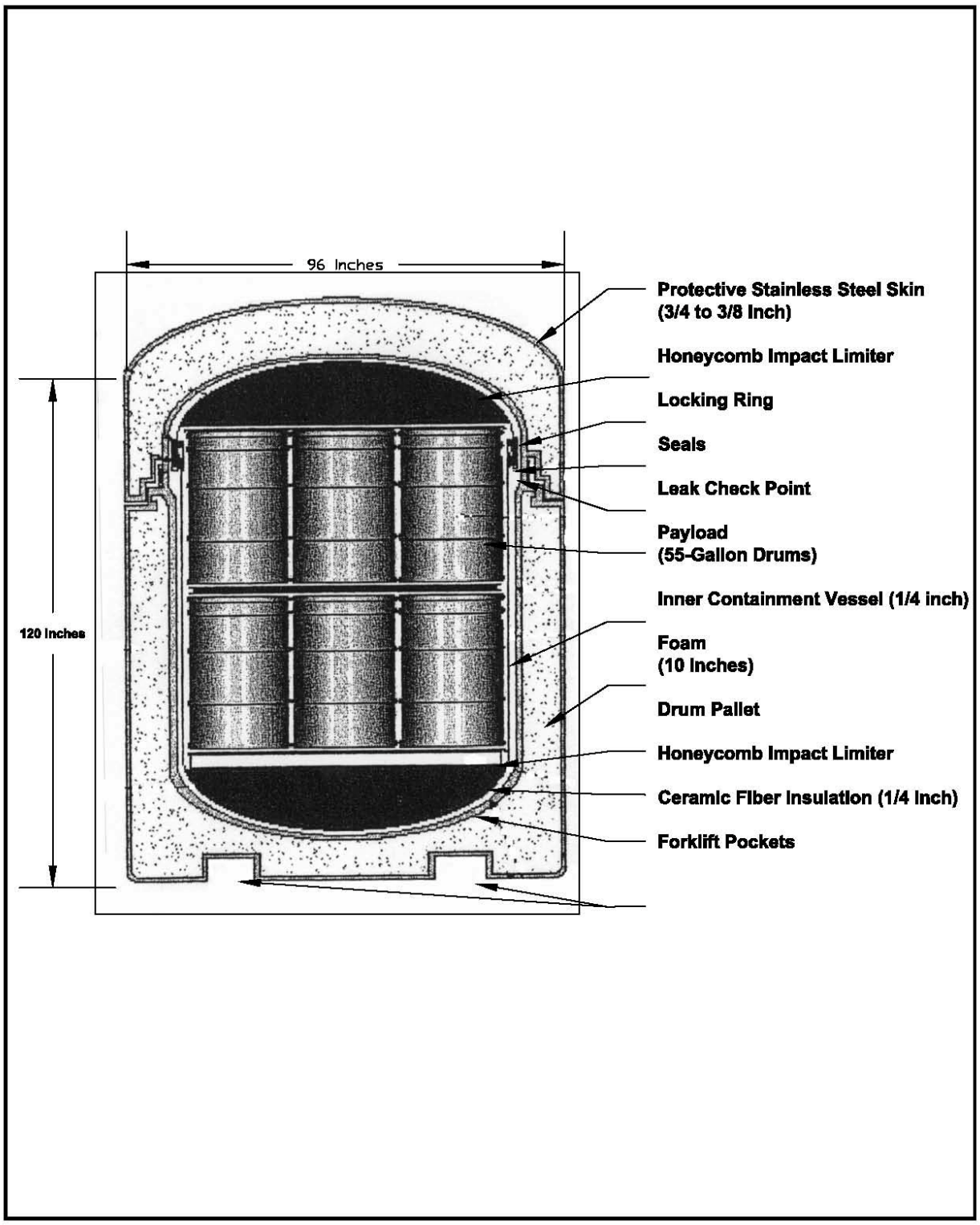


Figure 2-12. TRUPACT-II Shipping Container

The sheet piles installed to isolate and dewater the excavation would be removed during backfilling activities and managed as LSA waste. The components of the skid-mounted groundwater treatment system would be managed as LSA waste. It is anticipated that the ion-exchange media would be managed as Class A waste. The equipment associated with the confinement structure (e.g., ventilation) and the confinement structure itself, would be demolished and managed as LSA waste. In addition, all used equipment, such as diamond wire saws, demolition machines, remote- and manually operated excavation equipment, etc., would be segmented, as needed, and managed as LSA waste.

2.1.7 Mitigative Measures

Many actions would be adopted during remediation of WMA 1 to reduce or eliminate impacts to human health and the environment. Sediment controls and dust suppression would be employed during construction and demolition of the DCSA and source area confinement structure to protect the quality of air and ecological resources. The skid-mounted groundwater treatment system would be used to minimize impacts to the water resources, while PPE would be instituted as necessary to ensure safety and protect human health. The access controls that would be established from the installation of the DCSA fencing and subsurface barrier walls would also provide protection to human health and safety. The source area enclosure and barrier wall use would also provide additional measures for reducing airborne and aqueous releases.

2.2 WMA 2: Low-Level Waste Treatment Facility Area

The work planned at WMA 2 consists of the following activities:

- removal of remaining surface structures, concrete floor slabs (e.g., 02 Building), below-grade piping, hardstands, and other areas suspected of low-level soil contamination;
- removal of the contaminated waste and sediment remaining in Lagoon 1;
- excavation of contaminated sediment from Lagoons 2 and 3; and
- removal of liners from Lagoons 4 and 5 and excavation of any underlying contaminated soil.

Layout of the lagoons and associated facilities of WMA 2 is presented in Figure 2-13. Detailed discussion of the proposed remedial activities is presented in the following subsections.

2.2.1 Remediation Support Activities

The primary facility that would support the remediation of WMA 2 would be an environmental enclosure supporting the Lagoon 1 waste removal project. The need for an enclosure was deemed necessary due to the expectation that wastes classified as greater than Class A would be uncovered and managed during the remediation. The Lagoon 1 enclosure would provide containment of airborne emissions during the removal of these wastes.

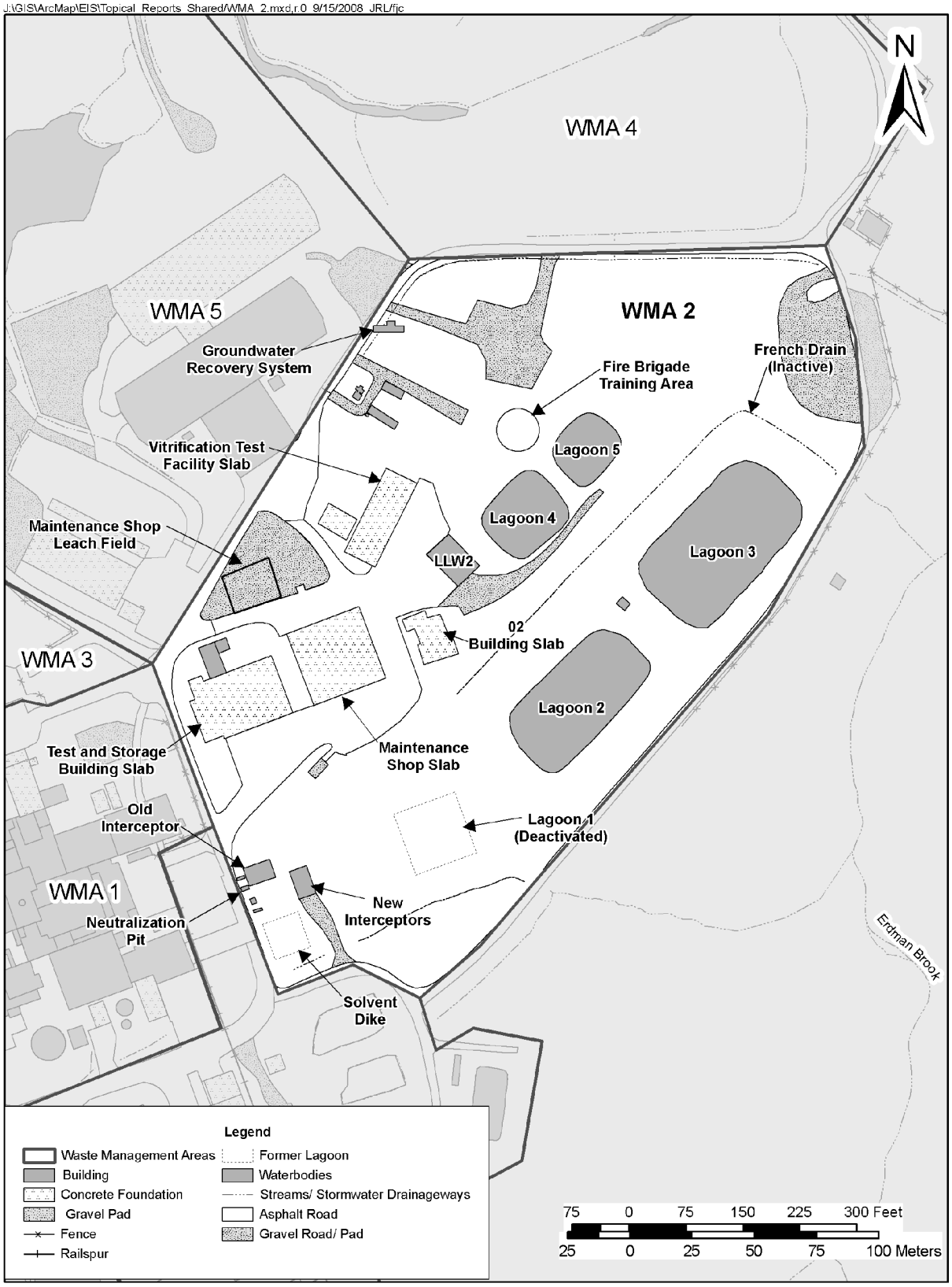


Figure 2-13. WMA 2 - Low-Level Waste Treatment Facility Area

Considering a Lagoon 1 excavation dimension of approximately 100 feet by 100 feet, the enclosure would be approximately 150 feet by 150 feet to allow sufficient free space to accommodate the excavation work as well as to provide a process (packaging) area for the Lagoon 1 wastes. Following installation of sheet piling around the Lagoon 1 excavation area (mainly to control groundwater), the building would be constructed. The conceptual Lagoon 1 enclosure would be single span, steel frame building with sheet metal walls and roof. The foundations would be placed outside the perimeter of the lagoon to be excavated.

2.2.2 Removal of Associated Structures, Facilities, and Floor Slabs

LLW2 Facility

When no longer needed for remediation wastewater treatment, the treatment components of the LLW2 treatment facility would be demolished and removed. The ion-exchange media would be managed as LSA waste. The remaining wastewater processing equipment and piping from the building would be removed and segmented, as appropriate, and managed as LSA waste.

The waste packaging area would be demolished using appropriate controls, such as fog spray. The demolition debris, including the sump liner, would be managed as LSA waste. The remainder of the LLW2 Facility and its floor slab would then be demolished by conventional methods without confinement and the demolition debris would again be managed as LSA waste.

A MARSSIM Final Status Survey would be performed in the affected area, and then the area would be filled as necessary, and restored to approximate natural grade.

New Interceptor

The New Interceptor roof would be removed from the subsurface structure, demolished, and containerized for disposal. The subsurface structure would be demolished by separating the stainless-steel liner from the concrete walls and floor. The liner would be cut into manageable pieces for disposal. Finally the concrete vault would be demolished, including a minor amount of excavating to access the entire subsurface structure. Within the excavation, any underground pipelines in the immediate area would be demolished and removed. The demolition debris generated from the demolition would be managed as LSA waste.

Since a larger encompassing excavation would be performed at a later point in the WMA 2 remediation, there would be no immediate need for final status surveys or verification surveys in this area. Backfilling efforts would be limited to achieving a safe excavation area, and the excavation would be left temporarily barricaded.

Old Interceptor

The Old Interceptor would be demolished using a process similar to that used for the New Interceptors, with the rubble being managed as LSA waste.

Underground pipelines in the immediate area would also be removed and managed as LSA waste. It should be noted that only the New Interceptors have a stainless-steel liner.

Following discharge of a highly contaminated liquid to the old interceptors in 1967, a 12-inch layer of concrete was poured into the bottom of the vault to provide additional shielding. Based on this information, the floor of the Old Interceptor is expected to be approximately two feet in thickness.

Since a larger encompassing excavation would be performed at a later point in the WMA 2 remediation, there would be no immediate need for final status surveys or verification surveys in this area. Backfilling efforts would be limited to achieving a safe excavation area, and the excavation would be left temporarily barricaded.

Neutralization Pit

The Neutralization Pit structure would be flushed prior to the initiation of demolition activities. The flushing fluids would be managed and treated on site, as appropriate. The liner, concrete walls, and floor of the Neutralization Pit, and the underground pipelines in the immediate area would be demolished and removed with the debris being managed as LSA waste. The process employed for the Neutralization Pit removal would be similar to the Old Interceptor demolition task.

Since a larger encompassing excavation would be performed at a later point in the WMA 2 remediation, there would be no immediate need for final status surveys or verification surveys in this area. Backfilling efforts would be limited to achieving a safe excavation area, and the excavation would be left temporarily barricaded.

Maintenance Shop Leach Field

The leach field components would be excavated by conventional means without confinement. Sediment sampling from the Septic Tank No. 1 associated with the Maintenance Shop Leach Field was performed for target compound list (TCL) organics, target analyte list (TAL) metals and radiological parameters in 1993 and 1994 as part of the RCRA Facility Investigation (RFI). Detections of TCL organics and TAL metals were generally in the low level ranges for constituents common to gasoline and cleaning agents typically in use at a maintenance shop and/or corresponding to site background concentrations.

The leach field area is located within the central portion (1,000 pCi/L Sr-90) of the North Plateau Groundwater Plume. Subsurface soils in this area are assumed to have been impacted by the North Plateau Groundwater Plume during seasonal high water levels. Therefore, the excavated material is assumed to be managed as LSA waste.

Solvent Dike

Contamination in the Solvent Dike was largely removed in 1986 when the sediment was excavated and disposed of off site, and the Dike was backfilled. Although it is assumed that only residual and low-level contaminants remain in

the area, the Dike would be excavated in advance of the larger excavation to ensure that any higher activity wastes are removed and risk to workers is reduced. The excavated material is assumed to be managed as LSA waste.

Since a larger encompassing excavation would be performed at a later point in the WMA 2 remediation, there would be no immediate need for MARSSIM Final Status Surveys or verification surveys in this area. Backfilling efforts would be limited to achieving a safe excavation area, and the excavation would be left temporarily barricaded.

Concrete Floor Slabs, Foundations, and Hardstands

The concrete floor slabs of the 02 Building, Test and Storage Building, Vitrification Test Facility, and Maintenance Shop would be demolished by conventional means with the demolition debris being managed as uncontaminated construction and demolition debris. Work of this type also comprises the Lagoon 1 enclosure concrete foundation.

The potentially contaminated surface soils and gravel hardstands present in the Fire Brigade Training Area, the Industrial Waste Storage Area, and the Well Purge Water Storage Locations would also be removed under this task. These soil and gravel materials would be managed as LSA waste.

2.2.3 Removal of Lagoons

The approximate limits of the planned lagoon excavations and a cross-section of the planned excavations are presented on Figures 2-14 and 2-15, respectively. Contaminated groundwater associated with the excavation activities would be appropriately managed and treated through the existing treatment facility (LLW2).

Lagoon 1

Preparation for removal of Lagoon 1 would include construction of the environmental enclosure discussed earlier in Section 2.2.1. Within the enclosure, the cap materials, hardstand waste contents, and underlying sand and gravel (expected to be Class C waste) from Lagoon 1 would be removed. The excavation would continue until the higher activity wastes have been removed allowing further unconfined excavation.

The excavation is expected to encompass a 10,000 ft^2 area (100 feet x 100 feet) and would extend approximately two feet into the Lavery till. The total depth of the excavation is expected to be approximately 14 feet.

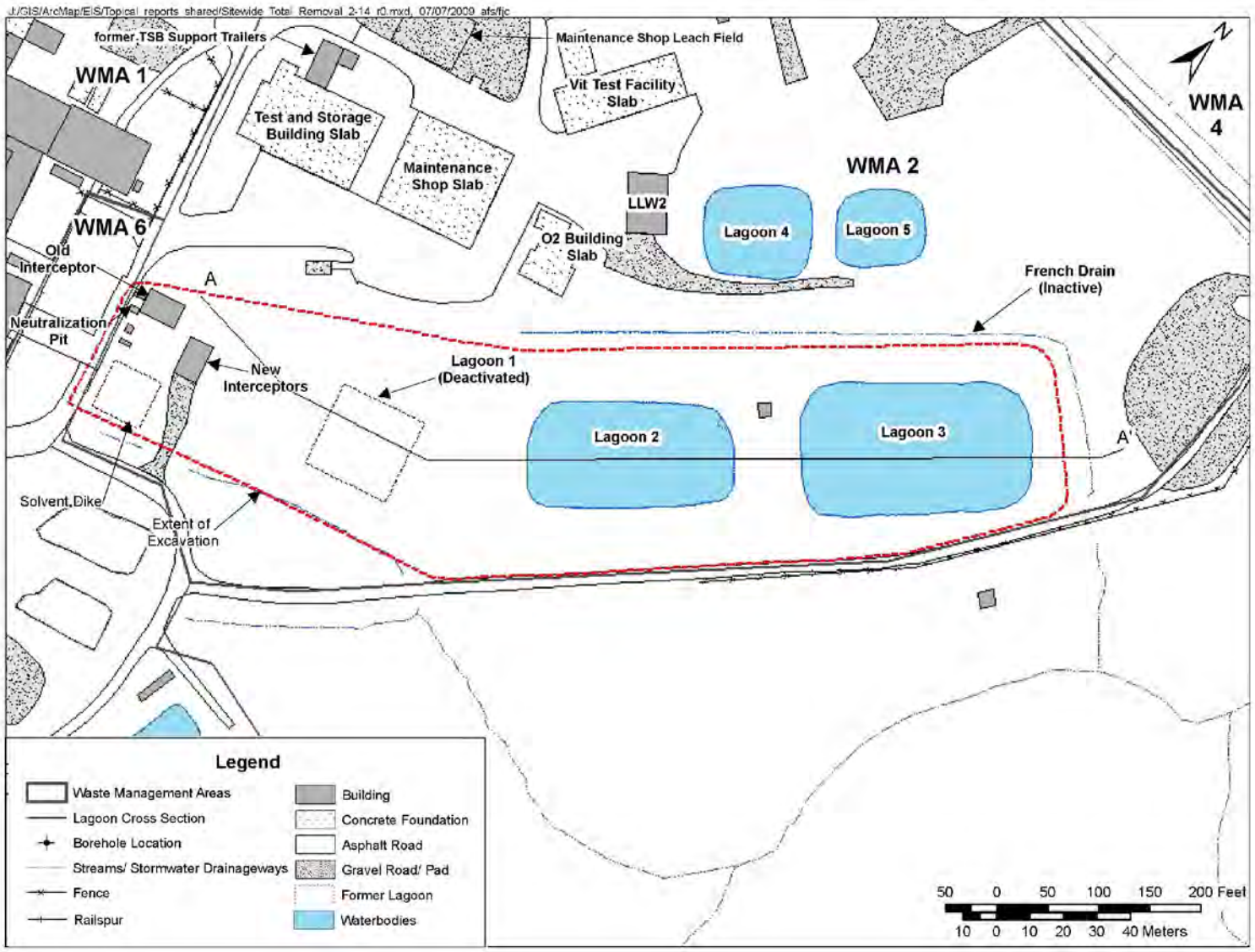


Figure 2-14. Lagoon Limits of Excavation

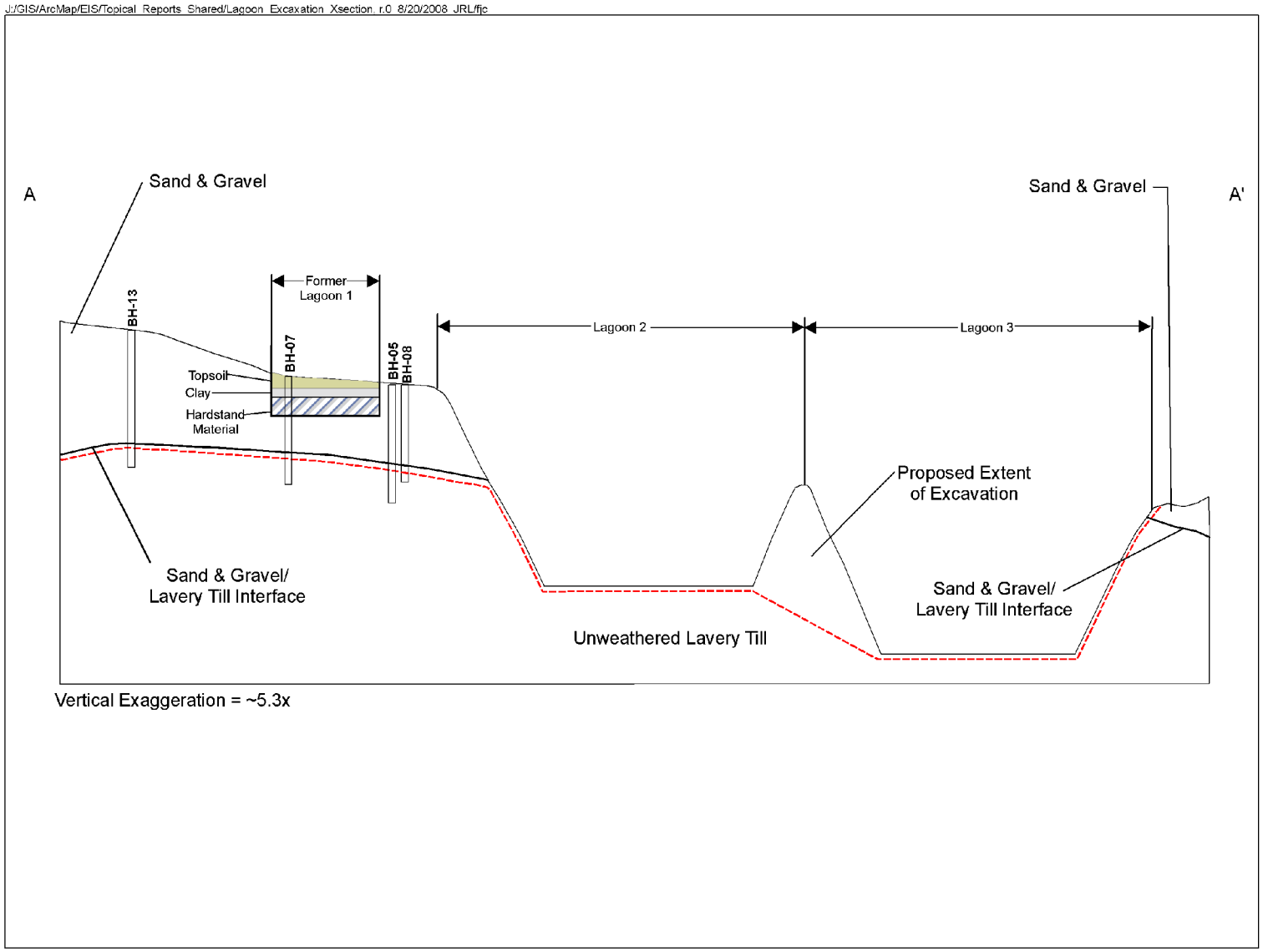


Figure 2-15. Lagoon Excavation Cross-Section

The upper layers of the Lagoon 1 cap are expected to be staged on site and reused as backfill. The lower layers of the cap are expected to be managed as LSA waste and the hardstand waste is assumed to be managed as Class A waste. Sand and gravel remaining in place from the original operations of the lagoon, down to the till surface, is expected to be managed as Class C waste.

Upon completion of the Lagoon 1 removal (and demolition of the enclosure, refer to Section 2.2.4), all of the miscellaneous facilities and structures in the vicinity and upgradient of Lagoon 1 would have been removed, and a larger excavation would be performed. This area extends from the location of the interceptors to Lagoon 2 and is approximately 64,000 ft^2 in size. Soils would be excavated down to about 14 feet and managed as LSA waste. This excavation is also expected to include removal and disposal of any remaining underground wastewater pipelines in the vicinity of Lagoons 1 and 2, and between Lagoon 1 and the interceptors.

This excavation would encompass the Solvent Dike, Old Interceptor, New Interceptor, and Neutralization Pit excavations. A MARSSIM Final Status Survey would be performed in the completed excavation area. In addition, arrangements would be made for an independent verification survey. After the surveys have been completed and any necessary confirmatory sampling of constituents of concern has been performed, the area would be backfilled with appropriate backfill material and contoured to the approximate natural grade. When used in this report, “appropriate backfill material” is defined as earth materials (unimpaired by chemical or radiological contamination) used to refill an excavated area in conformance with applicable engineering specifications.

Lagoon 2

The Lagoon 2 remediation would consist of removal and disposal of the pump shed and ancillary piping and equipment, and removal of the contaminated sediment from the lagoon surface.

Equipment and piping would be removed from the pump shed and the shed would be demolished. Buried piping and conduit would be removed using appropriate radiological controls, and the resulting equipment, pipe, and building debris would be managed as LSA waste. The stairways would be removed, cut into manageable sizes, and managed as LSA waste.

Using appropriate radiological controls and conventional excavation methods, contaminated lagoon sediment would be removed. As with Lagoon 1, the extent of excavation would be controlled using support surveys considering the DCGLs as action levels. The analysis in this report has been performed under the assumption that the excavation will extend approximately one foot into the Lavery till. It is expected that a four foot thick layer of material (sediment mixed with till) would be removed. It is assumed that the sediment-till mixture would be solidified using cement additives, and the resulting mixture is assumed to be managed as Class A waste. The actual extent of the excavation into the top of the Lavery till may vary from this estimate.

After completion of this work, a final status survey would be performed in the excavated area, and arrangements made for an independent verification survey. After the surveys have been completed and any necessary confirmatory sampling of constituents of concern has been performed, the excavation would be backfilled with appropriate backfill material and the surface restored.

Lagoon 3

The remediation of Lagoon 3 would be identical to the Lagoon 2 process. Additionally, the stainless-steel liner would be removed from the discharge weir and managed together with the solidified sediments, as Class A waste.

Using appropriate radiological controls, contaminated lagoon sediment would be removed and solidified. The DCGLs would be used to determine the extent of contaminated sediment and soil removal. It is again expected that the upper one foot of the underlying Lavery till would be excavated in addition to the contaminated sediment (estimated to be approximately two feet in total depth). The sediment-till mixture would again be solidified using cement additives and the mixture is assumed to be managed as Class A waste. The actual extent of the excavation into the top of the Lavery till may vary from this estimate.

After completion of this work, a MARSSIM Final Status Survey would be performed in the excavated area, and arrangements made for an independent verification survey. After the surveys have been completed, the excavation would be backfilled with appropriate backfill material and the surface restored.

Lagoons 4 and 5

The remediation of Lagoons 4 and 5 would consist mainly of removal and solidification of the remaining sediment and removal of the underlying liners. If deemed necessary based on support surveys, radioactive contamination beneath the liners would be removed to a maximum depth of two feet. For estimating purposes, it is assumed that approximately one foot of underlying soil is contaminated above the DCGLs. The solidified sediment, soil, and liner would be managed as Class A waste.

After completion of this work, a MARSSIM Final Status Survey would be performed in the area, and arrangements made for an independent verification survey. After the surveys have been completed and any necessary confirmatory sampling of constituents of concern have been performed, the excavation would be backfilled with appropriate backfill material and the surface restored.

2.2.4 Remediation Completion and Closeout

The Lagoon 1 enclosure would be demolished upon completion of the Lagoon 1 waste removals. The structure is assumed to have become slightly contaminated during the Lagoon 1 work, and would therefore be sprayed with fixative to allow the demolition to be accomplished using standard demolition equipment. The demolition debris, including the building superstructure, the ventilation system and equipment, and other internal equipment associated with the structure would be managed as LSA waste.

2.2.5 Mitigative Measures

Several mitigative measures would be employed during the WMA 2 remediation intended to mitigate or eliminate human and ecological exposure to the chemicals and radionuclides of concern. The mitigative measures employed in the form of engineering controls would consist of:

- Construction of the Lagoon 1 enclosure to provide containment of airborne contaminants during the Lagoon 1 remediation; and
- Removal of related facilities, such as the Solvent Dike, Interceptors, and Neutralization Pit, prior to performing the bulk excavation in the Lagoon 1 vicinity. This phased approach provides added safety against unexpected exposures to buried contaminants.

In addition, several mitigative measures would be incorporated into the works in the form of administrative controls, such as:

- Implementation of safety procedures including consideration of ALARA as the radiation goal for all remedial work;
- Dust suppression measures would be employed during concrete and steel demolition tasks and waste excavation and transportation activities, mitigating dust generation associated with this work;
- Silt fencing would be installed, as necessary, prior to ground disturbance to limit impacts to potential streams and waterways;
- Spray fixatives would be employed, as necessary, to limit the airborne dispersal of radiological constituents during process equipment and demolition; and
- Screening and surveying the work in progress in order to be certain that exposures are mitigated and the DCGLs are met prior to completing remediation.

2.3 WMA 3: Waste Tank Farm Area

The location of the Waste Tank Farm Area is shown on Figure 2-16.

A Tank and Vault Drying System will be installed before the starting point of this EIS to dry the residual liquids present in the waste tanks. Equipment for the system will include a dehumidifier and heater for air forced into the vaults. The exhaust air leaving the vaults will pass through HEPA filters. An additional enhancement to reduce corrosion inside the tanks would be to reconfigure the Tank and Vault Drying System to dry both inside the vaults and inside the tanks.

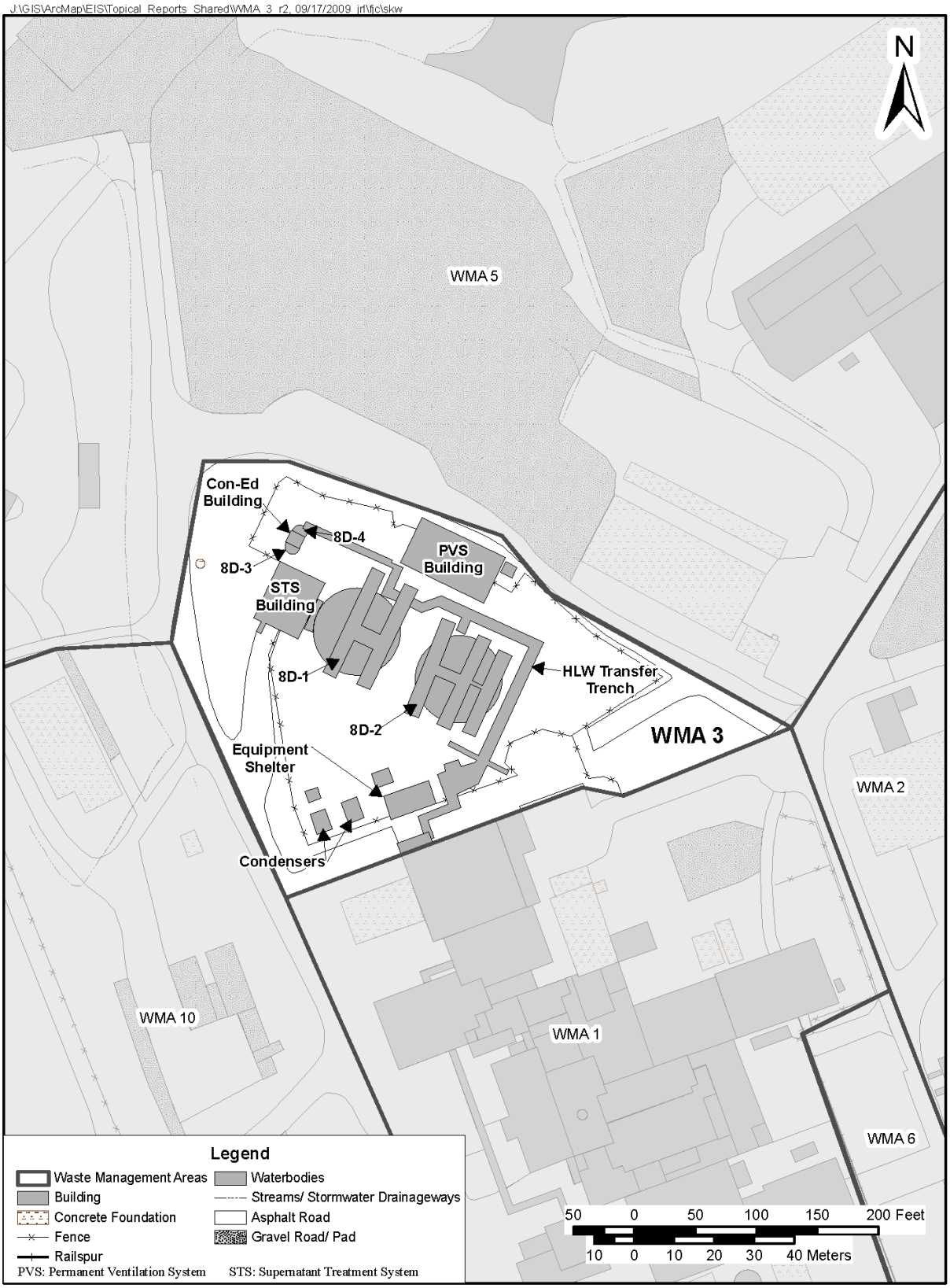


Figure 2-16. WMA 3 - Waste Tank Farm Area

2.3.1 Remediation Support Activities

The primary remediation support facility to be constructed at the Waste Tank Farm in preparation for the WMA 3 Remediation is the Waste Tank Farm Waste Processing Facility (WTFWPF). The WTFWPF is designed for the specific purpose of supporting the dismantlement of the Waste Tank Farm under confined conditions. Figure 2-17 illustrates the location and footprint of the proposed WTFWPF. Prior to construction of the WTFWPF, several existing facilities would be removed as described in the following paragraphs.

Demolition of the Con-Ed Building

The Con-Ed Building is a concrete block building located on top of the concrete vault containing Tanks 8D-3 and 8D-4. This building, which is 10 feet wide, 13 feet long, and 11 feet high, houses the instrumentation and valves used to monitor and control the operations of Tanks 8D-3 and 8D-4. The Con-Ed Building is radiologically contaminated. The majority of the contamination is believed to be contained within the piping and equipment inside the building. A fixative would be applied to the exterior of all piping and equipment to lock down contamination, before the piping and equipment are removed. The building structure and underlying concrete floor would be demolished. Waste classification assumptions for the Con-Ed Building were made based on the concept that parts of the building could be considered clean while other parts of the building and equipment might be considered contaminated. Similar to the Equipment Shelter and Condensers, a general assumption was applied to the building as a whole, and a separate assumption was applied to the removable equipment. In the case of the Con-Ed Building, it was assumed that the removable equipment would be managed as Class B waste, but the building structure demolition debris would be managed as CDD waste.

Demolition of the Equipment Shelter and Condensers

The WTF Equipment Shelter is a concrete building that is 40 feet long, by 18 feet wide by 12 feet tall. The Shelter sits on a one-foot-thick concrete pad. There is a nine-foot by seven-foot by five-foot-high addition that is attached to the shelter. This addition sits on a two-foot-thick concrete pad. The shelter housed the WTF Ventilation System that was formerly used to ventilate the four HLW Storage Tanks. Waste classification assumptions for the Equipment Shelter and Condensers were made based on the concept that parts of the building could be considered clean while other parts of the building might be considered contaminated. In the case of the miscellaneous structures such as the Equipment Shelter and Condensers, a general assumption was applied to the building as a whole, and in some cases, a separate assumption was applied to the separable equipment. In the case of the Equipment Shelter, it was assumed that the removable equipment would be managed as Class A waste, but the building structure and the condensers would be managed as CDD waste.

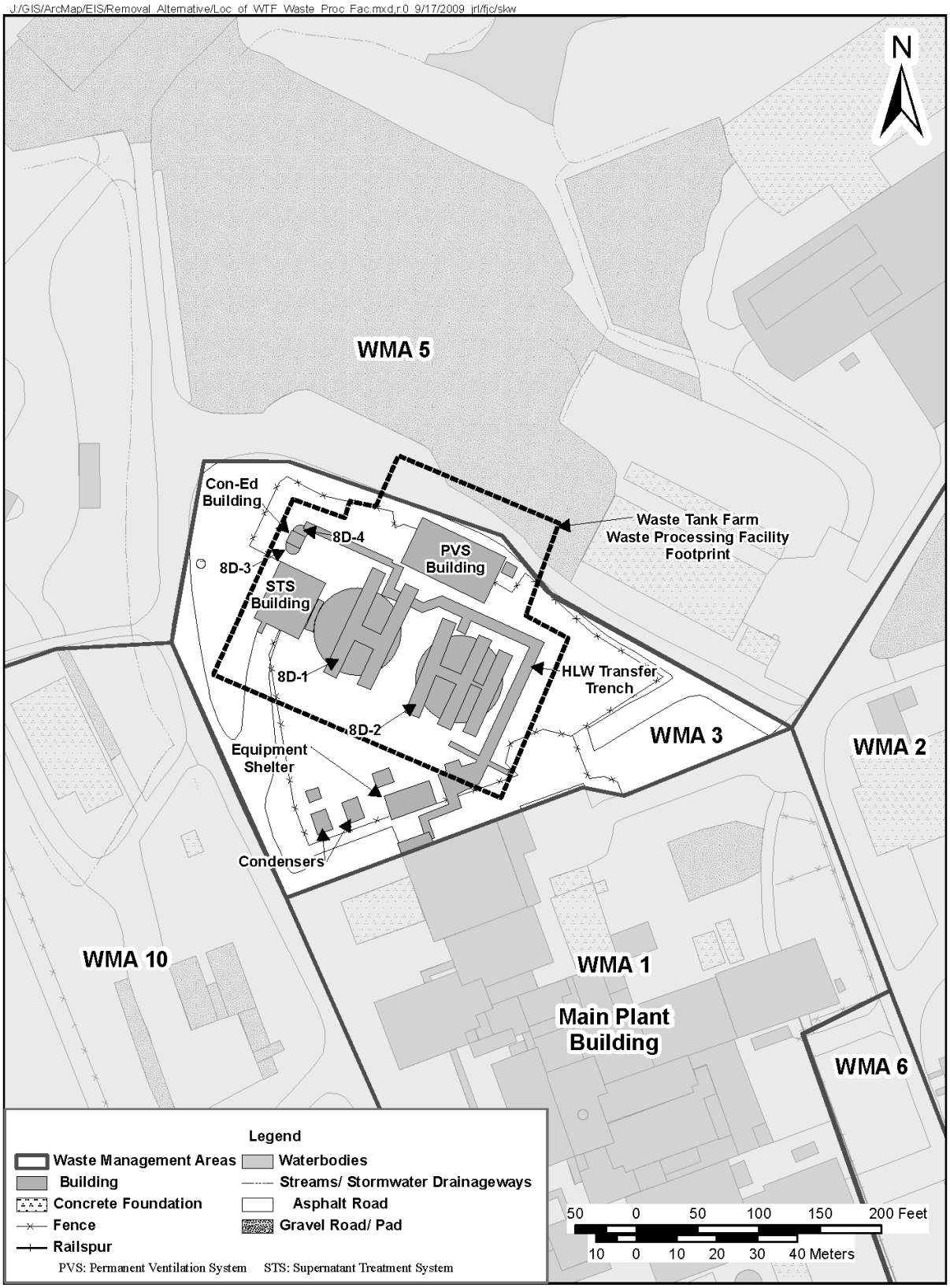


Figure 2-17. Location of the WTF Waste Processing Facility Within the WVDP

Demolition of the High-Level Waste Transfer Trench

The HLW Transfer Trench is approximately 500 feet long and varies from six feet to 20 feet wide. The trench height ranges from six to nine feet. The walls are made of 18- to 24-inch-thick reinforced concrete and the roof is two-foot-thick pre-cast concrete. The floor slab is one foot thick. The trench would be demolished through the use of pneumatic hammers and a front-end loader. Since the process piping in the trench was double-walled and equipped with a leak-detection system, the trench is not expected to be radiologically contaminated. The concrete demolition debris would be managed as CDD waste.

Removal of the High-Level Waste Transfer and Mobilization Pumps

There are five high-level radioactive waste mobilization pumps in Tank 8D-1 and four mobilization pumps in Tank 8D-2. These centrifugal mixer pumps are approximately eight feet long and are supported by a 10-inch-diameter stainless-steel pipe column that is 50 feet in length.

Tanks 8D-1, 8D-2, 8D-3, and 8D-4 also each contain an HLW transfer pump. These pumps are centrifugal multi-stage turbine type pumps that are supported by a 14-inch-diameter pipe column. The HLW transfer pumps in 8D-1 and 8D-2 are estimated to have an overall length of approximately 50 feet. The HLW pumps in 8D-3 and 8D-4 are estimated to have an overall length of approximately 20 feet. The mobilization pumps and the transfer pumps are driven by 150-horsepower electric motors.

Tanks 8D-1 and 8D-2 also contain an STS suction pump. These pumps are assumed to be of the same dimensions as the transfer pumps. These pumps are radiologically contaminated, so each pump would have to be removed under appropriate radiological controls. Previous pump removals employed the use of sleeving around the pumps and associated piping and a localized washing system. A similar process is planned for the dismantlement of the High-Level Waste Transfer and Mobilization pumps. The pumps would be cut into sections during removal and packaged for disposal. For estimating purposes, the pumps are assumed to be classified as follows:

- seven pumps from Tank 8D-1 (5 mobilization pumps, 1 transfer pump, 1 STS suction pump) are assumed to be managed as Class C waste;
- six pumps from Tank 8D-2 (4 mobilization pumps, 1 transfer pump, 1 STS suction pump) are assumed to be managed as TRU waste;
- one transfer pump from Tank 8D-3 is assumed to be managed as Class B waste; and
- one transfer pump from Tank 8D-4 is assumed to be managed as TRU waste.

Removal of Supernatant Treatment System Equipment (8D-1)

The Supernatant Treatment System (STS) was installed to support the solidification of the high-level liquid wastes in Tanks 8D-2 and 8D-4. The primary components of the STS were installed in and adjacent to Tank 8D-1. The ancillary equipment in the STS support building provided water for processing

and flushing, coolant for cooling, and allows for the addition of fresh zeolite. These ancillary systems are decommissioned under the STS Building demolition.

The STS was a zeolite molecular sieve system designed to strip cesium, the principle radioactive species, from the PUREX/THOREX supernatant and sludge-wash solutions and from return high-activity wastewaters from the Liquid Waste Treatment System (LWTS). It also removed lesser quantities of strontium and plutonium. The STS equipment installed in Tank 8D-1 comprises:

- STS prefilter (50-F-001);
- Supernatant feed tank (50-D-001);
- Supernatant cooler (50-E-001);
- Four zeolite columns (50-C-001 through 50-C-004);
- STS sand filter (50-F-002);
- Sluice lift tank (50-D-004); and
- Associated transfer piping.

Removal of these pieces of equipment would be performed from within the WTFWPF under confined conditions. The process would be similar to that used for the HLW pump removals. All of the STS equipment (not including the ancillary equipment) is assumed to be managed as TRU waste, for analysis.

Demolition of the High-Level Waste Pump Support Structures

The pump support structures would be removed in conjunction with pump removal. The support structures are not expected to be radiologically contaminated, so no containment would be needed and the structures would be cut into sections and disposed of as CDD.

Demolition of the Permanent Ventilation System Building

The PVS Building is assumed to be in operation at the start of decommissioning work. The equipment inside the building would have to be removed, packaged, and disposed of. The building would be demolished through the use of a front-end loader. Waste classification assumptions for the PVS Building were made based on the concept that parts of the building could be considered clean while other parts of the building might be considered contaminated (i.e., Filter Room, Filters, and all equipment and piping on the contaminated side of the filters). Similar to the Equipment Shelter, a general assumption was applied to the building as a whole and a separate assumption was applied to the removable equipment. In the case of the PVS Building, it was assumed that the demolition debris would be managed as LSA waste and the separable equipment, including the filter media, would be managed as Class A waste.

Construction WTFWPF

Based on recent estimates of radionuclide activities, removal of the HLW Tanks would require a shielded confinement structure to keep worker dose within DOE limits defined in 10 CFR 835.202 and in conformance with As Low As Reasonably Achievable (ALARA) protocols. The conceptual design presented in

this report represents a comprehensive stand-alone facility. In addition to tank hardware waste retrieval, it also provides for: remote processing of the tank residuals, remote-handling and size reduction of the tank structures, in facility characterization/classification of wastes, and waste packaging and shipping. Figures 2-18 and 2-19 illustrate the proposed floor plan/layout and an isometric view of the WTFWPF. This facility would also provide warehouse, office, Radiation Control and utility support areas.

Due to the shielding concerns, a structure was deemed necessary for tank removals, and the remote work performed during dismantling and size reducing the tanks could therefore, not be managed using any existing facility. Consideration was given to using an existing facility like the Remote-Handled Waste Facility for the packaging portion of the Waste Tank Farm mission. However, performing the entire mission, including packaging, at the tank site is considered to be more efficient and safer than separate facilities for tank removal and waste packaging.

Guidance for the design of facilities used to process radioactive materials is provided in DOE Standard 1021-93, *Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components.* Based on the form and amount of radioactive material to be processed in the WTFWPF and on the likely consequences to workers and members of the public in the event of an accident in the facility, it is expected that the WTFWPF would be categorized as a Performance Category 2 facility using the guidance in Standard 1021-93. In general, Performance Category 2 facilities are designed to conform to the requirements of the International Building Code. However, certain elements of facility design may be enhanced to provide a greater degree of hazard protection.

The WTFWPF would be a freestanding reinforced concrete and steel structure enclosed within an exterior sheet metal weather structure providing approximately 40,000 ft^2 of confinement over Tanks 8D-1, 8D-2, 8D-3, and 8D-4 and their associated structures. The WTFWPF also includes 12,000 ft^2 of office/project support space and a 33,000-ft^2 loading and transport wing. The maximum overall dimensions would be approximately 340 feet in length by 275 feet in width. The facility would be 87 feet high at its roof peak. The facility would be constructed primarily of cast-in-place reinforced concrete up to 5 feet in thickness for radiological shielding purposes and would be supported by a foundation on H-piles driven to a depth of approximately 50 feet belowground.

Pressure differentials would be maintained between each confinement zone so that airflow travels from zones of lesser contamination potential to zones of greater contamination potential. The WTFWPF ventilation system would ensure positive confinement of airborne radioactive material.

The air from all spaces would be filtered using a minimum of two fire-resistant HEPA filters in series before discharge to the environment. Redundant exhaust blower capability would be provided, and additional HEPA filter train(s) would be provided to allow for the maintenance and testing of a given HEPA filter train. The WTFWPF would be equipped with diesel generators housed in the warehouse to provide emergency standby electrical power to the appropriate motor control center(s) to ensure that power to WTFWPF ventilation system components could be provided in the event of a loss of off-site power.

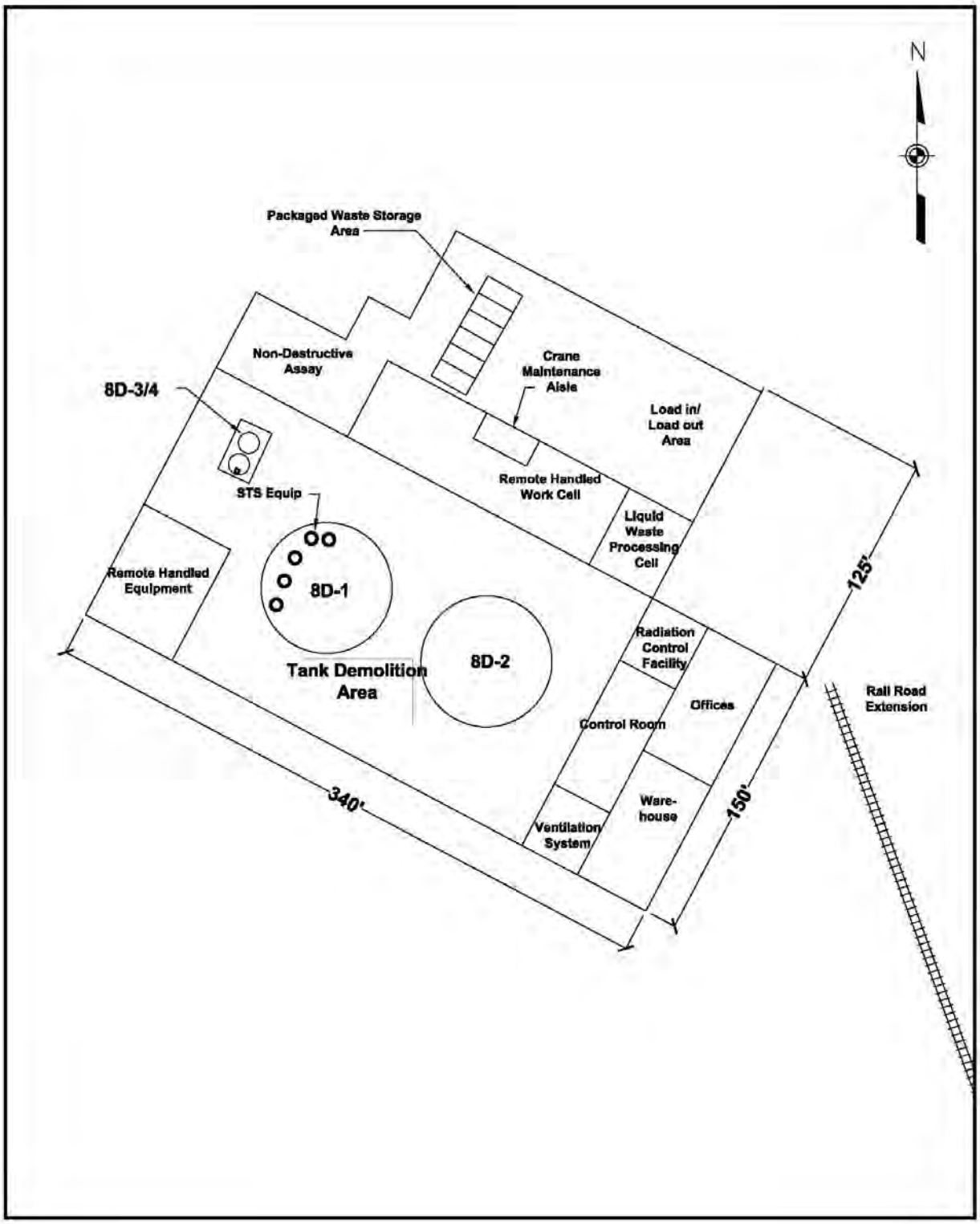


Figure 2-18. Waste Tank Farm Waste Processing Facility Layout

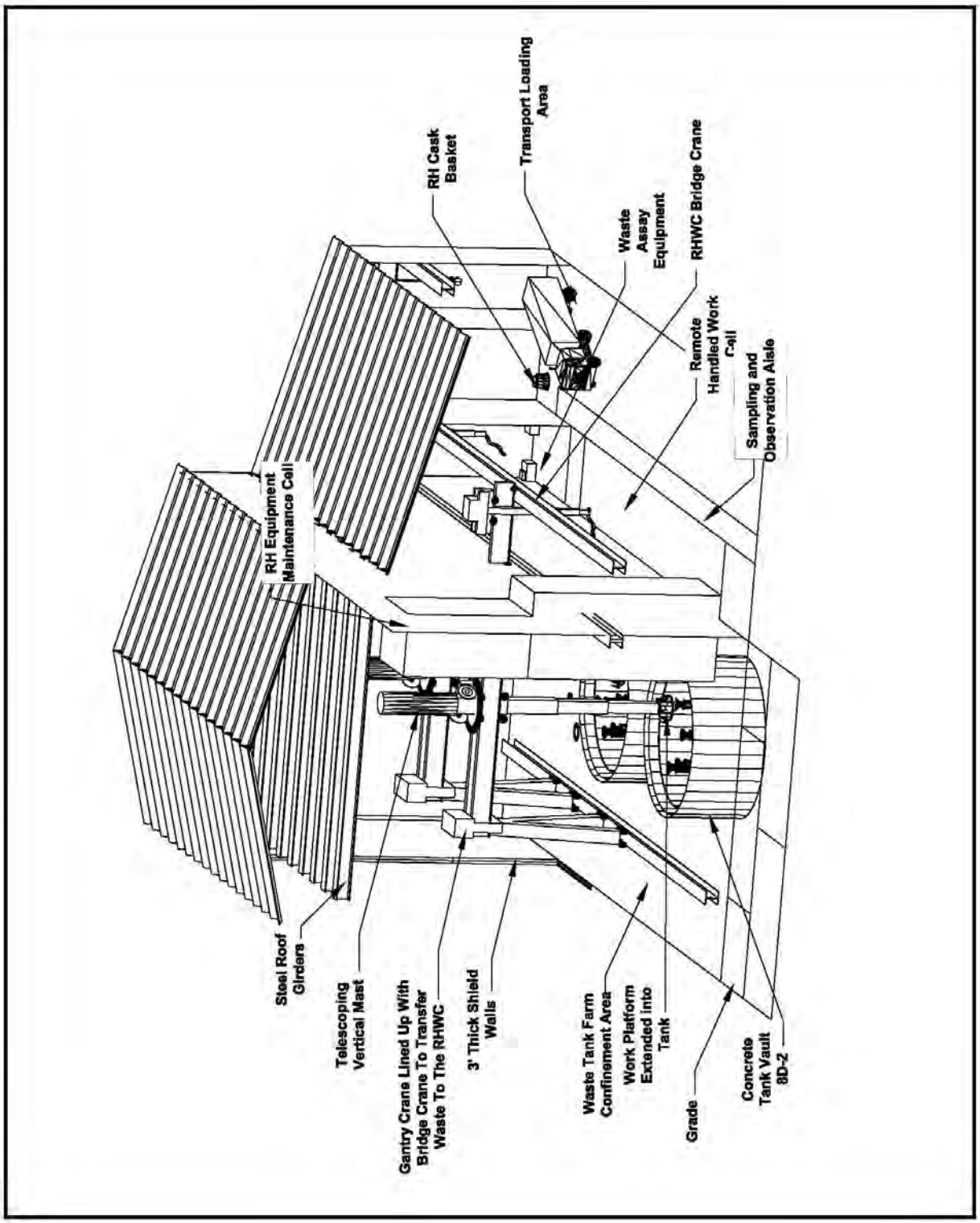


Figure 2-19. Waste Tank Farm Waste Processing Facility Isometric View

Due to the anticipated high levels of radiation and contamination, remote handling equipment would be purchased and installed. This equipment consists of gantry cranes, bridge cranes, telescoping mast, remote work cell platforms, and robotic arms with cutting torches, saws, and grapples. A closed-circuit video system would also be installed. For waste characterization purposes, Radioactive Waste Assay equipment would be purchased. Figure 2-20 shows the process flow diagram for the WTFWPF.

Liquid Waste Processing Cell (LWPC) equipment would be purchased and installed next to the confinement area, Figure 2-21. The purpose of this equipment would be to mobilize and remove the mobile zeolite fraction of the Tank 8D-1 contents. The removed contents would then be mixed with a grout for solidification. The solidified waste would be packaged in 55-gallon drums and managed as TRU waste.

2.3.2 Decontamination and Demolition of the Supernatant Treatment System Building and Associated Equipment

The Supernatant Treatment System (STS) Support Building is a two-story structure that contains equipment and support systems needed to operate the STS. The upper level is approximately 22 feet high, made up of a steel frame covered with steel siding. The lower level of the STS Support Building is approximately 15 feet high. This lower level was constructed with reinforced concrete floors and ceiling. This building, with the exception of the Valve Aisle, is radiologically clean. All non-contaminated equipment and building materials located outside of the Valve Aisle would be managed as CDD waste.

Following CDD removal, spray fixative would be applied to the interior surface areas of the Valve Aisle. The steel shield walls and roof of the Valve Aisle would be removed remotely using the telescoping mast equipped with cutting, grappling, and lifting end-effectors. The concrete floor of the Valve Aisle would be demolished using the remotely operated demolition hammer. All demolition debris would be managed as LSA waste.

2.3.3 Decontamination and Demolition of Tanks 8D-1, 8D-2, and Associated Vaults

The approximately eight-foot-thick soil overburden would be excavated using both manned and remote excavation equipment. The excavated soil would be managed as LSA waste. Once the soil has been removed, the STS equipment in Tank 8D-1 would be removed, processed and packaged for disposal. Figure 2-22 illustrates the general arrangement of the STS equipment in 8D-1. It is assumed that the processed STS equipment would be managed as TRU waste.

Residual ion-exchange and filter media would be packaged in waste containers for disposal.

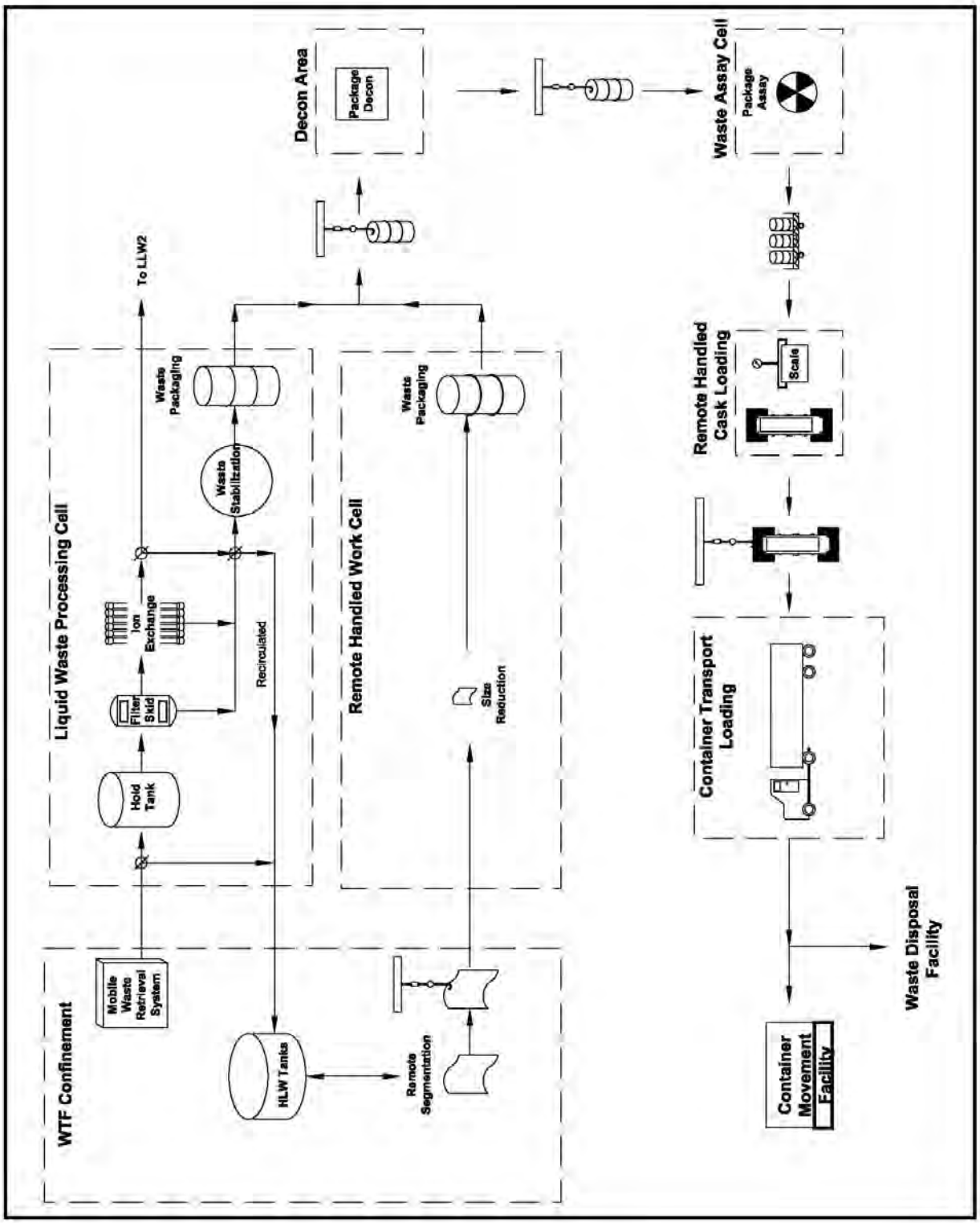


Figure 2-20. WTF Waste Process Facility Process Flow Diagram

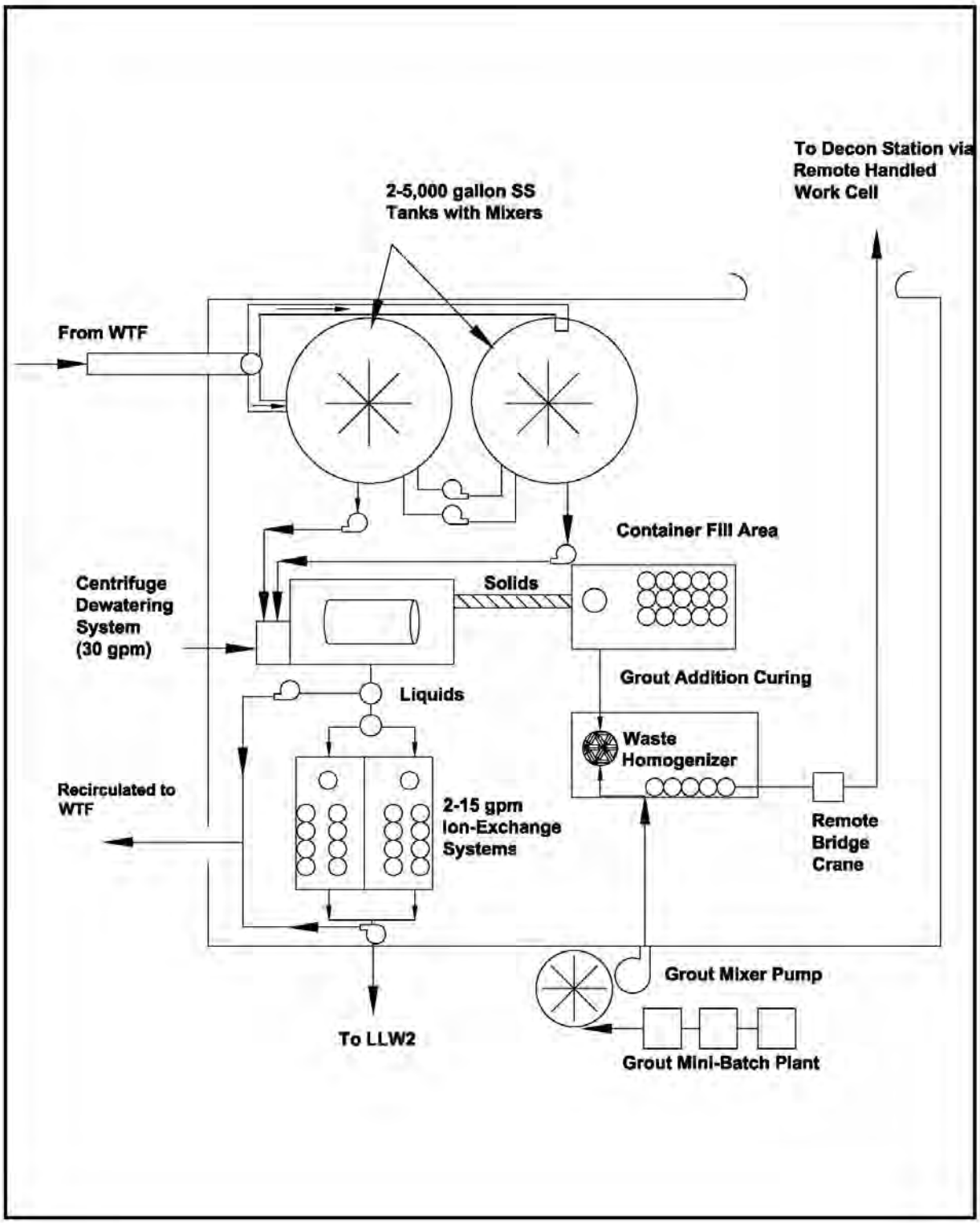


Figure 2-21. Liquid Waste Process Cell

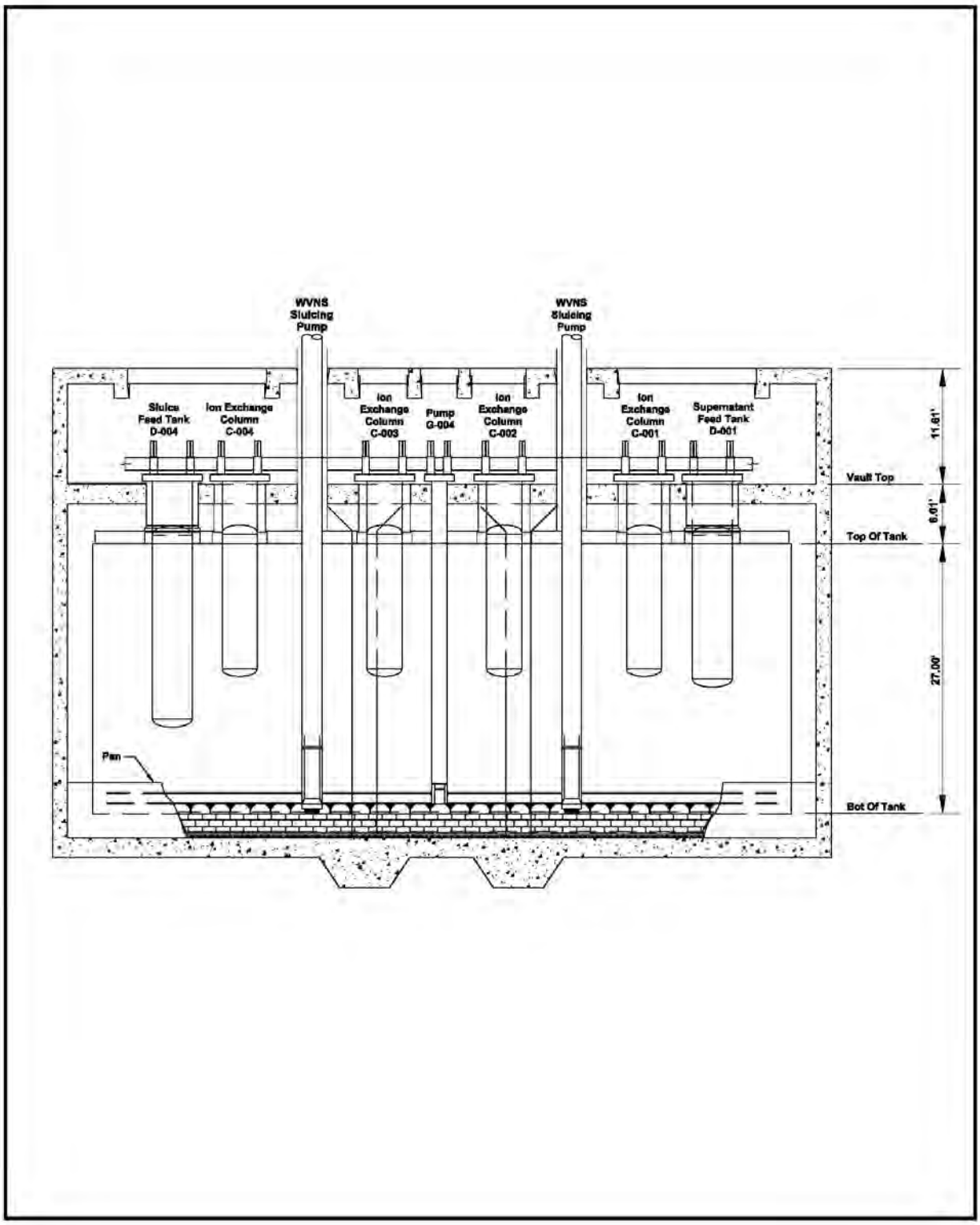


Figure 2-22. General Arrangement of the STS Equipment in 8D-1

The four ion-exchange columns contain radiologically contaminated zeolite. The zeolite would be flushed through the column J-nozzles to the Liquid Waste Processing Cell, for processing and mixed with grout for solidification. The zeolite/grout mixture would be placed into 55-gallon drums for curing. Once cured, the drums would be transferred to the decontamination station in the Remote-Handled Work Cell. For purposes of this estimate, it is assumed that this waste would be managed as TRU waste.

Removal of Residual Waste from Tank 8D-1

Once the STS equipment and mobile waste have been removed from Tanks 8D-1 and 8D-2, the tops of the tanks would be segmented with a telescoping mast system and dual arm work platform equipped with torch cutting end effectors.

The residual mobile radionuclide inventory in Tanks 8D-1 would be removed using a Waste Dislodging and Conveyance System (WDCS). The WDCS has several components including a Waste Dislodging End Effector (WDEE) to dislodge and mobilize tank residuals, a Waste Conveyance System (WCS) of pumps and piping to transfer mobilized residuals from the tank, a Deployment System (DS) to access the tank interior, and associated instruments and controls to control the WDCS components.

The WCS is designed to function as a pipeline to transfer the dislodged waste from the tank to the LWPC. A high-pressure water jet pump mounted on the WCS is capable of producing sufficient suction lift to transfer residual waste from Tanks 8D-1. Piping and high-pressure transfer pumps located at grade in the Waste Tank Farm Confinement Area (WTFCA) would be used to convey the residuals from the tanks to the LWPC for processing.

Once the STS equipment and mobile waste have been removed from the tanks, the tanks will be segmented with the WTFCA telescoping mast system and dual arm work platform equipped with torch cutting tools. The residual radionuclide inventory associated with the tank shells of 8D-1, 8D-2, and 8D-4 will require this waste to be packaged in 55-gallon drums. This will require initial segmentation within the tanks followed by additional size reduction in the RHWC to allow placement within the 55-gallon drums. After initial cutting the tank segments will be transferred to the RHWC using the hoist and trolley system.

The tank walls, supporting columns, horizontal gridwork, and the floor of the tank would be segmented and processed in a similar manner to the top of the tanks described above. The tank segments would be transferred to the RHWC for size reduction and packaging using the two telescoping work arm platforms equipped with grappling equipment, torch, and saw tools to segment and package the waste. The waste packages would be decontaminated in the Waste Packaging Decontamination Area (WPDA) and then characterized for waste disposal in the Waste Assay Cell (Figure 2-20). The waste class of the tank segments would range from Class A to TRU waste, depending upon the tank and its location within the tank. The majority of the waste generated is assumed to be Class C LLW or TRU waste. The waste packages would be transferred to the Remote-Handled Cask Loading Cell (RHCLC) for loading into shipping casks followed by transfer to the TLA where the casks would be loaded onto trailers for shipment.

2.3.4 Decontamination and Demolition of Tanks 8D-3, 8D-4, and Associated Vault

The soil overlying the vault would be removed using the WTFCA telescoping mast system with appropriate tools. The soil would be packaged and disposed of as LSA waste. The WTFCA telescoping mast system would then be used to demolish the valve pit, pump pit, and the 2-foot-thick vault roof using demolition hammers or similar types of equipment. The debris would be packaged and disposed of as LSA waste. The top of tanks 8D-3 and 8D-4 would be removed using the WTFCA telescoping mast system with a work arm equipped with a torch cutting tool. The tank tops would be transferred into the RHWC for additional segmentation as necessary for packaging.

The cooling coils contained in Tanks 8D-3 and 8D-4 would then be removed using grapples and/or mechanical shear tools, as required. The tank shells would be segmented with the telescoping vertical mast and dual work arm platform equipped with torch and shear cutting tools. The tank segments would be transferred into the Remote-Handled Work Cell for additional size reduction and packaging. Tank 8D-3 is assumed to be Class B low-level radioactive waste based on its current estimated radionuclide inventory. Tank 8D-4 is assumed to be managed as TRU waste based on its current estimated radionuclide inventory.

2.3.5 Demolition of the Tank Vaults of Tanks 8D-1, 8D-2, 8D-3, and 8D-4

After Tanks 8D-1, 8D-2, 8D-3, and 8D-4 have been removed, radiological surveys would evaluate dose rates and levels of contamination remaining in the vaults. Depending upon the results, it may be possible to demolish the vaults with manned demolition equipment.

The perlite blocks and gravel underlying Tanks 8D-1 and 8D-2 are assumed to be removed with manned equipment, such as long reach hydraulic excavators, packaged, and managed as LSA waste. The telescoping arm and dual work arm platform equipped with torch cutting tools would be used to segment the pans in the vaults in Tanks 8D-1 and 8D-2. The pan segments would be transferred to the Remote-Handled Work Cell for additional size reduction and packaging. The tank pans are expected to be managed as Class A waste.

Sheet piling would be driven around the tank vaults to stabilize the surrounding soil before the tank vaults are removed. The tank vaults would be demolished with either manned hydraulic excavators or remotely with the telescoping arm and dual work arm platform equipped with demolition hammer tools. The vault debris would be managed as LSA waste. The soil beneath the vaults would be surveyed, and any contaminated soil exceeding the established DCGLs or other applicable criteria would be removed, and managed in an appropriate manner, as warranted.

2.3.6 Remediation Completion and Closeout Activities

Portions of the Waste Tank Farm Waste Processing Facility and its associated equipment would have become contaminated supporting the closure of the Waste Tank Farm Area. The interior of the Waste Tank Farm Waste Processing Facility would be surveyed to assess contamination levels associated with the building surfaces and equipment. A spray fixative would be applied to the external

surfaces of equipment and the internal surfaces of the walls and ceiling of the Waste Tank Farm Waste Processing Facility. Used equipment and stainless-steel liners would be dismantled, segmented, packaged, and managed as LSA waste.

The Waste Tank Farm Waste Processing Facility would be demolished after the post-excavation survey has been completed, regulatory approval has been obtained, and the excavation is backfilled with appropriate backfill material. The enclosure would be demolished by conventional demolition equipment, such as hydraulic excavators equipped with demolition hammers and shears. The demolition debris would be managed as LSA waste.

Once the facility has been removed, any contaminated soil generated during demolition would be managed as LSA waste. A MARSSIM Final Status Survey would be performed in the area impacted by demolition of the enclosure to establish that residual radioactivity levels do not exceed the established DCGLs.

Once regulatory approval is obtained, additional clean soil backfill would be placed and the area graded to restore the approximate natural grade.

2.3.7 Mitigative Measures

Most of the remediation work projected in this estimate for WMA 3 occurs inside the Waste Tank Farm Processing Facility, which also serves as an environmental enclosure. This use of this facility helps to mitigate many of the potential environmental impacts associated with remediation work, such as sedimentation, air, and noise control. The facility would be constructed with a filtered ventilation system and storm water runoff drainage collection devices. A bed of drainage gravel would extend around the facility perimeter, to reduce the effects of storm water runoff erosion and resulting sedimentation transport.

The Waste Tank Farm Processing Facility also includes internal capabilities for liquid waste and leachate handling and treatment. Aqueous emissions from the Waste Tank Farm Processing Facility would undergo treatment to provide significant reduction in contaminant concentration. Sediment control and dust suppression would be employed to reduce the amount of dust that could be airborne or carried off by storm water runoff. Equipment needed to support construction and demolition activities would be equipped with mufflers.

2.4 WMA 4: Construction and Demolition Debris Landfill

The Construction and Demolition Debris Landfill (CDDL) covers an approximate 1.5-acre area to the northeast of the Main Plant Process Building, Figure 2-23. CDDL disposal activities were restricted to construction and demolition debris. However, the CDDL is in the flow path of the North Plateau Groundwater Plume, and groundwater impacted by strontium-90 is assumed to have come in contact with the CDDL buried waste. For estimating purposes, the CDDL soil cover is assumed to be managed as LSA waste.

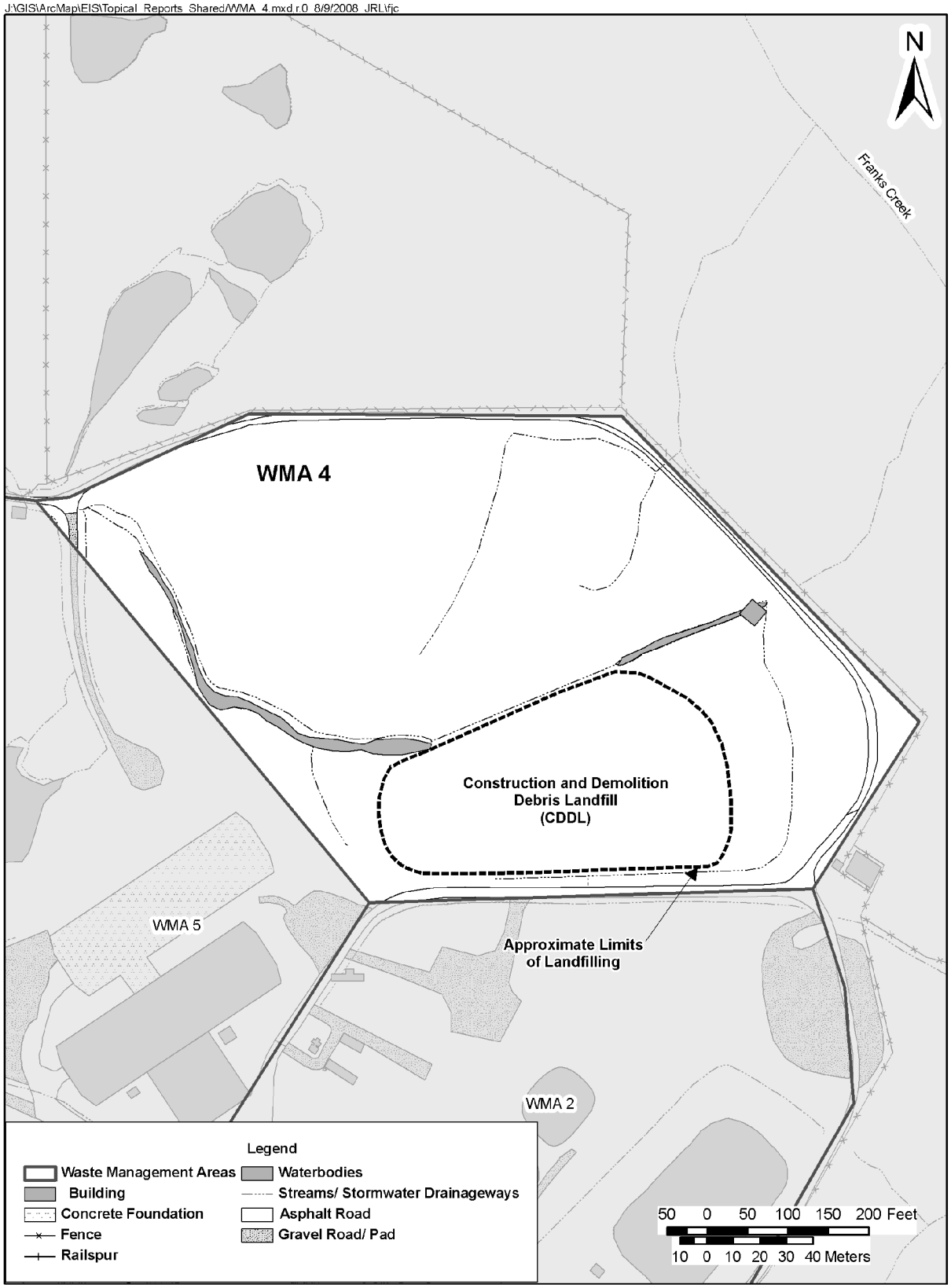


Figure 2-23. WMA 4 - Construction and Demolition Debris Landfill

2.4.1 Remediation Support Activities

Support for the CDDL remediation is provided by the Soil Drying Facility (SDF). The SDF process equipment would consist of a feed bin, a conveyor, a rotary dryer, a soil cooler, a radial soil stacker, off-gas bag house, HEPA filters, thermal oxidizer and stack and is discussed further in Section 2.13.1 of this report. Other support elements for the CDDL remediation would involve characterization sampling and surveying of soil, as necessary, to confirm the boundaries of contamination.

2.4.2 Removal of Wastes from CDDL

The CDDL soil cover and wastes would be removed with hydraulic excavation equipment using appropriate PPE and engineering controls. Excavation activities would include removal of approximately 1.5 feet of subgrade soil underlying the CDD waste. This depth of over-excavation at the CDDL was selected mainly based on the waste materials being removed. In most cases, the expected over-excavation is approximately one foot (lagoons, for example). An over-excavation of one foot is considered implementable in cases where the waste being removed is a soil-like material, and where a definitive boundary between the waste and non-waste soil is expected. An over-excavation of up to two feet might be more realistic in areas where there is limited data on the lower limit of contamination or where the waste material and underlying soil are very similar in appearance. In contrast, the CDDL is expected to have a definitive boundary between waste and non-waste, and the waste material is expected to be very different from the underlying soil (suggesting that one foot of over-excavation would be sufficient). However, due to the expectation that some of the CDDL debris would be found commingled with underlying soil (assumed to be commingled in the first six inches of soil), an over-excavation of 1.5 feet was selected.

The soils, along with waste deemed to be non-RCRA hazardous, would be transported to the SDF for further processing. These materials would be managed as LSA waste. Since some volatile organic compounds (VOCs) have been detected in groundwater downgradient of the CDDL, there is a potential to uncover hazardous wastes in the CDDL. Waste that could contain elevated levels of hazardous constituents would be segregated, characterized, and packaged in B-25 boxes, to be managed as mixed waste.

2.4.3 Remediation Completion and Closeout Activities

Site restoration work would occur after the North Plateau Groundwater Plume has been excavated. After the waste and any apparent contamination have been removed from the CDDL, a MARSSIM final Status Survey would be performed to verify that residual radioactivity levels do not exceed the established DCGLs. Once regulatory approval has been obtained the area would be backfilled with clean soils and graded to restore the approximate natural grade.

2.4.4 Mitigative Measures

Due to the excavation removal activities and other work proposed for WMA 4, sediment control and dust-suppression measures would be employed to reduce

the amount of exposed soil that would be airborne or carried away in storm water runoff. Work in the contaminated areas would require the use of PPE and contamination controls, as well as the use of contamination reduction zones and buffer areas.

2.5 WMA 5: Waste Storage Area

2.5.1 Remediation Support Activities

The work planned for this WMA under the Sitewide Removal Alternative is relatively simple in terms of construction complexity. In general, all wastes that are expected to be generated during remediation would be classified as LSA waste or Construction and Demolition Debris. Therefore the work can be completed without confinement, using standard construction techniques. In addition, remediation support activities would be limited to implementation of the site Health and Safety procedures, sediment and erosion control procedures, and similar standard construction preparation activities.

2.5.2 Removal of Remote-Handled Waste Facility

The location of the Waste Storage Area is shown on Figure 2-24. The Remote-Handled Waste Facility (RHWF) would be closed, demobilized, decontaminated, and demolished as part of this alternative, Figure 2-25.

The equipment inside of the RHWF Work and Process Cells would be removed using a cutting torch along with the existing building crane and forklift. The stainless-steel liners on the floor and walls of the Work Cell would be removed and sectioned using a demolition hammer, shears, and cutting torches. The liner would be managed as LSA waste. The shielded door between the Work Cell and the Buffer Cell would also be sectioned and removed, as would the shielded door between the Buffer Cell and the Receiving Area. The shielding and shielded door debris would be managed as LSA waste. The 30-ton bridge crane that services the Work Cell would be removed using a cutting torch and a hydraulic crane. The crane would be removed in sections, segmented, and managed as LSA waste.

The facility would be decontaminated from areas of higher levels of contamination to areas of lower levels of contamination. Debris would be remotely removed from the Work and Buffer Cells. A spray fixative would be applied to the interior surfaces of the Work and Buffer Cells to lock-down any remaining contamination.

Following decontamination, radiological characterization surveys would be performed to assess the levels and extent of contamination on the remaining building materials. The survey results would be used in modeling to verify that the building structure and foundation can be demolished without the use of containment.

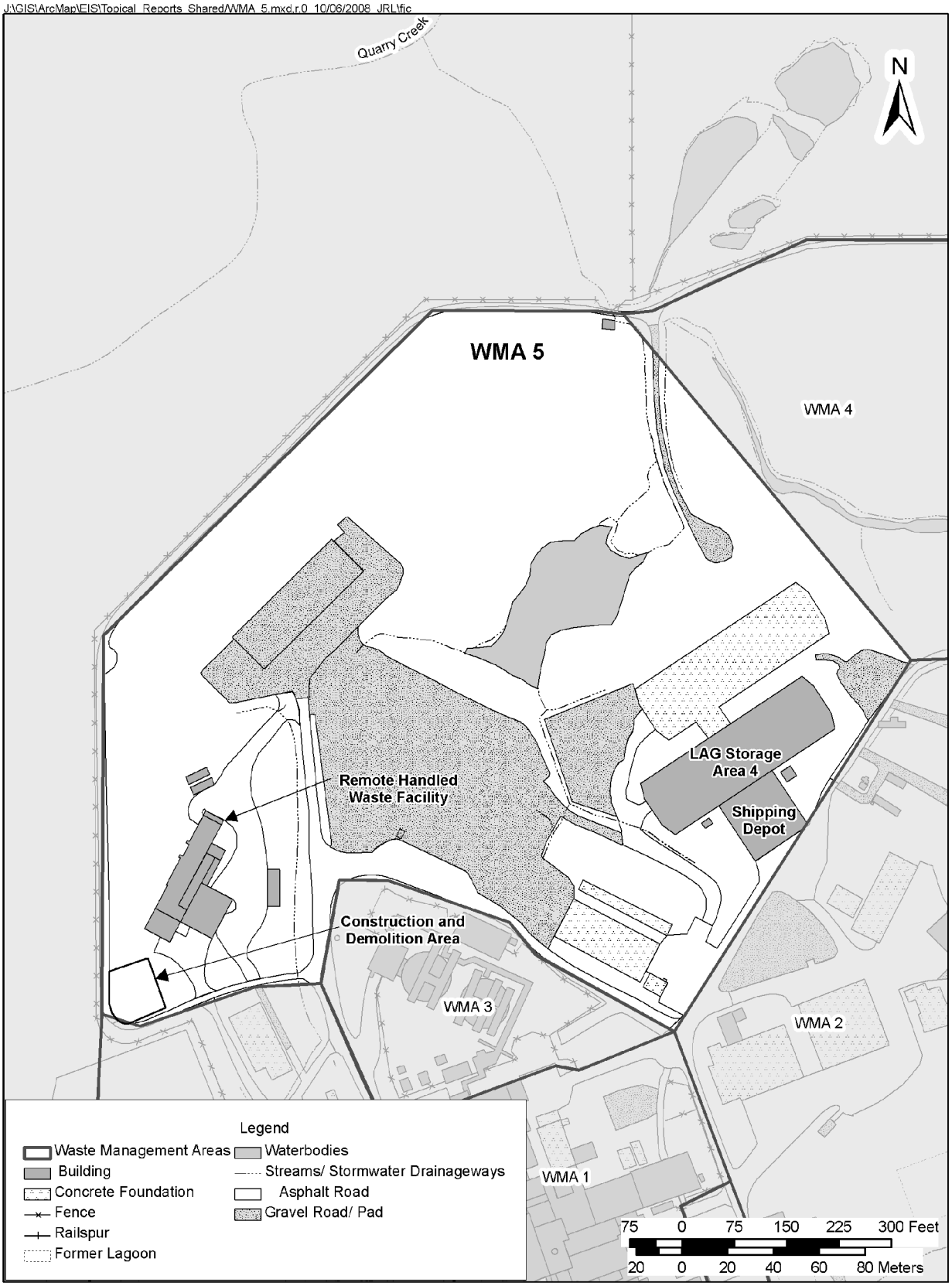


Figure 2-24. WMA 5 - Waste Storage Area

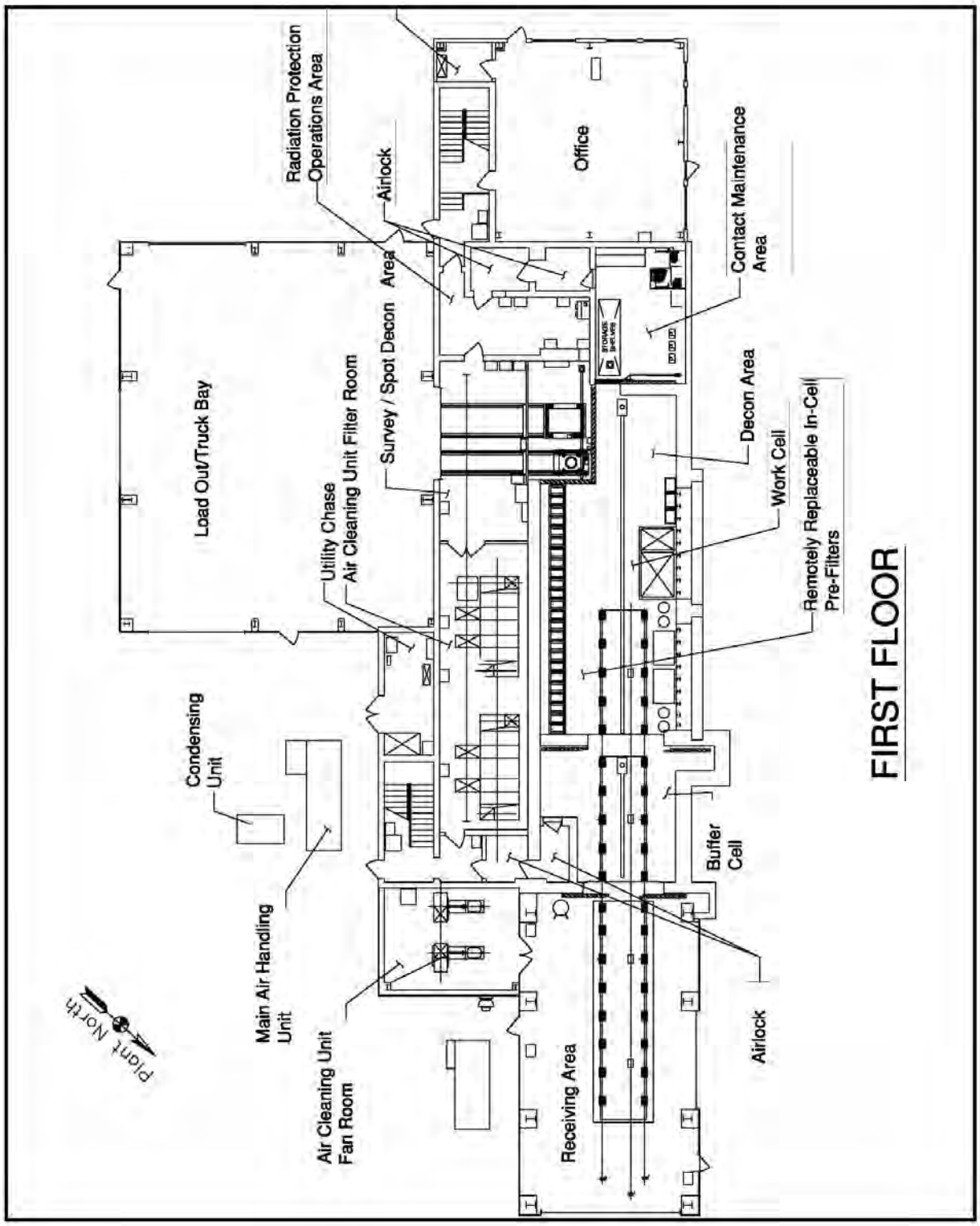


Figure 2-25. Remote-Handled Waste Facility Plan View, First Level

The building structure would be taken down using a hydraulic crane and front-end loader, as would the adjacent office building structure. The RHWF foundation and the underground tank vault would be demolished using hydraulic hammers and front-end loaders, down to a depth of approximately two feet below grade. The RHWF building demolition debris and the foundation demolition debris would be managed as LSA waste. The office building demolition debris would be managed as CDD.

The underground waste transfer pipelines that run from the Batch Transfer Tank in the Wash Down Collection Tank Room to Tank 8D-3 would be grouted and removed. These grouted pipelines would be excavated, sectioned and managed as Class A waste. Approximately 32,000 ft^3 of Class A waste would be generated during WMA 5 closure activities.

2.5.3 Removal of Miscellaneous Facilities

Removal of LAG Storage Area 4 and Shipping Depot

The Shipping Depot is directly connected to the Lag Storage Area (LSA) 4. Both building structures would be demolished with hydraulic cranes and front-end loaders. The debris from both of these structures would be collected and disposed of as CDD. The LSA 4 foundation, as well as the Shipping Depot foundation and adjacent shipping dock, would be demolished with hydraulic hammers and front-end loaders. This concrete debris would be gathered and taken to a regional landfill for disposal as CDD.

2.5.4 Removal of Concrete Floor Slabs and Gravel Pads

The concrete floor slabs of the former Lag Storage Building, LSA 1 Building, and the LSA 3 Building would be demolished through the use of backhoe-mounted hydraulic hammers. The concrete debris would then be collected and staged through the use of front-end loaders. Since these areas are not assumed to be radiologically contaminated, the demolition debris would be managed as clean CDD debris.

The gravel pads/hardstands in this area (the CPC WSA Foundation and Hardstand, the Cold Hardstand, LSA 2 Hardstand, the Construction and Demolition Area, the Vitrification Vault and Empty Container Hardstand, and the Old/New Hardstand) would be excavated by hydraulic crane. These areas also are believed to be free of radiological contamination, so the excavation debris would be collected and disposed of as CDD.

2.5.5 Remediation Completion and Closeout Activities

A MARSSIM Final Status Survey would be performed following the removal of surface structures, to verify that residual radioactivity levels do not exceed the established DCGLs. An independent verification may also be required by the overseeing agencies.

After the verification survey is complete and regulatory approval is received, the area would be backfilled with clean soil and graded. Finally, seed and mulch would be applied over the graded area.

2.5.6 Mitigative Measures

Due to the concrete-demolition work proposed for WMA 5, sediment control and dust-suppression measures would be employed to reduce the amount of exposed soil that would be airborne or would be carried away in storm water runoff. Work in the contaminated areas of the RHWF would require the use of PPE and contamination controls.

2.6 WMA 6: Central Project Premises Area

The Central Project Premises Area consists of a variety of site support structures as shown on Figure 2-26.

2.6.1 Remediation Support Activities

The work planned for this WMA under the Sitewide Removal Alternative is relatively simple in terms of construction complexity. In general, all wastes that are expected to be generated during remediation would be classified as either LSA waste or CDD. Therefore the work can be completed without confinement, using standard construction techniques. In addition, remediation support activities would be limited to implementation of the site Health and Safety procedures, sediment and erosion control procedures, and similar standard construction preparation activities.

2.6.2 Removal of Surface Structures

Sewage Treatment Plant

The Sewage Treatment Plant would be removed in two stages. The first stage consists of removal of the metal siding, roof, and wood frame through the use of a front-end loader and crane. The second stage consists of removal of the foundation of the facility, which is made up of stone and concrete. The base would be demolished through the use of a hydraulic hammer, backhoe and front-end loader. All demolition debris from the treatment plant would be collected and disposed of as CDD.

Cooling Tower

The Cooling Tower support basin would be removed as part of this alternative. The tower itself is assumed to have been removed prior to the starting point of the EIS. The remaining support basin is radiologically and chemically contaminated with water treatment chemicals. A spray fixative would be applied to the concrete surface. The basin would be demolished using a demolition hammer and front-end loader. The concrete debris would be packaged and managed as LSA waste.

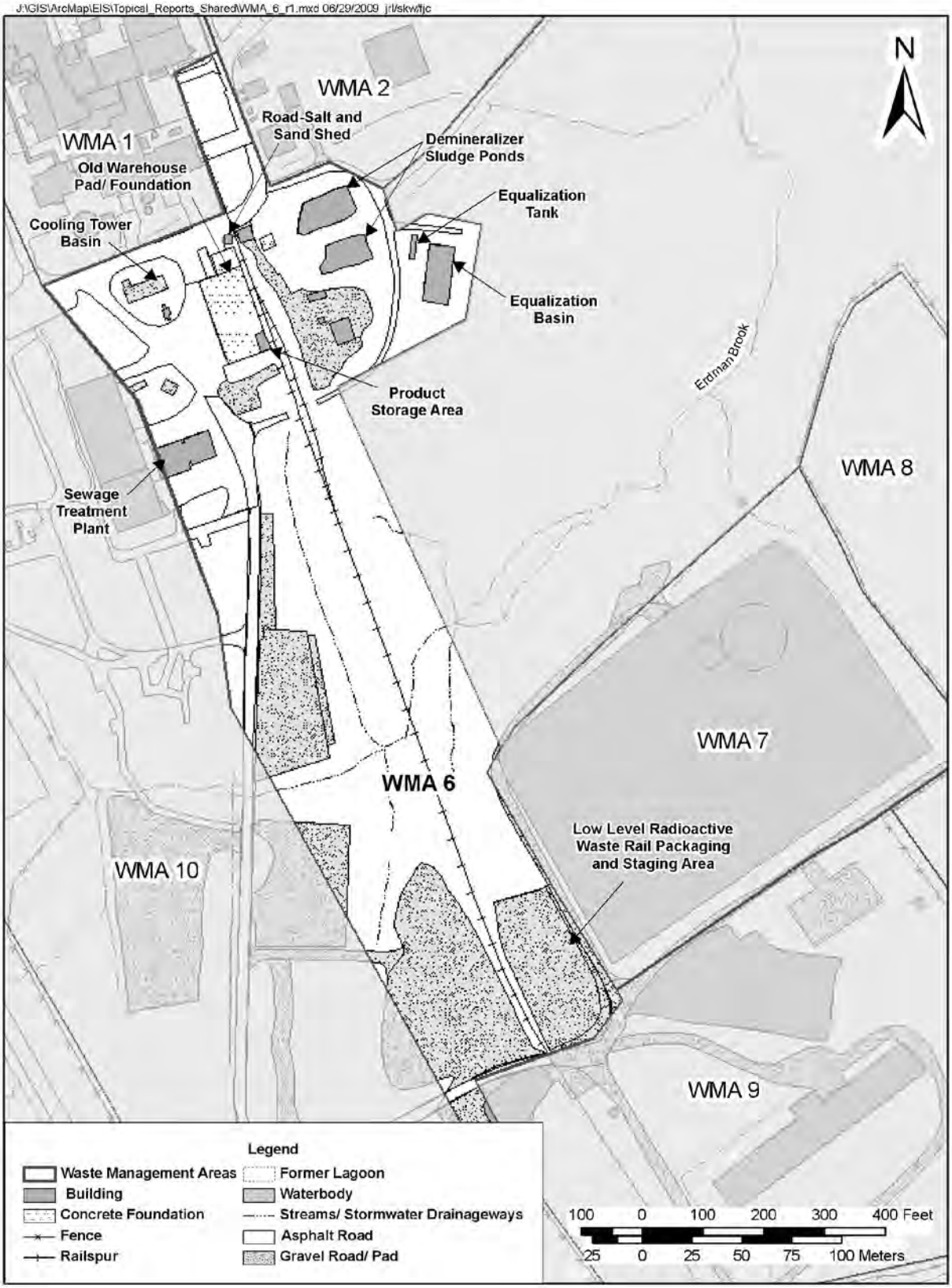


Figure 2-26. WMA 6 - Central Project Premises

Equalization Basin and Equalization Tank

Under the Sitewide Removal Alternative, the Equalization Basin and Equalization Tank would be removed and the area backfilled with appropriate backfill material and restored. The liner would be removed using hand tools and disposed of as CDD. After liner removal, the 12-inch influent pipeline would be filled with concrete. The entire basin would then be filled with compacted soil, using an excavator and drum roller compactor.

The Equalization tank, an underground concrete vault, would be removed using a backhoe, front-end loader, and hydraulic hammer. The demolished tank debris would be collected and disposed of as CDD.

Demineralizer Sludge Ponds

The North and South Demineralizer Sludge Ponds would be excavated down to approximately five feet through the use of a front-end loader. Radionuclides have been found in the sediment of each pond, so the excavated sediment and soil would be managed as LSA waste. After completion of excavation activities, a MARSSIM Final Status Survey would be performed in the excavated areas, to verify that residual contamination is less than the established DCGLs. Independent surveys would be performed as requested by the regulators. The ponds would then be backfilled and compacted with clean soil.

South WTF Test Tower

The South Tower and the support pads would be removed as part of this alternative. The North Tower has already been removed but the support pad remains in place. The South Tower would be removed through the use of a hydraulic crane. The concrete support pads would be demolished using a hydraulic hammer and front-end loader. The tower and concrete debris would be collected and disposed of as CDD.

Low-Level Radioactive Waste Rail Packaging and Staging Area

This area would be completely demolished and removed as part of this alternative. The pads would be demolished through the use of a hydraulic hammer, backhoe, and front-end loader. The crushed limestone rail ballast would be excavated by a hydraulic excavator. The concrete debris would be collected and disposed of as CDD. The crushed limestone would be stockpiled on site for the use as appropriate backfill material for other remediation activities.

Rail Spur

The Railroad Spur that serviced the WVDP site would be dismantled and removed. This line runs from the Fuel Receiving and Storage Building to a rail line junction, northeast of Riceville Station. A portion of this spur would be removed as part of the removal efforts proposed for WMA 6 and the rest would be removed as part of the removal efforts associated with WMA 12. As part of the removal alternative, the rails and tracks would be removed by hydraulic crane and placed on trucks for disposal. A portion of the Rail Spur in the vicinity of the FRS and old warehouse is thought to be contaminated. This portion would be

managed as LSA waste. The remaining rail and ties would be managed as CDD, although many times these materials are found to be recyclable for beneficial reuse. The ties would be characterized prior to disposal. For the purpose of the technical reports, the ties are assumed to be non-hazardous.

The track ballast is mainly uncontaminated with only a small portion in the vicinity of the FRS considered contaminated. The portion of the Rail Spur that is contaminated (7,500 ft^2) would be removed and managed as LSA waste. The uncontaminated portions would be suitable for reuse on site as road base, structural fill, etc. The length of track to be removed is approximately 2,200 feet. For the basis of this estimate, it is assumed that the width of the ballast area is 20 feet with an average depth of 12 inches.

2.6.3 Removal of Concrete Floor Slabs and Gravel Pads

The following concrete slabs would be removed in this WMA: The Product Storage Area Pad, the Old Warehouse Floor, and the Salt-Sand Shed Pad. These slabs would be demolished using hydraulic hammers and front-end loaders. The concrete demolition debris would be disposed of as CDD.

2.6.4 Remediation Completion and Closeout Activities

A MARSSIM Final Status Survey would be performed following the removal of surface structures, to verify that residual radioactivity levels do not exceed the established DCGLs. An independent verification may also be required by the overseeing agencies.

After the verification survey is complete and regulatory approval is received, the area would be backfilled with clean soil and graded. Finally, seed and mulch would be applied over the graded area.

2.6.5 Mitigative Measures

Due to the concrete-demolition work proposed for WMA 6, sediment control and dust-suppression measures would be employed to reduce the amount of exposed soil that would be airborne or would be carried away in storm water runoff. Work in the contaminated areas (such as the contaminated portion of the rail spur) would require the use of PPE and contamination controls, as well as the use of contamination reduction zones and buffer areas.

2.7 WMA 7: NRC-Licensed Disposal Area and Associated Facilities

The work planned at WMA 7 consists of removal, packaging, characterization, and disposal of the wastes buried in disposal holes and trenches at the NRC-Licensed Disposal Area (NDA). The NDA remediation is separated into waste removal from the Nuclear Fuel Services (NFS) disposal area, and waste removal from the WVDP disposal area. Implementation of the proposed remedial activities at the NDA would also involve the installation, operation, and ultimately, removal of numerous Remediation Support Facilities. The layout of the NDA is illustrated in Figure 2-27.

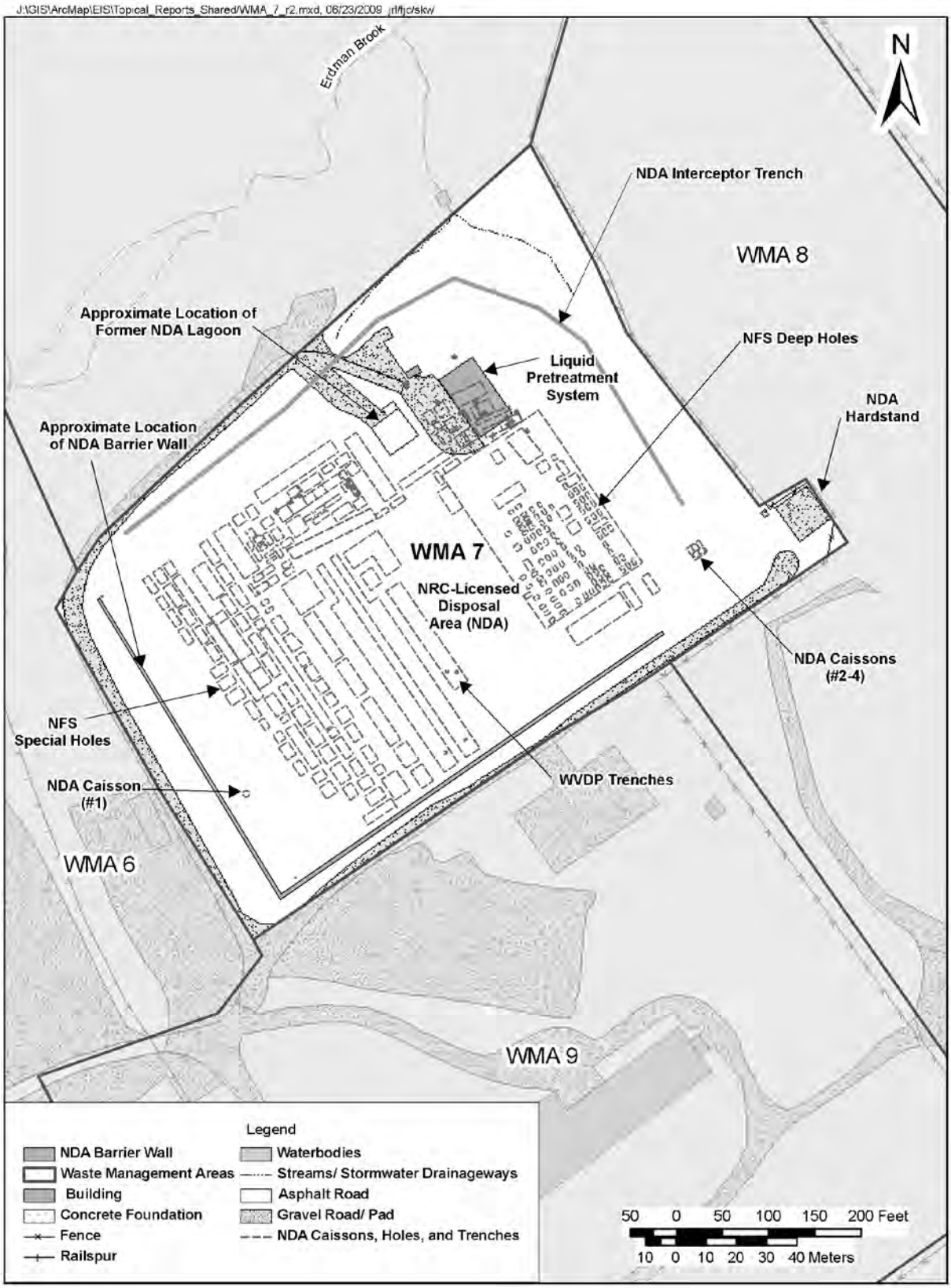


Figure 2-27. WMA 7 – NDA and Associated Facilities

The general sequence of remedial activities would include: 1) removal of the waste materials conducted under appropriate environmental enclosures, 2) temporary backfilling of the waste excavations using stockpiled cover material to maintain safety and structural control, 3) performance of an area-wide excavation to the depth of waste burial. The limits of the area-wide excavation would be supported by a MARSSIM survey. The area-wide excavation would be restored upon receipt of regulatory approval using appropriate backfill material.

The remedial activities planned at WMA 7 under the Sitewide Removal Alternative are discussed in detail in the following sections.

2.7.1 Remediation Support Activities

Support for the NDA remediation is provided by several support facilities including the NDA Environmental Enclosure, the Leachate Treatment Facility, the Container Management Facility, and the Modular Shielded Environmental Enclosure. These facilities are discussed in greater detail in the following paragraphs.

Geophysical Investigation

Locations of the burial holes and trenches in the NDA are not precisely mapped. Thorough geophysical investigation of the burial locations, to the extent practical, would be performed to define the limits of waste disposal and determine proper locations for construction of environmental enclosures and installation of shoring for trench and hole removal.

NDA Environmental Enclosure

The designed purpose of the NDA Environmental Enclosure is to provide environmental containment of the various airborne emissions expected to be released during the NDA Excavation Project. This enclosure would be constructed over the footprint of the NFS burial area of the NDA and a portion of the WVDP burials and is intended to cover all disposal areas known to contain wastes of categories greater than Class A. Figure 2-28 provides an illustration of the Conceptual NDA Environmental Enclosure. The NDA Environmental Enclosure is intended for secondary containment, since the primary containment is to be provided by a Modular Shielded Environmental Enclosure (discussed later in this section).

The NDA Environmental Enclosure would be a Performance Category 3 (PC3) Facility designed to withstand design-basis natural hazards, such as earthquake, high winds, and snow loading. The structure would be designed in accordance with “DOE Standard – Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities, DOE-STD-1020-2002.” The standard requires PC 3 structures to be designed to include such elements as a “Tornado Missile Barrier” (refer to Tables 3-1 and 3-3 of the Standard), involving substantial walls and roof. This enclosure would be a single span, insulated, steel frame building with one-foot-thick reinforced concrete exterior walls. The foundations of the building would be placed outside the perimeter of known waste burials. The structure would have a 35-foot eave height, and a span

of up to 165 feet, large enough to allow use of heavy equipment inside and to allow erection of confinement structures within it. Access to the interior areas would be provided by equipment shield doors as well as numerous shielded mandoors. It would be well ventilated to prevent accumulation of exhaust fumes from operation of heavy equipment, and the ventilation air discharge would be HEPA-filtered to control migration of any airborne radionuclides to the atmosphere. The building would contain appropriate levels of fire protection, water and electrical supply, and a closed-circuit camera security and operations system.

During construction of the NDA Environmental Enclosure, an upgradient groundwater control system would be installed. The components of this system would involve a sheetpile barrier wall and an overburden groundwater drain installed on the upgradient side of the barrier. The bottom edge of the wall would be keyed into the unweathered Lavery till to prevent water from passing under it, and the upper edge of the wall would be above the maximum anticipated water level in the soil to prevent water from passing over it. The overburden groundwater drain would be installed along the upgradient side of the barrier wall to redirect groundwater, eliminating the potential for inward hydraulic gradient across the barrier wall. It may be possible to make use of the existing soil-bentonite barrier wall, as a supplement to the sheet pile wall planned for this activity. This beneficial use and cost savings have not been incorporated into the alternative cost. The proposed location of the barrier wall is illustrated in Figure 2-28.

Leachate Treatment Facility

Two existing facilities (the low-level radioactive waste treatment facility [LLW2] and the NDA liquid pretreatment system) were considered in lieu of new construction for treatment of the NDA and SDA leachate. Neither of these existing facilities had all the components needed for performing the treatment that would be required, and both are relatively old systems, likely in need of refurbishing prior to treatment. The LLW2 system is designed to treat certain radionuclides, but is not large enough to house all the components needed to treat leachate from the disposal areas. In addition, utilizing this system to support SDA and NDA removal would require transferring the highly contaminated liquids a much greater distance. It is conceivable that some components of the NDA liquid pretreatment system could be used, however, these components are nearly 17 years old and may not be easily compatible with the currently envisioned leachate treatment system. Based on this rationale, new construction was deemed necessary.

The designed purpose of the Leachate Treatment Facility is to complement the waste removal process, by providing treatment (or pre-treatment) of the liquids removed during the waste excavation process (for both NDA and SDA). The Leachate Treatment Facility would be constructed as a stand alone facility on the South Plateau near SDA Trench 14, in close proximity to other disposal area remediation support facilities, such as the Container Management Facility, as shown in Figure 2-29.

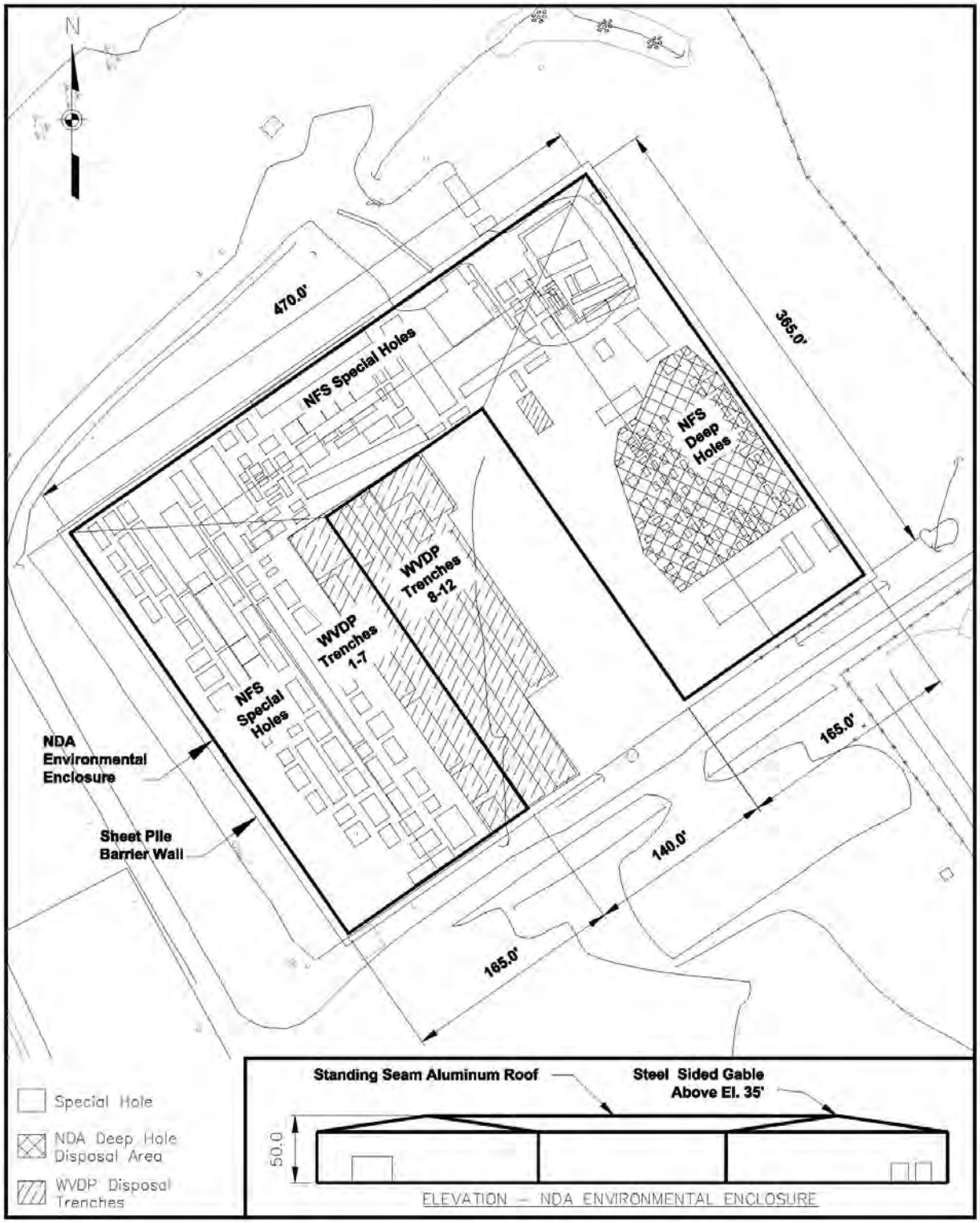


Figure 2-28. Conceptual NDA Environmental Enclosure

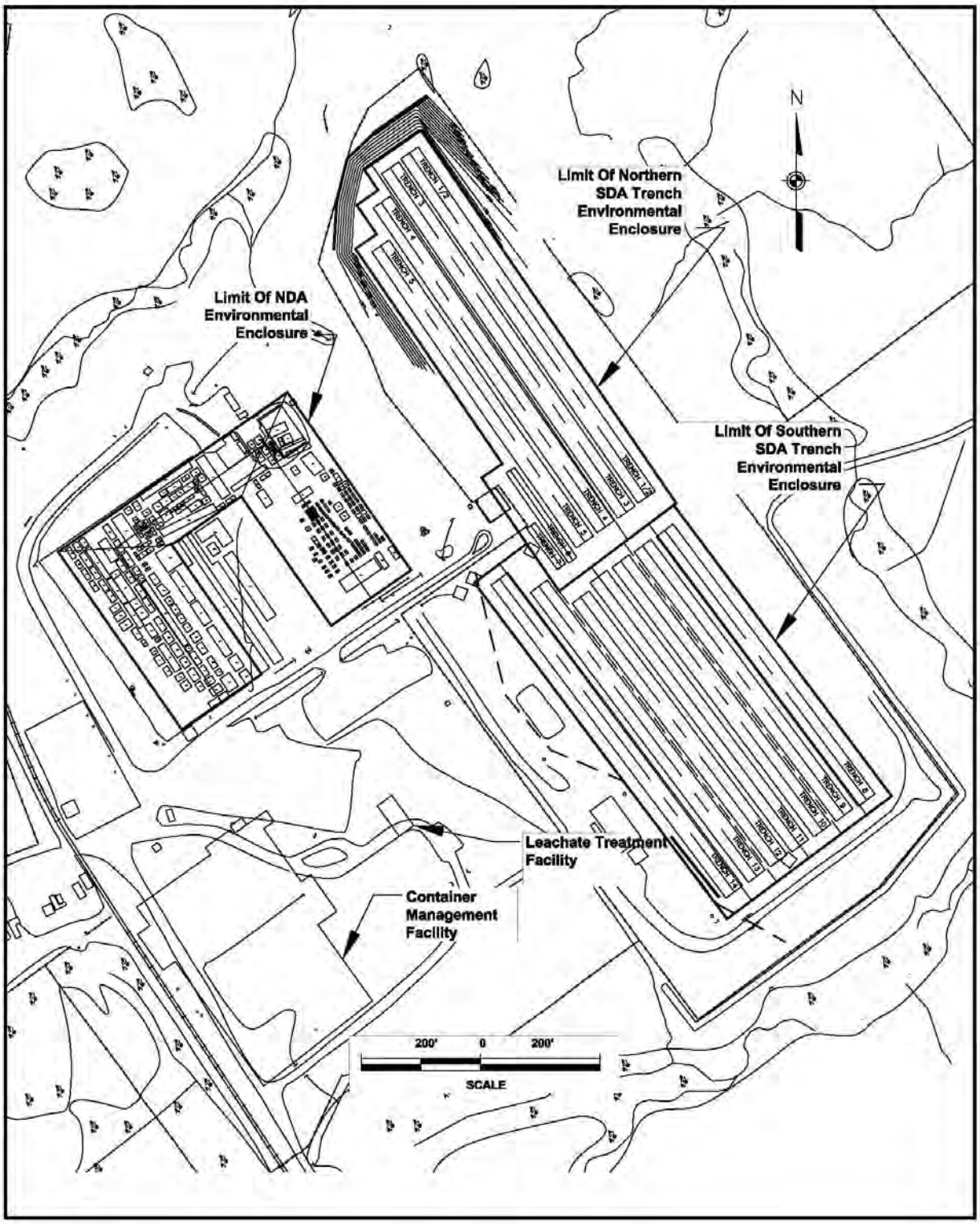


Figure 2-29. Plot Plan of Proposed Facilities to Support Closure of WMAs 7 and 8

The Leachate Treatment Facility would be capable of removing organic chemicals that might be present by biological degradation and adsorption, removing entrained solids by filtration, and removing dissolved radionuclides by ion-exchange, before transferring the treated water to the Low-Level Waste Treatment Facility (LLWTF) in WMA 2 for final treatment and discharge. The Conceptual Leachate Treatment Facility Process Flow Diagram is illustrated in Figure 2-30. The process employed in this facility would not be able to remove tritium from the leachate. This facility may require a RCRA permit to operate.

The facility would be operated on demand and, based on the limiting productivity of the waste removal process, would be expected to process an average of 1,000 gallons of leachate per day. It is assumed to be operated eight hours a day during the waste removal work. The treatment process would consist of a leachate hold tank, a bioreactor, a mechanical filter, an activated carbon polisher, and ion-exchange columns. The components of the facility that are used to manage raw leachate, including the raw leachate storage tank and the primary process equipment, would be constructed inside of a 1,900-ft^2 building intended to provide appropriate shielding between these components and the environment. Raw leachate storage and treated water storage tanks are similarly expected to be housed in small buildings, approximately 400 ft^2 and 2,250 ft^2 in size, respectively. The treated water storage building is also expected to house a small laboratory. The Conceptual Leachate Treatment Facility Building Layout is illustrated in Figure 2-31. The principal components of the Leachate Treatment Facility are:

- 9,000-gallon raw (untreated) leachate hold tank – The leachate hold tank would be installed in a shielded enclosure, separate from the treatment process as well as the treated leachate storage tanks. Leachate pumped from the hold tank would be filtered using mechanical filtration prior to introduction to the treatment train;

- The bioreactor – This component would be used to treat the organic chemicals in the leachate. The reactor would be operated on a batch basis and would employ aeration with agitation, settling, and decanting. The sludge from the bioreactor would be transferred to a sludge hold tank for processing, packaging, and disposal;

- The ion-exchange columns – This component would be used to remove most of the dissolved radionuclides from the leachate, and would employ an inorganic ion-exchange material to remove the two principal radionuclides of concern, cesium-137 and strontium-90;

- Mechanical Filter and Carbon Beds - The decanted leachate in the hold tank would be passed through fine filters to remove entrained solids prior to introduction of the leachate into the activated carbon polisher beds, thereby preventing plugging of the beds. The activated carbon polisher would be used to remove any remaining organic material that was not removed by operation of the bioreactor;

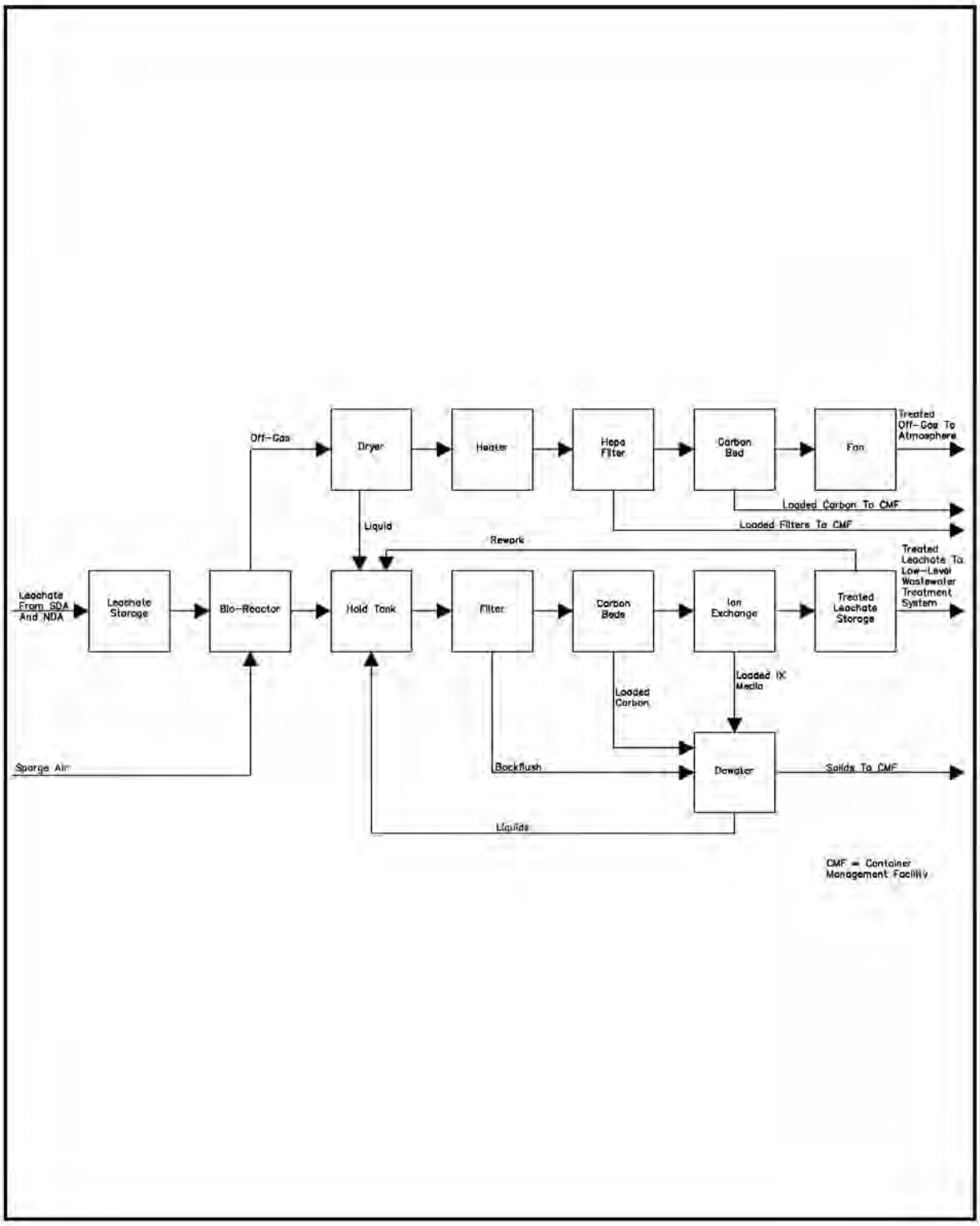


Figure 2-30. Conceptual Leachate Treatment Facility Process Flow Diagram

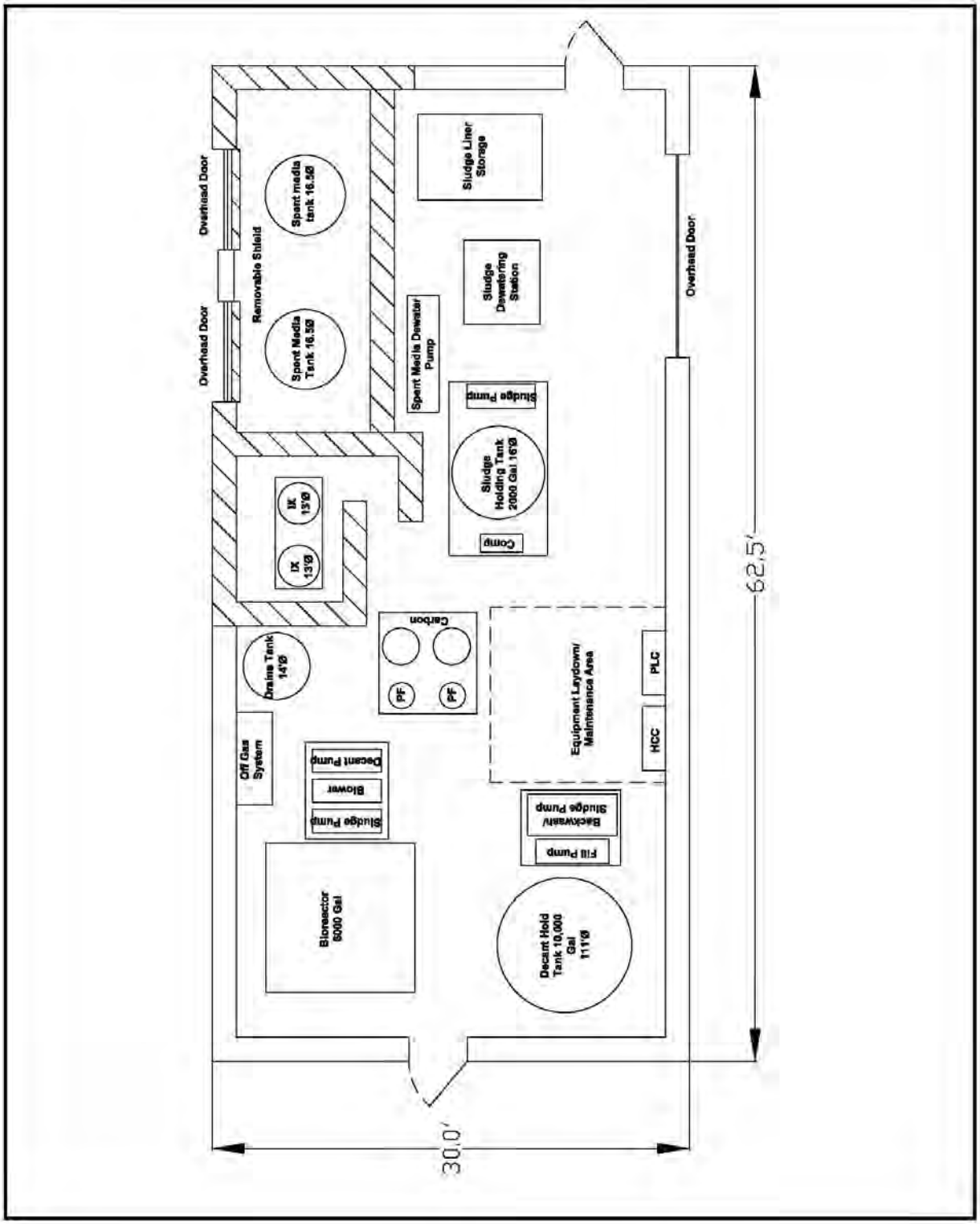


Figure 2-31. Conceptual Leachate Treatment Building Layout

- The effluent from the carbon beds would be directed to the treated water storage tanks. The treated leachate in these tanks would be sampled and analyzed before being directed either to the LLWTF lagoons for final treatment and/or discharge through a SPDES-permitted discharge, or back into the Leachate Treatment System to be "reworked"; and

- Off-Gas Treatment – Off-gases from the bioreactor would be treated by (1) mist elimination to remove entrained droplets, (2) heating to reduce the relative humidity for purposes of protecting downstream equipment, (3) HEPA filtration to remove radiologically contaminated particulate matter, and (4) carbon adsorption to remove organic vapors. An off-gas blower would keep the process under negative pressure for contamination control.

The Leachate Treatment Facility would be decommissioned and demolished upon completion of the WMA 7, WMA 8, and/or other potential emergent site activities that require its support. The treatment system would be flushed to purge the system of residual leachate and wastewater. The zeolite ion-exchange media would be removed from the vessels and managed as Class C waste. The treatment equipment would be removed, segmented, and managed as Class A waste. The Leachate Treatment Facility Building would be demolished using typical site protocols and the structural components of the building, including concrete, would be managed as LSA waste.

Container Management Facility

One existing facility was considered to be a potential candidate to house the Container Management Facility: the Drum Cell. The Drum Cell was found to be inadequate in terms of size, and to require significant modification to upgrade the already 20-year old facility in order to utilize it to support the functions of the Container Management Facility. Under the Sitewide Removal Alternative, it also seems to make the most sense to have a single location to consolidate all wastes which might require interim storage. This would make monitoring and maintenance activities the most efficient. Since the greatest quantities of such wastes would come from the NDA and the SDA, and since a single location on the South Plateau would allow all facilities and operations to be removed from the North Plateau, utilizing a single new facility on the South Plateau is believed to be the most efficient approach.

The Container Management Facility (CMF) discussed in this section is a conceptual structure with dimensions designed according to the space needed for processing and potentially storing large volumes of waste. The geometry of the CMF is flexible, with the most critical features of the design being the relatively small process area and the space required for the process equipment. The location of the CMF is also flexible, provided that it is sited in relative proximity to the NDA and SDA and allows for the efficient movement of wastes from the burial areas to the CMF. The footprint of the CMF, as presented in this section, is anticipated to occupy some of the space that is currently occupied by the Drum Cell building, since the Removal Alternative implementation schedule has the Drum Cell being removed prior to construction of the CMF. However, there is a potential for the Drum Cell to be used for decommissioning purposes (i.e.,

storage area, laydown area) during the course of the Removal Alternative for which the timing might overlap with the schedule for construction and operation of the CMF. In this case, the CMF storage area configuration might be revised to allow for the CMF construction and operation prior to demolition of the Drum Cell. The variations that are envisioned as a result of the reconfiguration would have negligible effect on the overall costs and impacts discussed in this report.

The designed purpose of the Container Management Facility is to provide remote handling, processing (drying, size reduction, sorting, compaction), packaging, and characterization of the solid wastes removed during the NDA and SDA excavation projects. The Container Management Facility would be constructed as a stand alone facility on the South Plateau. This facility may require a RCRA treatment and storage permit since some of the excavated wastes are expected to be classified as mixed wastes prior to off-site shipment.

The CMF would be constructed along the rail spur on the South Plateau, to minimize the effort needed to ship waste containers by rail, as shown in Figure 2-29. It would be capable of receiving and handling wastes from the NDA and SDA in an "as excavated" form or in a “packaged” form. In addition to the processing area, the CMF would consist of a control room to support remote handling operations, a counting room, office space for support personnel, and general facilities. The Conceptual Container Management Facility Layout is illustrated in Figure 2-32. The Conceptual Container Management Facility Elevation is illustrated in Figure 2-33. Because of its relative isolation from other facilities at the WNYNSC, and the length of time it would be expected to operate, it would have independent water and electric supply, and septic systems.

The Container Management Facility would be a radiological facility with reinforced concrete shield walls around processing and storage areas and a steel frame and steel cladding in other areas. The floors and foundations would be constructed of reinforced concrete, and the roofs would be constructed of concrete with asphalt roofing. The conceptual layout of the facility was created with a portion of the building in a two-story configuration: the processing, containerizing, and characterization areas on the first floor and office space on the second floor.

The inside surfaces of the shielded work area would be lined to facilitate decontamination. The floor and lower levels of the walls subject to impact from crane-carried loads would be lined with stainless steel. The upper levels of the walls and the ceilings would be covered with a strippable paint.

The remainder of the conceptual facility was designated for interim storage of Class B and C low-level radioactive waste, Greater-Than-Class-C waste, and transuranic waste. This portion of the building was designed as a single-story, warehouse-type structure.

The building would be equipped with a HEPA-filtered ventilation system, independent from the process off-gas system. This ventilation system would be designed for heating, ventilation, air conditioning, and contamination control. The ventilation system would discharge to the same stack as the off-gas treatment system.

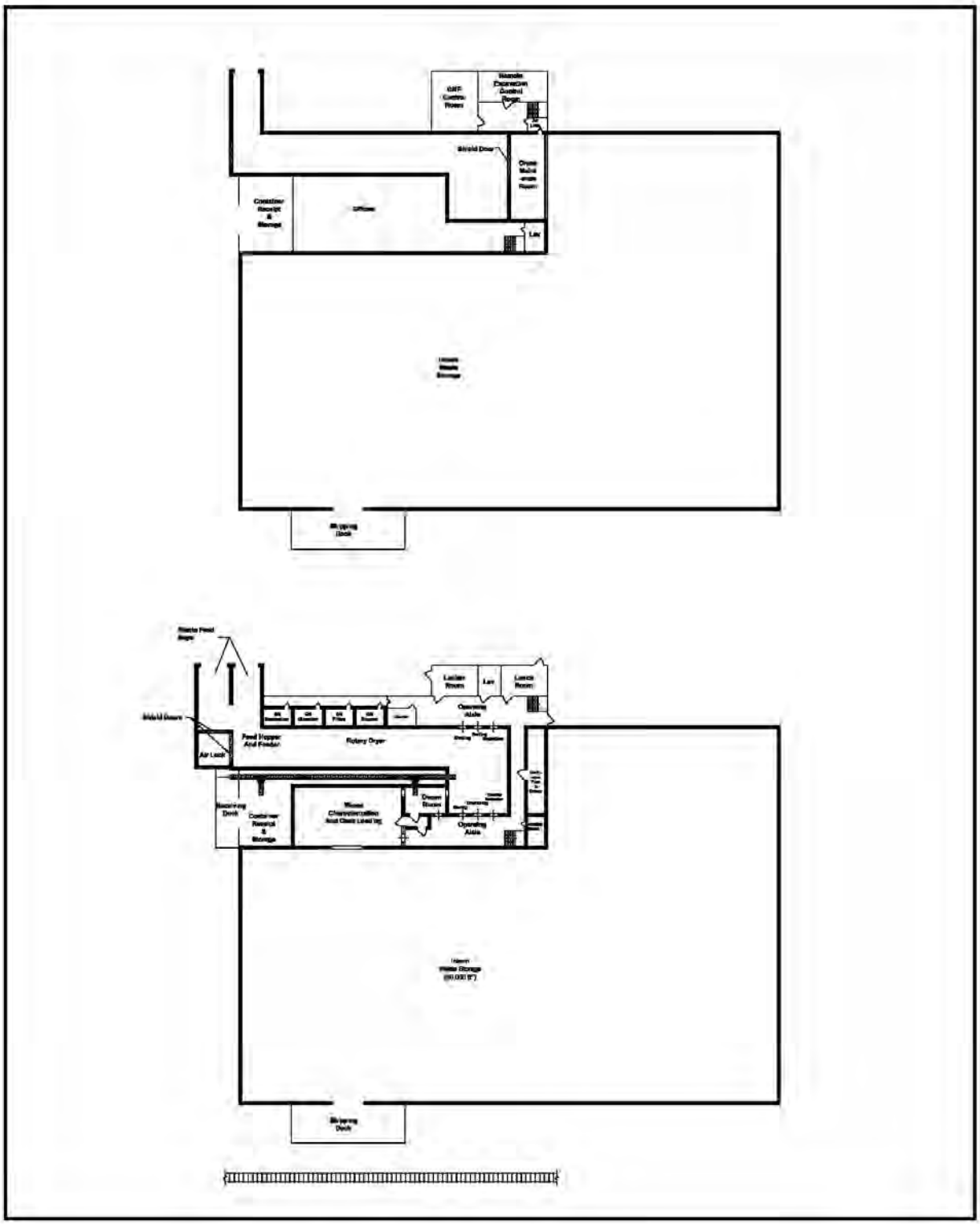


Figure 2-32. Conceptual Container Management Facility Layout

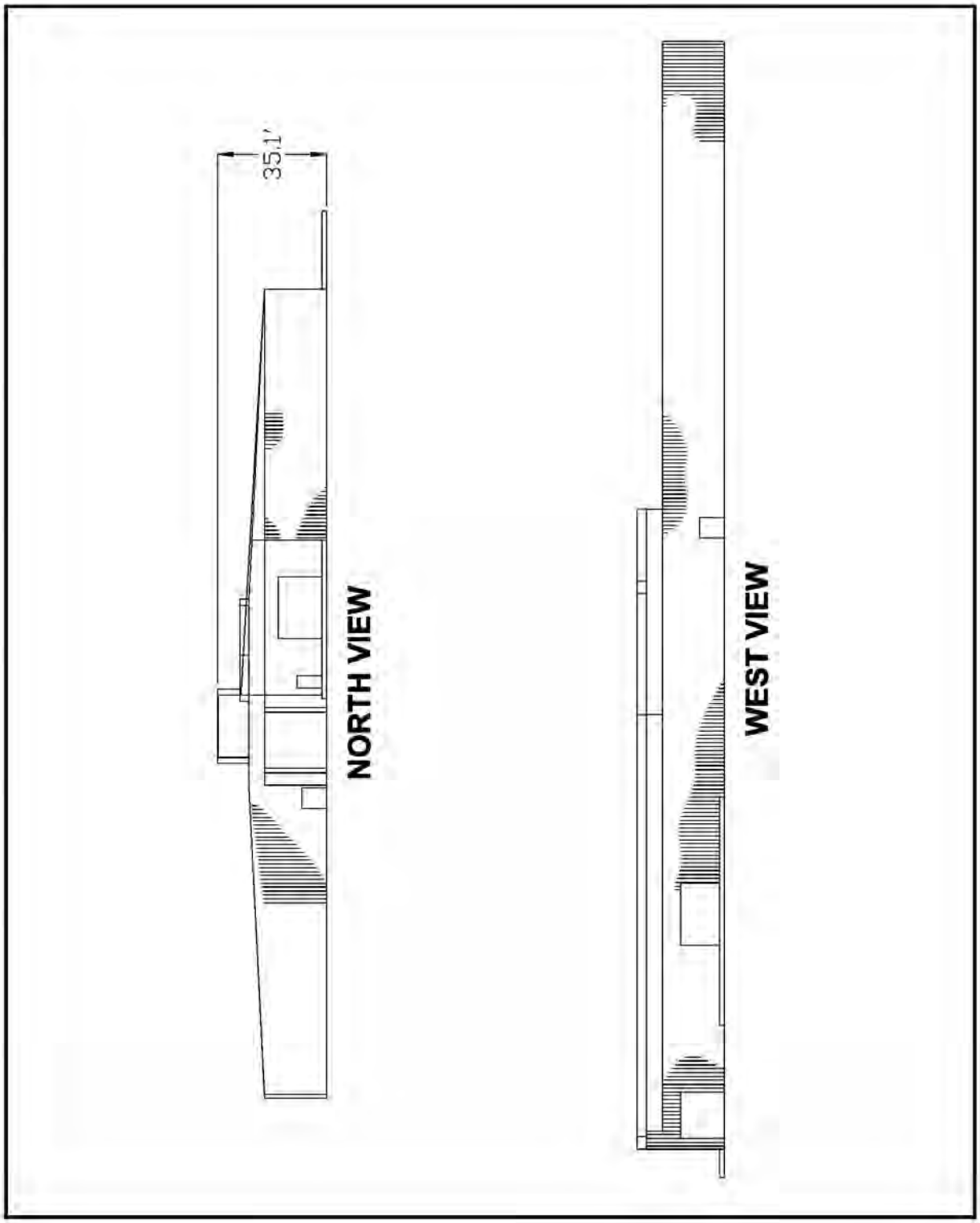


Figure 2-33. Conceptual Container Management Facility Elevation

The primary components of the waste processing area comprise the following:

- Rotary Waste Dryer – A rotary drum dryer was selected for drying the mixture of buried wastes, soil, and waste packages expected from the NDA and SDA removal projects, because it would be capable of accepting a wide variety of materials in any size smaller than the diameter of the rotary drum.

  The dryer would be operated at a slight vacuum for purposes of contamination control. The tumbling action of the dryer would break clods of soil and cause separation of the soil from the hardware, and/or other debris;

- Off-Gas Treatment System – The off gas treatment train would consist of a catalytic oxidizer (destruction of airborne organics); a heat exchanger (removes heat energy from the off-gas); a quencher (temperature reduction and particulate removal); and HEPA filters;

- Dry Waste Processing Stations – numerous remote-operated processing stations would be included in order to appropriately sort, size-reduce, and package the dry wastes. In general, each of these stations would include shield windows, master slave manipulators, and power manipulators. The processing stations planned for the CMF consist of:

  - Shaker Station – The primary item of equipment would be a shaker table designed to separate loose soil from waste hardware;

  - Sorting Station – Located in close proximity to the shaker station, where the operator would begin sorting wastes based on physical makeup;

  - Volume and Size Reduction Stations – These stations would consist of various remote-operated cutting (saws and torches) and shearing equipment, vises, as well as a super-compactor; and

  - Packaging Station – Drumming and boxing of wastes would occur at the packaging station. This station would employ a bridge crane capable of lifting and moving filled waste containers, as well as processing equipment that may need to be decontaminated and transferred out for repair. In addition, tools needed to secure the lids to the tops of the drums and boxes would be located here.

- The Decontamination Room would be located in an airlock that would allow for hand wiping of packages containing contact-handled wastes, and for mechanical decontamination of packages containing remote-handled wastes. A remotely operable decontamination system, such as a carbon dioxide pellet decontamination system, would be provided; and

- Waste Characterization and Cask Loading room would include an overhead crane, scales, non-destructive analytical equipment, and portable shielding. The non-destructive analytical equipment would include: (1) a radiography station for boxes, (2) a radiography station for drums, (3) a waste curie monitor that would employ scintillation detectors to measure beta/gamma

activity, (4) a high-resolution gamma spectroscopic measurement system employing high-purity germanium detectors for boxes, (5) a similar high resolution gamma spectroscopic measurement system for drums, (6) a passive neutron measurement system for boxes, and (7) a similar passive neutron measurement system for drums.

Located between the processing area and the loading docks, the Container Management Facility would contain a storage area for the storage of low-level radioactive waste that exceeds the concentration limits of radionuclides established for Class C waste in 10 CFR 61.55 (Greater Than Class C or GTCC), and for potential orphan wastes without available disposal options such as Pre-Project Class B and C wastes, and TRU wastes removed from WMA 1, WMA 3, WMA 7, and WMA 8. The estimated area needed for proper storage of these wastes is approximately 80,000 ft^2. The adjacent shipping dock would be equipped with a gantry crane for loading drums and boxes onto railcars and truck beds.

Movement of low-level waste packages would be done using a forklift. These packages (B-25 boxes or HICs, and 55-gallon drums) would ultimately be directly placed into railcars or onto truck beds, as appropriate.

Drums of contact-handled GTCC wastes eventually would be moved with a forklift from the storage area to the shipping dock, where they would be loaded into appropriate shipping containers, such as TRUPACT-II shipping containers. A gantry crane would then be used to place the shipping containers onto trucks for transport off site.

Upon shipment, drums of remote-handled GTCC wastes and TRU wastes would be moved with a shielded forklift from the storage area, back into the Cask Loading room. With the aid of the overhead crane, drum handling fixture, cask liner holding fixture, and power manipulator, operators would remotely load the drums into cask liners, such as the RH-72B shipping cask liner, and load the liners into shipping casks, such as the shielded RH-72B shipping cask. The loaded cask would then be transferred by crane or forklift to the shipping dock. Using the gantry crane, the loaded casks would be placed onto railcars or truck beds, as appropriate, for off-site transport.

The Container Management Facility would be decommissioned and demolished upon completion of the WMA 7, WMA8, and/or other emergent site activities that require its support. Demolition of the Container Management Facility would result in the generation of a variety of waste streams, including CDD, LSA, and Class A waste. The demolition process would include appropriate measures for facility areas and components based on the respective operational and use history.

Decommissioning activities would be generally contemplated as follows:

- The conceptual facility would house 32 processing rooms/cells that would be surveyed and characterized for radiological constituents prior to initiation of decommissioning activities;

- Interior process areas would be vacuumed and undergo remote mechanical decontamination, as warranted;

- Stainless-steel liner systems associated with processing rooms/cells would be removed and subsequently managed as Class A waste;

- Process equipment would be removed and segmented and would be managed as Class A waste;

- Spray fixation will be utilized to stabilize residual contamination on interior walls and ceilings prior to demolition;

- Resurvey of the 32 processing rooms and cells for radiological constituents prior to initiation of demolition;

- Due to the uncontaminated and contaminated nature of the CMF, the structural steel and concrete demolition would be done selectively in order to segregate expected waste types. Structural steel and aboveground concrete would be assumed to be contaminated and managed as LSA waste. Foundations would be assumed to be uncontaminated, and the waste generated from this activity would be assumed to be managed as CDD waste; and

- Removal of the finish work that was installed outside the CMF during construction, including fencing, driveway pavement, and outdoor utilities would be managed as CDD waste.

The Container Management Facility decommissioning activities would be modified if necessary, based on the final building design, construction, and subsequent operational history.

Modular Shielded Environmental Enclosure

The Modular Shielded Environmental Enclosure (MSEE) would be designed and constructed specifically to support waste removal projects at the NDA and SDA. This enclosure would control airborne emissions, shield against high-radiation fields, and facilitate remote controlled removal of wastes from holes and trenches up to 55 feet deep.

The MSEE, depicted in Figures 2-34 (MSEE - Perspective View) and 2-35 (MSEE Wall and Roof Panel Sections), would provide the primary confinement for the radiological and hazardous material releases that are expected during the excavation and retrieval of buried wastes. The MSEE would be designed to allow remote control of excavation, retrieval, and maintenance operations. The modular design of the MSEE would allow it to be configured over holes and trenches of various sizes and it would be used numerous times prior to being replaced. It would be maintained under negative pressure by a HEPA-filtered ventilation system.

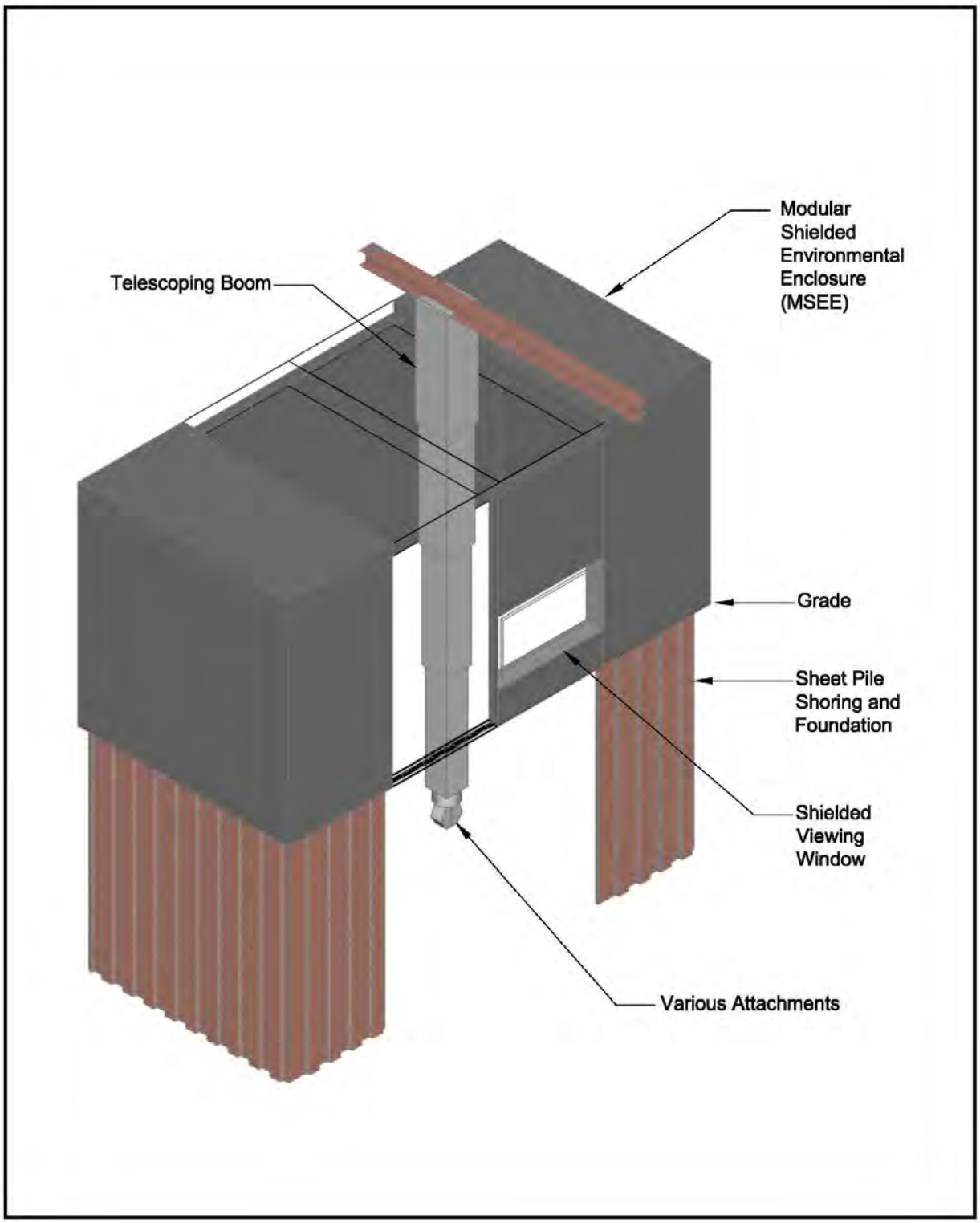


Figure 2-34. MSEE - Perspective View

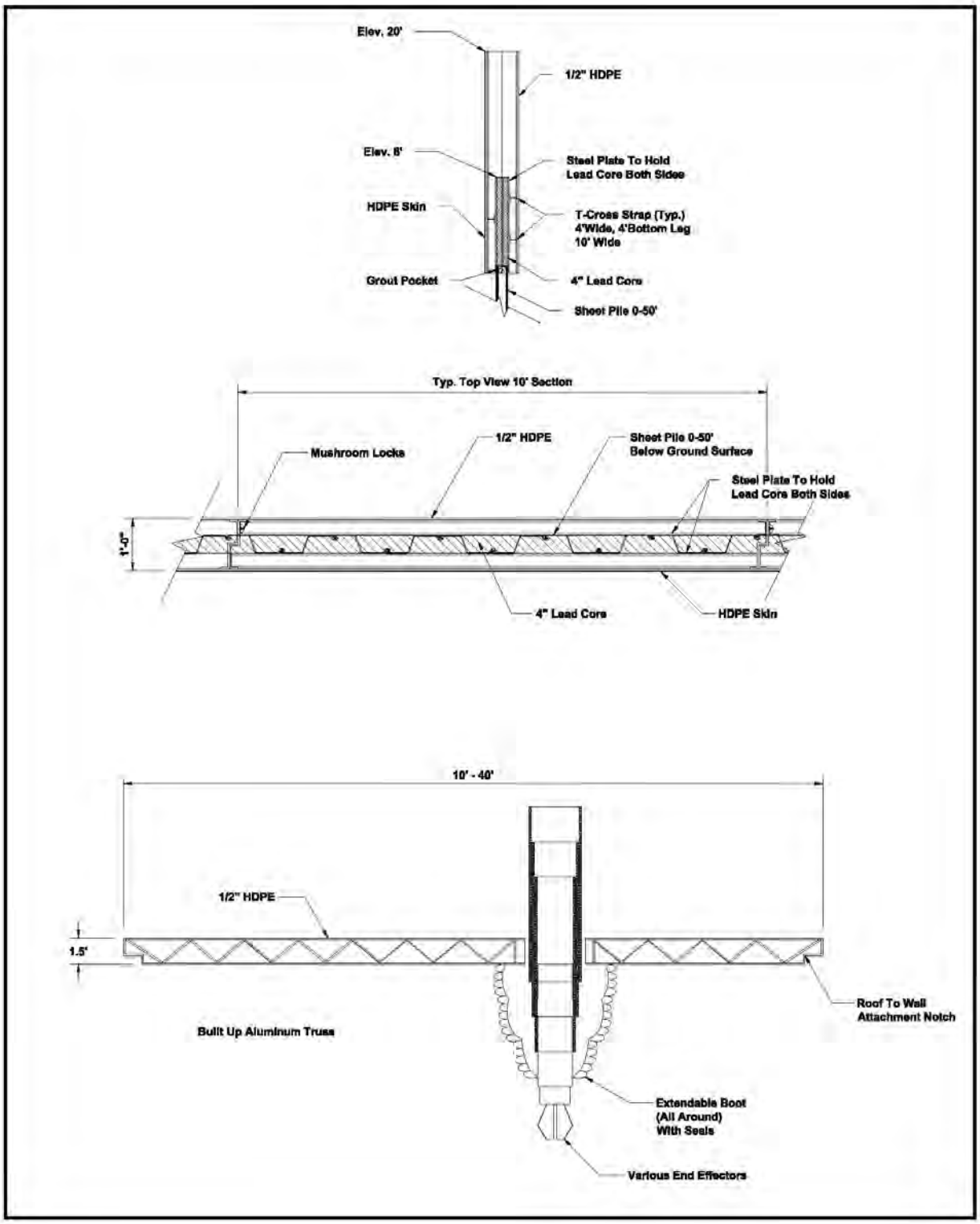


Figure 2-35. MSEE Wall and Roof Panel Sections

MSEE construction would consist of a steel-frame wall, clad with high-density polyethylene (HDPE) sheeting and an interstitial lead shield core. The inside surfaces would be covered with multiple layers of thin, strippable, plastic film to simplify decontamination and repair efforts. The roof sections would be made of steel truss clad with HDPE sheeting on both sides. The roof would be equipped with a boot to allow access by a Z-mast crane or telescoping mast. This is an important distinction between the NDA and SDA MSEE structures. The NDA MSEE structures would be relatively small (due to hole sizes at the NDA) and will employ a remote or manually operated Z-mast crane, operating from the outside of the NDA MSEE structure. Two Z-mast cranes are planned for the NDA. The Z-mast crane mast will penetrate through a boot in the top of the MSEE, and will perform necessary operations using remote video. This configuration was selected based on the small size of the NDA Special and Deep Holes.

The MSEE structure used at the SDA would be much larger, requiring the manufacture of a specialized Z-mast bridge crane operating inside of the SDA MSEE. The cranes operating within the shielded enclosure would therefore be operated remotely. Additional discussion of the SDA MSEE configuration is presented in Section 2.8.1.

The MSEE design includes prefabricated wall and roof panels that would be assembled over the trench or hole to be excavated. The wall panels would be approximately 10 ft wide and 20 ft in height, and would be constructed with a steel frame. A core of lead brick shielding (2 inches thick) would be included from the bottom of the wall (ground level) to a height of 8 ft. The lead core would be held in place by steel sheeting on the inner and outer surfaces of the lead brick core. The roof panels would not be shielded.

The wall panels would fit side by side around the perimeter of the excavation (on top of the sheet pile). The roof panels would be approximately 10 ft wide by 10 ft, 20 ft, or 40 ft in length. These different lengths would be suitable for spans of 10 ft, 20 ft, or 40 ft, and could cover holes or trenches of 100 ft^2 to 1,000 ft^2, 200 ft^2 to 2,800 ft^2, and 400 ft^2 to 3,200 ft^2 in size, respectively. For example, the 1,000-ft^2 MSEE would contain ten 10-ft roof panels, and 22 side panels around the perimeter. This MSEE would measure approximately 100 ft by 10 ft and would be a standard height of 20 ft.

The 3,200-ft^2 MSEE would be constructed using eight 40-ft-span roof panels and 24 wall panels around the perimeter. This MSEE would measure approximately 40 ft by 80 ft and would be a standard height of 20 ft.

The 2,800-ft^2 MSEE would contain up to fourteen 20-ft roof panels, and 32 wall panels around the perimeter. This MSEE, in its largest configuration, would measure approximately 140 ft by 20 ft and would be a standard height of 20 ft.

The length of any of the MSEE configurations could be adjusted by removing a number of wall and roof panels (i.e., the smallest configuration would be 100 ft^2). The conceptual design included in the Removal Alternative for the NDA contains a quantity of materials sufficient to construct six MSEE structures, two of each

size (span). The MSEE would also contain an internal chain hoist system capable of reaching to the bottom of the 60-foot-deep holes.

The MSEE would be equipped with a soil handling workstation. This station would include a soil vacuum system that would be used to remove loose soil and collect it in 55-gallon drums or B-25 boxes, depending upon known characteristics of the respective hole or trench from which the waste was being exhumed. This station would include shielding, a shield window, master-slave manipulators, and a waste container transfer system.

The MSEE also would be equipped with a Material Handling Workstation. This station would include shielding, a shield window, a console for operating the chain hoist system, master-slave manipulators, and a waste container transfer system.

The NDA MSEEs would be reused up to five times before replacement, equating to an approximate 3-year life expectancy. The shorter life span of the NDA MSEEs is based on the structures being assembled/disassembled numerous times.

WVDP Disposal Area Environmental Enclosure

Similar to the NDA Environmental Enclosure, the designed intent of the WVDP Disposal Area Environmental Enclosure would be to minimize airborne emissions caused by the excavation and removal of wastes from the WVDP Disposal Area of the NDA.

The conceptual WVDP Disposal Area Environmental Enclosure would be a single span, steel frame building with sheet-metal walls and roof. The foundations would be placed outside the perimeter of known waste burials, suggesting that the WVDP Disposal Area project would occur either before or following the removal of wastes from the NFS holes. The structure would be about 220 feet by about 200 feet, with an eave height of about 35 feet, large enough to allow use of heavy equipment inside. It would be well ventilated to prevent accumulation of exhaust fumes from operation of heavy equipment. The ventilation air discharge would be HEPA-filtered to mitigate the release of airborne radionuclides to the atmosphere.

2.7.2 Closure of Ancillary Surface and Subsurface Facilities

There are several surface and subsurface facilities associated with the NDA that would be decommissioned and removed as part of the Sitewide Removal Alternative. The surface facilities that would be removed consist of the remaining office trailers and the Liquid Pretreatment System. The subsurface facilities that would be removed consist of the inactive plant waterline, leachate transfer pipeline, the NDA Interceptor Trench, and the upgradient barrier wall.

The two office trailers to be removed are considered semi-portable offices, approximately 16 feet and 60 feet in length, respectively. The Liquid Pretreatment System consists of a Quonset style building, approximately 40 feet in width by 60 feet in length, and 20 feet in height, housing several treatment tanks of varying capacities. The building and trailers would be demolished using

standard construction equipment and practices, with the demolition debris being packaged in bulk and disposed of off site at a construction and demolition debris landfill.

The inactive plant waterline would be removed and disposed of at a construction and demolition debris landfill. Once the surface structures are demolished, there would be no further need for the SDA leachate transfer pipeline. This pipe and any potentially impacted bedding material, would be excavated and packaged in bulk as LSA waste.

The NDA interceptor trench would be decommissioned and removed. The NDA Interceptor Trench is approximately 850 feet in length and averages approximately 14 feet in depth. Removal would include excavation and segregation of surface materials for later use in the backfill. The stone trench bedding, piping, and fabrics that make up the trench would be excavated without shoring, since there would be no need to enter the excavation. The excavated material, including the trench manholes (7 in total) would be managed as LSA waste.

The Upgradient Barrier Wall installed in 2008 would be decommissioned and removed. The Barrier is approximately 854 ft in length and ranges from 14.3 to 25 ft in depth, with an average depth of 18.8 ft. Removal would include overexcavation of the placed materials and subsequent management of the excavated materials as LSA waste. The excavation would be performed with minimal shoring, as feasible, since there would be no need to enter the excavation.

Following excavation, the minimum amount of restoration work would be performed, assuming that the next phase of the NDA remediation would likely disturb this area once again.

2.7.3 Removal of Nuclear Fuel Services Waste Burial

Removal of NFS Special Holes

Excavation and removal of the lower activity wastes from the NFS special holes would be done under a tent-like primary confinement structure within the NDA Environmental Enclosure. Certain special holes and deep holes containing higher activity (GTCC) wastes would be excavated under the MSEE (as described above). In general, excavation would be performed using standard shielded excavation equipment. In cases where radiation fields in excess of 50 mR/hr are detected, remote controlled excavation would be utilized.

The existing geomembrane cover as well as the underlying cap soils and upper layers of overburden, would be excavated to an approximate depth of four feet. This soil would be placed into lift liners in intermodal type containers or in liftliners and directly into railcars, and would be managed as LSA waste.

The individual holes, or similar groups of holes, would be opened by excavating a vehicle access ramp at the end of the special hole down to the floor level of the hole. During excavation, leachate would be transferred to the Leachate Treatment

Facility for treatment and discharge. Depending upon moisture content, the bucket loads of soil might be transported to the Container Management Facility to be dried and processed, or might be sampled and placed directly into lift liners in intermodal type containers or gondola railcars. Waste containers, bare wastes, and waste materials commingled with soil that are excavated would be transported directly to the Container Management Facility for processing. Large debris and wastes may also be segmented in the excavation prior to transport.

For items expected to be classified as GTCC that could not be adequately processed within the MSEE, such as the dissolvers in Special Holes 9 and 72, the segments would be placed into appropriate containers, which would be closed, remotely wiped down, then transferred to the Container Management Facility where the containers would be reopened and processed. For other large items, such as the railroad car in Special Hole 72, the segments would be placed into B-25 boxes which would subsequently be closed, wiped down, then transferred to the Container Management Facility for further processing.

After all the special holes under the temporary confinement structure have been excavated, the temporary confinement structure would be dismantled then re-erected over the special holes to be excavated next.

Removal of Nuclear Fuel Services Deep Holes

In preparation of excavation of a deep hole, sheet piling would be driven around the hole to a depth of approximately 10 feet below the base of the planned excavation. The sheet piling would provide structural support of the surrounding till during the excavation process. An MSEE would then be constructed over the sheeted area. Overburden soils excavated in order to access the buried wastes would be staged within the NDA Environmental Enclosure, for later reuse as temporary backfill. The existing geomembrane cover would be loaded for disposal and managed as LSA waste.

Removal of wastes from the deep holes would be performed entirely within the MSEE, using the tools and processes described in Section 2.7.1. A hydraulic hammer would be used to break up hard objects, such as the concrete that was placed over the spent fuel in Deep Hole 48. The Z-mast would be able to extend to the bottom of the 60-foot-deep holes and would be designed to operate effectively when the masts are fully extended. Complementary hoisting equipment, independent from the remotely operated crane system, would also be used within the MSEE.

Bulk soil that was backfilled over the waste would be removed, to the extent possible, using an excavation bucket. Loose soil commingled with waste would be removed, whenever possible, by use of a vacuuming system. During vacuuming, the soil that is brought to the surface would be placed into 55-gallon drums. Overburden soil would be placed into lift liners and sealand containers or railcars, and managed as LSA waste. Interstitial soil and soil removed from the sides of the holes would be placed into 55-gallon drums because subsequent assay work could determine that they are GTCC wastes. The filled containers would be remotely closed, wiped down, and removed from the MSEE through an airlock. Real-time monitoring tools would also be employed to help segregate

high activity wastes. The loaded containers would then be transported to the Container Management Facility, to be opened and further processed.

After all the waste has been retrieved from a hole, contamination on the interior surfaces of the MSEE would be removed by remote wiping or immobilized with a spray-on fixative. The MSEE would then be removed and positioned over the next hole to be excavated. After the MSEE has been removed, the sheet piling would be extracted for re-use and some of the stockpiled overburden would be used to temporarily backfill the hole.

2.7.4 Removal of WVDP Waste Burials

Excavation of WVDP Burial Trenches

Since WVDP Trenches 1 through 5 contain wastes classifiable as being greater than Class A, these trenches would be excavated under the NDA Environmental Enclosure. The configuration of the NDA Environmental Enclosure would also cover WVDP Trenches 6 and 7, which are in close proximity to Trenches 1 through 5. WVDP Trenches 8 through 12 would be excavated under a less robust structure called the WVDP Environmental Enclosure. The WVDP Environmental Enclosure would be similar in construction to the NDA Environmental Enclosure, without the exterior shield walls. The existing geomembrane cover over this area would be removed simultaneously and managed with the cover soils as LSA waste.

The wastes in WVDP Trenches 1 through 7 would be removed in the same manner as the NFS Special Holes, as described above.

Upon completion of these excavation tasks, one large excavation cavity would remain. A MARSSIM Final Status Survey would be performed in this excavation before it is backfilled with appropriate backfill materials.

Excavation of WVDP Caissons

To the extent possible, free liquids would be pumped from the WVDP caissons to the Leachate Treatment Facility prior to the start of excavation work. WVDP disposal records indicate that drummed waste disposal occurred in Caisson 1, but records do not indicate that waste was placed in Caissons 2 through 4. If possible, the drums of waste would be removed intact using a crane and associated grappling attachment. An excavation bucket may also be used if necessary. Intact waste containers would be decontaminated, overpacked, and transported to the Container Management Facility for processing. If not intact, the drums and waste soil would be placed into B-25 boxes, which would be closed, decontaminated, and also transported to the Container Management Facility for processing. After the waste has been removed from a caisson, the floor of the caisson would be inspected using a CCTV camera lowered by the crane. Although wastes are not anticipated in Caissons 2 through 4, the caissons would be emptied and demolished. If waste is found to be present in Caissons 2 through 4, it would be removed and managed in a similar manner.

After all the waste has been retrieved from a caisson, the caisson would be demolished and the debris would be managed as LSA waste.

2.7.5 Remediation Completion and Closeout Activities

After the waste has been removed from the deep holes, special holes, and WVDP trenches, the burial area would be excavated to a depth below the bottoms of the disposal holes using standard excavation equipment. This excavation would encompass subsurface barriers installed to support remediation. This soil would be placed into lift liners in intermodal type containers or in gondola railcars, and sampled for waste characterization purposes, and then managed as LSA waste. Under this mass excavation assumption, the former NDA lagoon would have also been removed and managed as LSA waste.

The NDA Environmental Enclosure and the WVDP Disposal Area Environmental Enclosure would be demolished after all necessary post-excavation surveys have been completed, regulatory approval has been obtained, and backfilling is either complete or underway. The enclosure would be demolished by conventional demolition equipment, such as hydraulic excavators equipped with demolition hammers and shears. The demolition debris would be managed as LSA waste.

Used equipment, such as the MSEE, remote- and manually operated excavation equipment, the Z-mast excavator, overhead crane systems, etc. would be size-reduced, as needed, and managed as LSA waste.

Once the facility and associated equipment have been removed, any contaminated soil generated during demolition would be managed as LSA waste. A MARSSIM Final Status Survey would be performed in the area impacted by demolition of the enclosure to establish that residual radioactivity levels do not exceed the established DCGLs.

2.7.6 Mitigative Measures

There are numerous mitigative measures employed during the WMA 7 Remediation intended to mitigate or eliminate human and ecological exposure to the chemicals and radionuclides of concern. Several of the mitigative measures are provided in the form of engineering controls, such as:

- Construction of the Modular Shielded Environmental Enclosure (primary containment) and the NDA Environmental Enclosure (secondary containment);
- filtration of all discharged air through high-efficiency particulate air (HEPA) filters;
- construction of an upgradient overburden barrier and drain designed to minimize the volume of leachate needed to be handled; and
- containment and collection of leachate, and pretreatment using the Leachate Treatment Facility.

In addition, several mitigative measures are incorporated into the works in the form of administrative controls, such as:

- Implementation of safety procedures including consideration of ALARA as the radiation exposure goal for all remedial work; and
- Screening and surveying the work in progress in order to be certain that exposures are mitigated and the DCGLs are met prior to completing remediation.

2.8 WMA 8: New York State-Licensed Disposal Area and Associated Facilities

The work planned at WMA 8 consists of removal, packaging, characterization, and disposal of the wastes buried in trenches at the New York State-Licensed Disposal Area (SDA). Implementation of the proposed remedial activities at the SDA would also involve the installation, operation, and ultimately, removal of numerous Remediation Support Facilities. The layout of the SDA is illustrated in Figure 2-36.

The general sequence of remedial activities would include: 1) removal of the waste materials conducted under appropriate environmental enclosures, 2) temporary backfilling of the waste excavations using stockpiled cover material to maintain safety and structural control, 3) performance of an area-wide excavation to the depth of waste burial. The limits of the area-wide excavation would be supported by a MARSSIM survey. The area-wide excavation would be restored upon receipt of regulatory approval using appropriate backfill material.

The remedial activities planned at WMA 8 under the Sitewide Removal Alternative are discussed in detail in the following sections.

2.8.1 Remediation Support Activities

SDA Environmental Enclosures

Removal of wastes from the SDA would be performed within environmental enclosures, providing secondary containment against airborne discharges of radionuclides. The environmental enclosures were deemed necessary for the excavation project since the SDA trenches are known to contain wastes classifiable as greater than Class A.

The SDA remediation would be performed in two parts, and therefore, two separate enclosures would be constructed over the SDA: one over the northern Trenches 1 through 7 (North SDA Environmental Enclosure); and one over the southern Trenches 8 through 14 (South SDA Environmental Enclosure). The general construction specifics of both enclosures would be essentially identical to that of the NDA Environmental Enclosure, as discussed in Section 2.7.1. The layout and general cross-section of the conceptual North SDA Environmental Enclosure is illustrated in Figure 2-37. The layout and general cross-section of the conceptual South SDA Environmental Enclosure is illustrated in Figure 2-38.

The North SDA Environmental Enclosure would be a single-span steel frame building with one-foot-thick reinforced concrete exterior walls, and a metal roof.

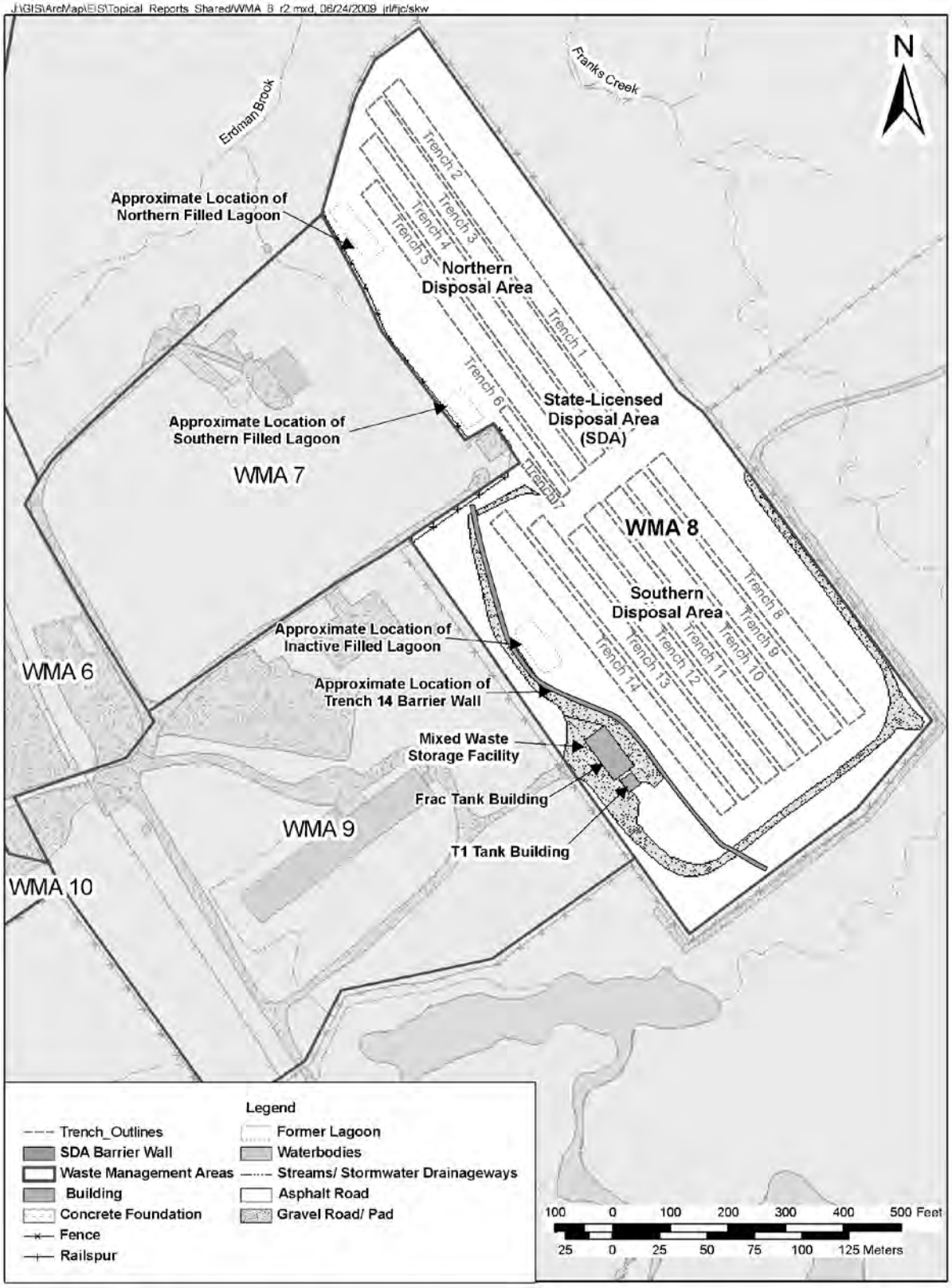


Figure 2-36. WMA 8 - SDA and Associated Facilities

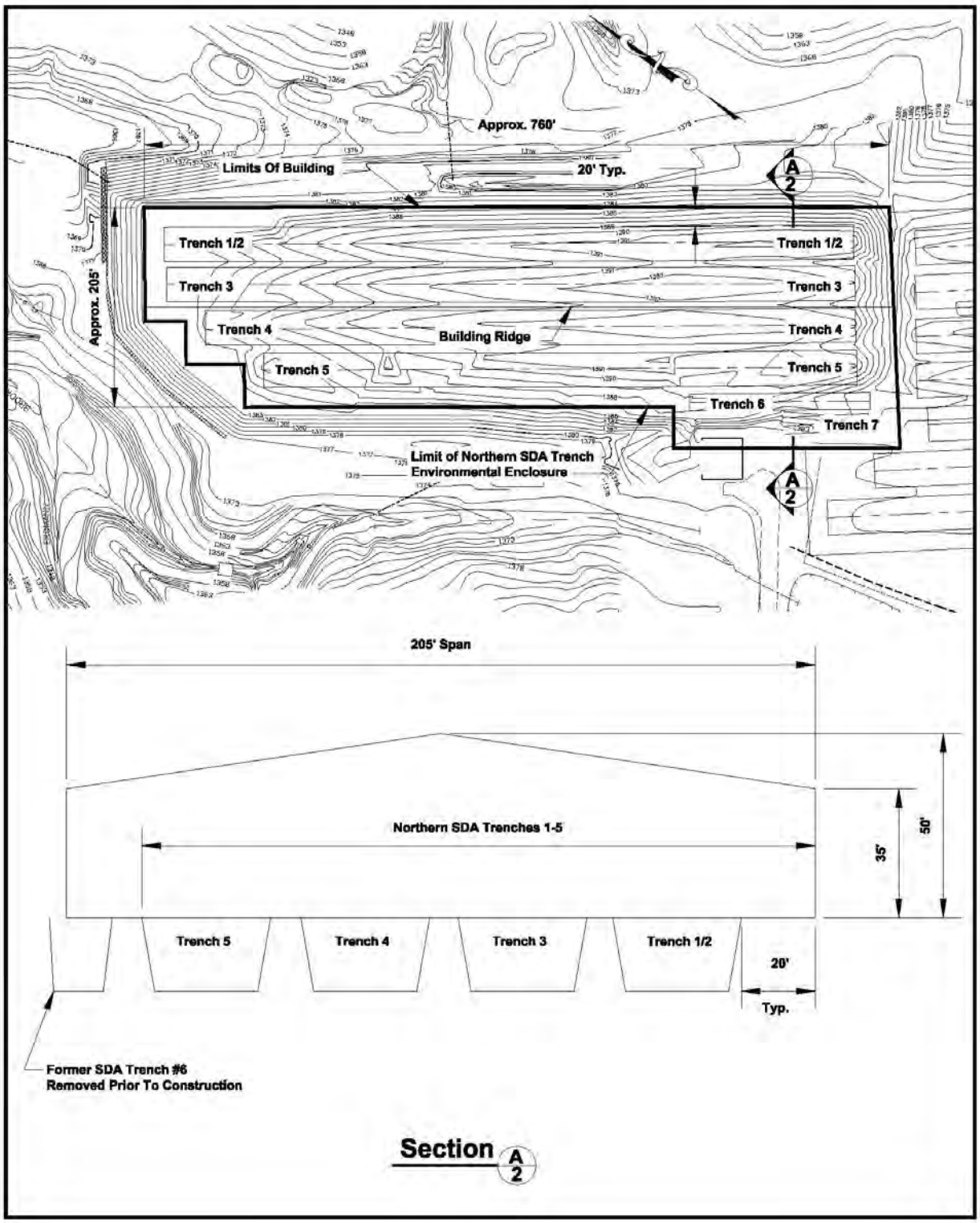


Figure 2-37. Conceptual North SDA Environmental Enclosure

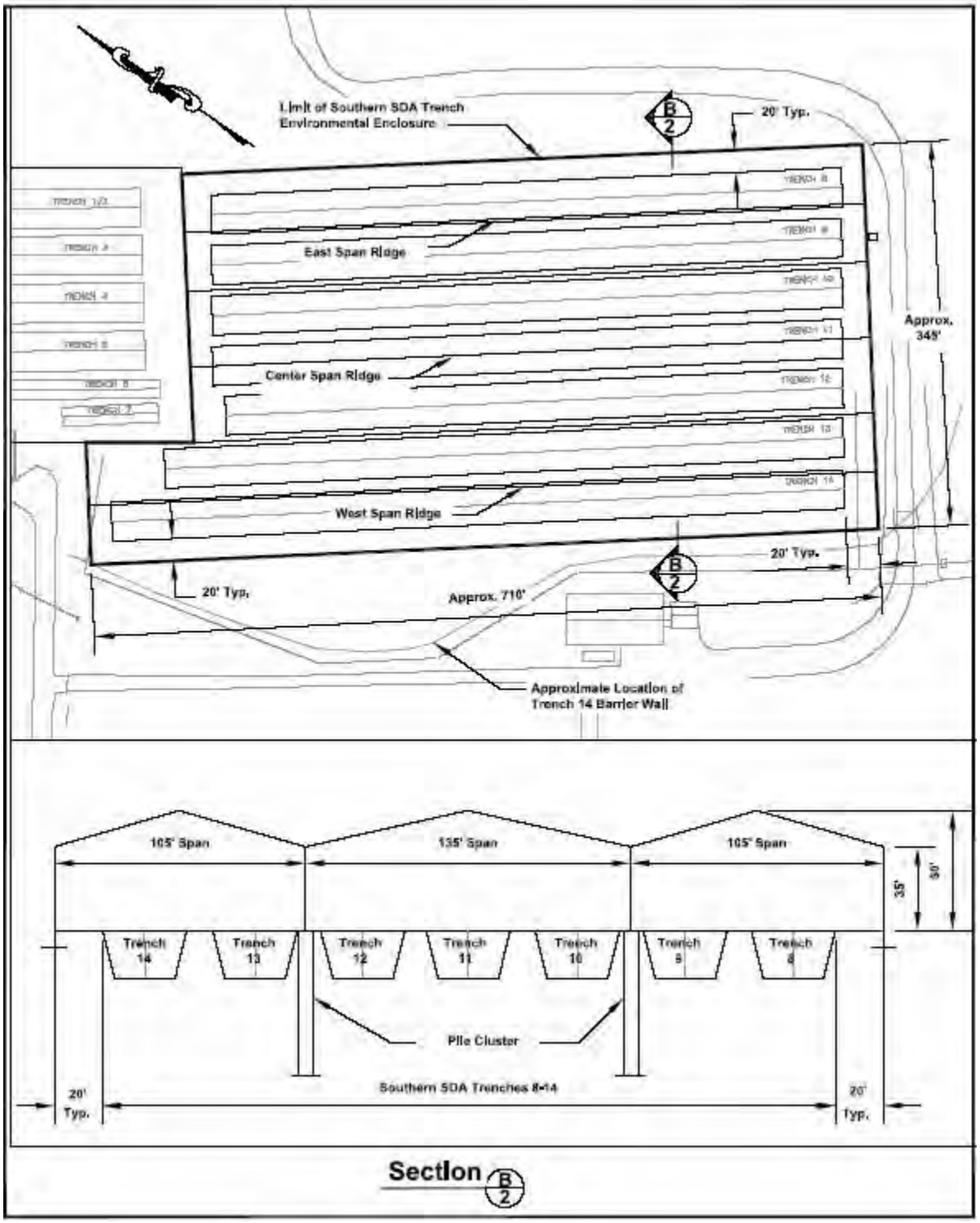


Figure 2-38. Conceptual South SDA Environmental Enclosure

The building would be approximately 156,000 ft^2 in size, and the perimeter foundations would be placed outside the perimeter of known waste burials. The building would be equipped with heating, ventilation, electrical, fire protection, and closed circuit television monitoring equipment. The ventilation air discharge would be HEPA-filtered to prevent release of airborne radionuclides to the atmosphere.

The South SDA Environmental Enclosure would be similar in construction to the North SDA Environmental Enclosure, but due to the width of the SDA in this area, the building would be a tri-span steel frame building approximately 245,000 ft^2 in size. Pile foundations would be required to support the interior column lines. The pile foundations would be located between Trenches 9 and 10, and between Trenches 12 and 13. The piles would be driven to approximately 30 feet below grade.

Modular Shielded Environmental Enclosures

Similar to the process employed for the NDA removal, the SDA removal would be performed within a Modular Shielded Environmental Enclosure (MSEE) when high radiation fields are expected. The SDA MSEE, similar to the structure used for the NDA, would be constructed of modular panels, allowing flexibility in size and assembly, as discussed in Section 2.7.1.

The SDA MSEE structures were configured to fit the SDA trenches based on the perimeter of each trench. For example, Trench 3 with a length of approximately 700 ft and a width of approximately 33 ft, would have a perimeter of almost 1,500 ft. Based on this perimeter, a total of 76 partially shielded wall panels (20 ft each) and 36 unshielded roof panels (20 ft by 40 ft) would be needed. This MSEE would be approximately 720 ft in length and would be used for Trenches 1 and 2, as well as for Trench 3.

Other MSEE lengths that would be constructed are: Trench 4 (and reused for 14), 700 ft in length; Trench 13 (and reused for 5), 640 ft in length; Trench 8 (and reused for 9), 600 ft in length; Trench 10 (and reused for 11), 580 ft in length; and Trench 12 (not reused), 580 ft in length.

Similarly, Trench 6, with a length of approximately 10 ft, would have a perimeter of approximately 420 ft. Based on this perimeter, a total of 22 fully shielded wall panels and 10 shielded roof panels would be needed. This MSEE would subsequently be utilized for the Trench 7 removals, as well.

In summary, the conceptual design included in the Removal Alternative contains a quantity of materials sufficient to construct MSEE structures over half (7) of the SDA trenches. The SDA MSEEs are expected to be reused one time (one MSEE used to excavate two trenches each) during an anticipated seven-year life expectancy. Six Z-mast cranes will be purchased to support the SDA remediation. Three of the cranes would be used concurrently with the remaining cranes as backup to minimize downtime associated with repairs and maintenance. The MSEEs and cranes would subsequently be reused, to complete the remainder of the trenches.

SDA Lagoon Environmental Enclosures

A pre-engineered, sheet metal confinement structure would be constructed over each of the three filled lagoons. The conceptual lagoon confinement structures would be single span, steel frame buildings with sheet metal walls and roof. The foundations would be placed outside the perimeter of the lagoon to be excavated. Each of the structures would be about 140 feet by about 120 feet, with an eave height of about 25 feet, large enough to allow use of heavy equipment inside. It would be well ventilated to prevent accumulation of exhaust fumes from operation of heavy equipment. The ventilation air discharge would be HEPA-filtered to prevent release of airborne radionuclides to the atmosphere. Electrical lighting would be included to support the work to be performed inside.

Leachate Treatment Facility

The LTF discussed in Section 2.7.1, would be a new stand alone facility designed to process the aqueous leachate from the SDA trenches as well as from the holes and trenches in the NDA. The LTF is capable of removing suspended solids by filtration, organics by biological degradation and adsorption, and dissolved radionuclides by ion-exchange. Tritium, which is found mainly in the SDA leachate, is not removed in the LTF process. The LTF is designed to allow batches to undergo multiple treatment runs when necessary, prior to discharge to the LLWTF for final treatment and discharge.

Container Management Facility

The CMF, discussed in Section 2.7.1, would also be a new stand alone facility designed to process the solid wastes excavated from the SDA and NDA. It would be capable of receiving the wastes directly from the excavation face, and processing the wastes completely for transportation and disposal.

Geophysical Investigation

Locations of the filled lagoons and the exact locations of the 19 special purpose holes within the Trench 6 area are not precisely mapped. Through geophysical investigation of the burial locations, to the extent practical, would be processed to define limits of waste disposal and determination the proper locations for construction of environmental enclosures and installation of shoring for trench excavation.

2.8.2 Closure of Ancillary Surface and Subsurface Facilities

If not previously removed, liquid stored in the Mixed Waste Storage Facility Tank T-1 would be transferred and treated in the Leachate Treatment Facility. After the liquid has been removed, Tank T-1 and associated equipment in the Mixed Waste Storage Facility would be segmented and managed as LSA waste. A spray fixative would be applied to the interior surfaces of the facility and it would be demolished with the debris managed as LSA waste. Tanks T-2 and T-3 were never used and will be segmented and managed as CDD waste.

2.8.3 Removal of Filled SDA Lagoons

The existing geomembrane cover and layers of cap materials and overburden over each of the lagoons, approximately four feet in thickness, would be excavated using standard excavation equipment, and managed as LSA waste. The excavation would then continue into the underlying fill material. High radiation fields are not expected during this work, therefore remote-operated equipment is not anticipated for excavation of the filled lagoons.

In general, the excavation progress would be controlled using support surveys, by screening excavated material and providing a bucket by bucket screening of the extent of contamination. The contaminated excavated material would be placed directly into waste containers and would likely be managed as LSA waste.

2.8.4 Removal of SDA Waste Trenches

Although the SDA remediation is performed in two parts within each of the environmental enclosures, since the process employed is identical for each, a single discussion of the process will be presented.

The existing geomembrane cover as well as the underlying soil cap, estimated at approximately four feet in thickness, would be excavated and managed according to the remediation support survey findings. Soils from the cap that are identified as contaminated would be placed directly into waste containers for disposal. These soils are expected to contain only low levels of radioactivity and would therefore be managed as LSA waste. Some of this soil may be stockpiled within the SDA Environmental Enclosure for reuse as temporary trench backfill, discussed later in this section.

As each trench is being prepared for excavation, sheet piling would be driven around it to a depth of approximately 10 feet below the base of the planned excavation, using a drop hammer or similar equipment. A crane would then be used to position each of the panels of the MSEE (described in Section 2.7.1), onto the sheet piling and over the trench, to create the primary containment against high-activity environmental releases.

Removal of wastes from the 20-foot-deep trenches would be performed entirely within the MSEE, using the tools and processes described in Section 2.7.1. Overburden soils excavated in order to access the buried wastes would be staged within the SDA Environmental Enclosures, for later reuse as temporary backfill. The Z-mast would be able to extend to the bottom of the trenches and would be designed to operate effectively when the masts are fully extended. Complementary hoisting equipment, independent from the remotely operated crane system, would also be used within the MSEE.

Using the same process employed under the NDA waste removals, all the material bounded within the sheet piling would be systematically excavated. Material brought to the surface would be placed into waste containers, such as B-25 boxes, which would be closed and secured, decontaminated, and transferred to the Container Management Facility for further processing.

Leachate encountered during the waste removal process would be pumped to the Leachate Treatment Facility.

Because the surrounding till is expected to be contaminated, the excavations would extend both laterally to the sheet piling placed around the trench, and down a short distance below the original bottom of the trench, as necessary. The primary objective would be to ensure that all high activity wastes have been removed, allowing the remainder of the excavation to proceed using standard excavation equipment within only the confines of the SDA Environmental Enclosure.

Whenever radiation fields are detected in excess of 50 mR/hr, operations would be performed remotely. Approximately 10% of the waste volume in the SDA is estimated to have contact exposure rates in excess of 50 mR/hr. To keep radiation exposures ALARA, remote operation could be performed when less intense radiation fields are encountered. Conceptually, the control room for the remote operations would be located in the Container Management Facility, with observation capabilities being provided by CCTV cameras inside the MSEE and on excavation equipment lowered into the trench.

After the waste has been retrieved from a trench, the interior surfaces of the MSEE would be decontaminated to the maximum reasonable extent by remote wiping. The MSEE would be removed from the completed trench and positioned over the next trench to be excavated. After the MSEE has been removed, the sheet piling would be extracted and retained for re-use. During this trench completion process, the overburden soils removed to gain access to the buried wastes (staged within the SDA Environmental Enclosure) would be used as temporary trench backfill.

The SDA Environmental Enclosures would remain until excavation work in the SDA has been completed. After the higher activity wastes have been removed from SDA Trenches, the entire burial area would be excavated to remove soils remaining from between the trenches as well as soil from below the trenches, using standard excavation equipment. This excavation would encompass subsurface barriers installed prior to remedial work, and would include the subsurface concrete wall and soil-bentonite barrier wall previously installed along the west side of Trench 14. Since the higher activity wastes would have been removed, this soil would be placed directly into waste containers and managed as LSA waste.

2.8.5 Remediation Completion and Closeout Activities

The used equipment would consist of the MSEE, remote- and manually operated excavation equipment, Z-mast excavator, and overhead crane systems. These pieces of equipment would be segmented, as necessary, and managed as LSA waste.

A large excavation would exist after the waste and contaminated soil was removed from the SDA Trenches. A MARSSIM Final Status Survey would be performed in the excavation to verify that residual radioactivity levels do not exceed the established DCGLs. Residual levels would also be compared against New York State Department of Environmental Conservation (NYSDEC) Cleanup Guidelines for Soils Contaminated with Radioactive Materials, DSHM-

RAD-0501 (formerly TAGM 4003), as applicable, until NYSDEC adopts regulations compatible with the NRC's License Termination Rule. An independent verification survey may also be required by the overseeing regulatory agencies. After the verification survey is complete and regulatory approval is received, the area would be backfilled with clean soils and graded, as necessary, to restore the approximate natural grade.

The SDA Environmental Enclosures would be demolished after all necessary post-excavation surveys have been completed, regulatory approval has been obtained, and backfilling is either complete or underway. The ventilation system HEPA filters of the environmental enclosure would be removed by bag-out procedures. The ventilation system equipment would then be selectively demolished and transferred to the Container Management Facility for processing. These wastes are expected to be managed as LSA waste.

The interior surfaces of the environmental enclosure would be expected to be slightly contaminated. Therefore, they would be thoroughly surveyed, and residual contamination would be spray fixed, as necessary to allow demolition of the structure without confinement. The enclosure would be manually demolished with hydraulic excavators equipped with demolition hammers. The debris would be characterized and is expected to be managed as LSA waste.

Once the facility has been demolished, any contaminated soil generated during demolition would be removed and managed as LSA waste. A final status survey would be performed in the area impacted by demolition of the enclosure to establish that residual radioactivity levels do not exceed the established DCGLs. A chemical survey would also be performed to verify that hazardous constituents are below appropriate regulatory guidance values.

2.8.6 Mitigative Measures

There are numerous mitigative measures employed during the WMA 8 Remediation intended to mitigate or eliminate human and ecological exposure to the chemicals and radionuclides of concern. Several of the mitigative measures are provided in the form of engineering controls, such as:

- Construction of the Modular Shielded Environmental Enclosure (primary containment) and the SDA Environmental Enclosures (secondary containment);
- Filtration of all discharged air through HEPA filters; and
- Containment and collection of leachate, and pretreatment using the Leachate Treatment Facility.

In addition, several mitigative measures are incorporated into the works in the form of administrative controls, such as:

- Implementation of safety procedures including consideration of ALARA as the radiation exposure goal for all remedial work; and

- Screening and surveying the work in progress in order to ensure that exposures are mitigated and the DCGLs are met prior to completing remediation.

2.9 WMA 9: Radwaste Treatment System Drum Cell Area

The location of the Radwaste Treatment System Drum Cell Area (Drum Cell) is shown on Figure 2-39. The Drum Cell building would be removed along with the associated instrumentation and monitoring shed.

2.9.1 Remediation Support Activities

Support elements for the Drum Cell remediation would typically be limited to characterization screening and sampling to confirm the boundaries of contamination, as required.

2.9.2 Removal of Drum Cell Building

The Drum Cell building would be demolished, along with the concrete drum supports and foundations. Demolition would be performed using standard demolition equipment without any type of secondary confinement. The building superstructure, constructed mainly of steel, would be dismantled, and the components segmented using a shear attachment on an excavator. The concrete drum supports and building foundation would be demolished using an excavator with a demolition hammer attachment. The demolition debris would then be removed using a front-end loader, or similar equipment. The demolition debris would be directly loaded into waste containers and managed as CDD waste.

2.9.3 Removal of the Subcontractor Maintenance Area

The subcontractor trailers would be demolished using standard means and methods. The demolition debris would be managed as CDD waste. The Subcontractor Maintenance Area had been used to clean asphalt-paving and concrete equipment. Diesel fuel was reportedly used to clean various pieces of this equipment, however, subsequent remedial work is assumed to have removed any presence of contamination. Therefore, the gravel pad would be managed as CDD waste.

2.9.4 Remediation Completion and Closeout Activities

The NDA hardstand staging area and the NDA Trench Soil Container Area might be useful during remediation of the NDA. Therefore, these surface pads would be left in place during the NDA and WMA 9 removal projects. Upon completion of the waste removals, these pads would be excavated, and managed as LSA waste.

After the completion of this removal work, a MARSSIM Final Status Survey would be performed in the excavation areas. Arrangements would also be made for independent verification surveys, if required. After satisfactory completion of the surveys, the excavation areas would then be filled with clean soil. The area would then would be seeded and fertilized to help restore the area to a near natural appearance.

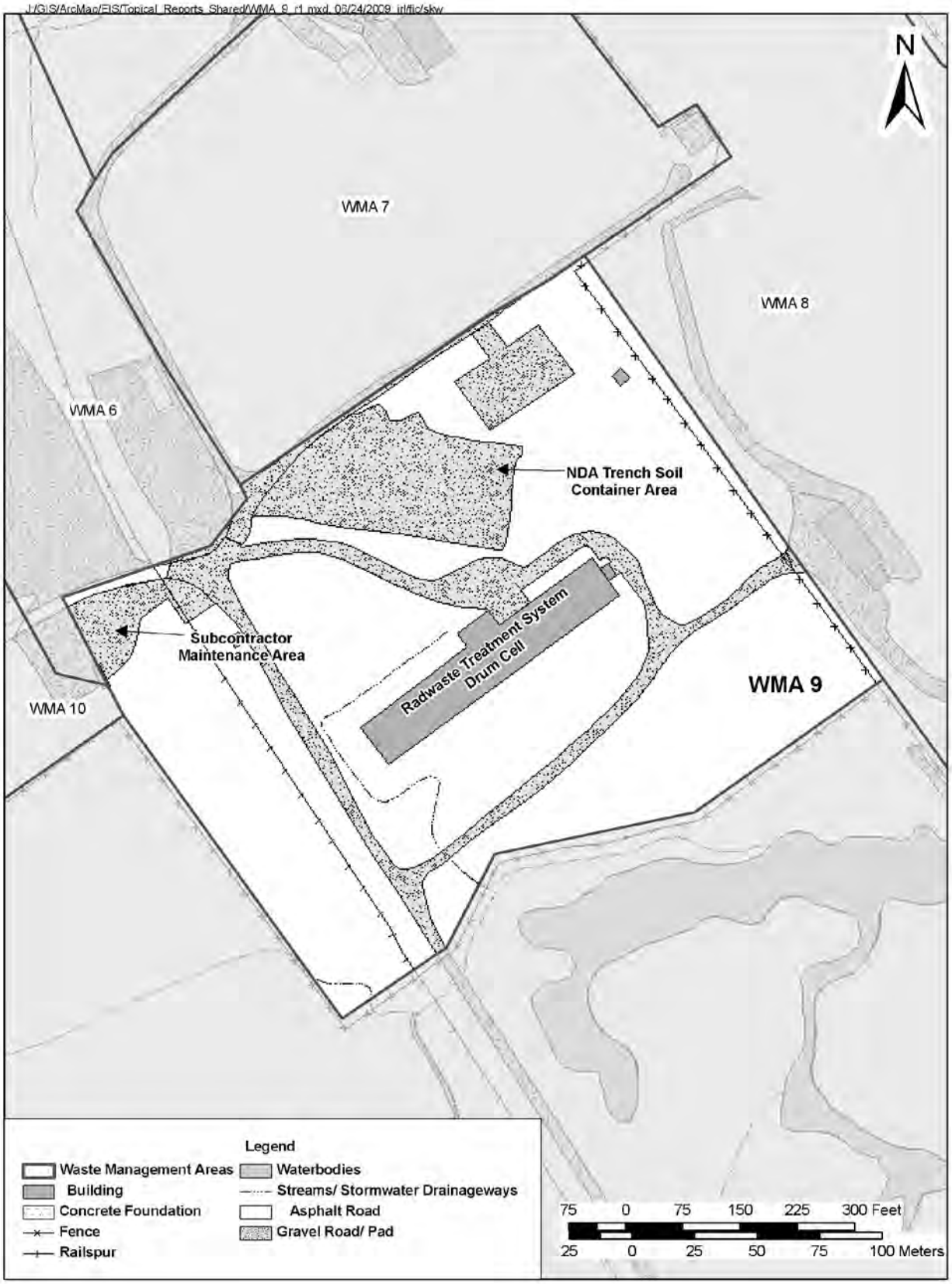


Figure 2-39. WMA 9 - Radwaste Treatment System Drum Cell

2.9.5 Mitigative Measures

Standard engineering controls would be employed at WMA 9 to mitigate airborne and aqueous emissions, and protect the workers, public, and environment from unnecessary exposure to contaminants. Some examples are included in the following:

- water mists would be used during the concrete and steel demolition tasks to minimize dusts;
- Dust-suppression measures would be employed during waste transportation activities, mitigating the dust generation during transportation related work;
- Silt fencing would be installed prior to ground disturbance to ensure that sediment-laden surface waters are appropriately filtered prior to joining the perimeter streams and waterways;
- heavy equipment would be equipped with mufflers for noise reduction; and
- safety planning would be a prerequisite to all site tasks, ensuring that all workers are aware of the hazards involved in the work.

2.10 WMA 10: Support and Services Area

The location of the Support and Services Area and related facilities is shown on Figure 2-40.

2.10.1 Remediation Support Activities

The work planned for this WMA under the Sitewide Removal Alternative is relatively simple in terms of construction complexity. In general, all wastes that are expected to be generated during remediation would classified as CDD. Therefore the work can be completed without confinement, using standard construction techniques. In addition, remediation support activities would be limited to implementation of the site Health and Safety procedures, sediment and erosion control procedures, and similar standard construction preparation activities.

2.10.2 Removal of Surface Structures

New Warehouse

The New Warehouse is expected to be standing at the start of work to this removal alternative. This structure would be demolished through the use of a hydraulic crane and front-end loader. The resulting demolition debris would be collected and disposed of as CDD. It is assumed that only the foundation wall and the floor slab would be removed, leaving the piers and footings in place. The wall block and slab would be demolished with hydraulic hammers and a front-end loader. The demolition debris would be managed as CDD waste.

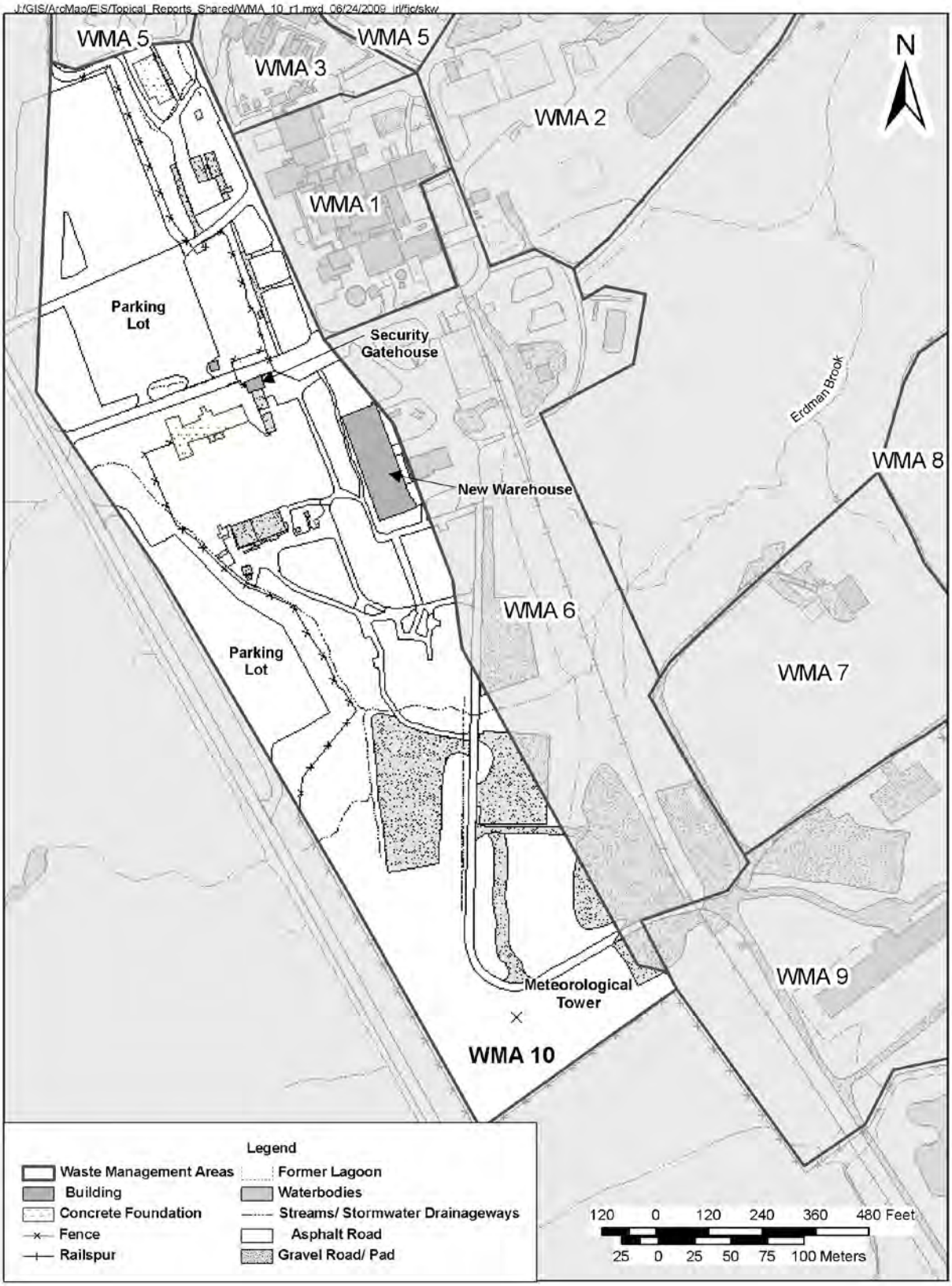


Figure 2-40. WMA 10 - Support and Services Area

Meteorological Tower

The Meteorological Tower is triangular steel tube (14-gauge steel, 1.5-inch OD) structure that is approximately 200 feet high. The tower is made up of three sections which are connected to form a triangle, approximately 18 inches on a side. The tower is supported by nine, ¼-inch guy-wires. The tower and guy wires would be removed using a hydraulic crane. A five-foot by 12-foot by six-inch-thick concrete pad, that is used to support meteorological equipment, would also be removed. The three guy-wire concrete anchor pads would be left in place. Both support pads would be demolished through the use of hydraulic hammers and a front-end loader. The demolition debris would be managed as CDD waste.

Security Gatehouse

The Main Security Gatehouse building and foundation would be removed in this alternative. The gatehouse is approximately 34 feet by 20 feet by nine feet high at the edge of the roof, with a concrete floor, concrete block walls, and a built-up roof with metal deck. The foundation is a six-inch-thick concrete pad. The gatehouse building would be removed through the use of a hydraulic crane and front-end loader. The foundation would be removed using hydraulic hammers and a front-end loader. The demolition debris would be managed as CDD waste.

Security Fencing

A barbed-wire security fence runs along the perimeter of the WNYNSC property line and the public roads running into it. This fence consists of three strands of barbed wire supported by metal posts, with spacing of about 20 feet. The fencing has a total running length of approximately 125,000 linear feet. The fence would be removed through the use of a backhoe loader. The demolition debris would be managed as CDD waste.

Another steel security fence surrounds the WVDP, the SDA, and miscellaneous other locations. It is made of galvanized steel chain link with galvanized steel pipe posts, with a spacing of about 10 feet. The fence is seven feet high with a total length of 25,000 feet. Three strands of barbed wire are stretched across the top of the fence. The posts are set in concrete footings six inches in diameter and five feet deep. The fence would be removed through the use of a backhoe loader. The demolition debris would be managed as CDD waste.

2.10.3 Removal of Concrete Floor Slabs

The floor slabs for the Administration Building, the Expanded Environmental Lab, the Fabrication Shop, and the Diesel Fuel Storage Building would all be removed as part of this alternative.

For the Administration Building, the concrete piers that support the adjacent trailers, the Conference Room, entrance area to the Conference Room, and the corridors between the building and trailers would also be removed during this phase of work. It is assumed that only the upper two feet of the piers would be

removed, leaving the rest of the piers in the ground. The piers and slabs would be removed through the use of pneumatic hammers and front-end loader.

For the purposes of this alternative it is assumed that the building structures for the Expanded Environmental Lab and its addition would be removed prior to the start of work to this alternative, leaving only the floor supports to be demolished. The lab floor is supported by 72 concrete piers and the addition is supported by a 90-foot by two-foot concrete slab. It is assumed that only the upper two feet of the piers and the foundation would be removed, through the use of pneumatic hammers and a front-end loader.

It is assumed that the Fabrication Shop would be removed prior to the start of work to this removal alternative, with only its floor slab remaining. This slab would be removed through the use of pneumatic hammer and front-end loader.

For this alternative, it is assumed that the diesel fuel storage tank and day tank would have been removed prior to the start of work, with only the concrete foundation remaining. The slab would be removed using a pneumatic hammer and front-end loader.

2.10.4 Remediation Completion and Closeout Activities

A MARSSIM Final Status Survey would be performed following the removal of surface structures; to verify that residual radioactivity levels do not exceed the established DCGLs. An independent verification may also be required by the overseeing agencies.

After the verification survey is complete and regulatory approval is received, the area would be backfilled with clean soil and graded. Finally, seed and mulch would be applied over the graded area.

2.10.5 Mitigative Measures

Due to the concrete-demolition work proposed for WMA 10, sediment control and dust-suppression measures would be employed to reduce the amount of exposed soil that would be airborne or would be carried away in storm water runoff. The heavy equipment used in the demolition activities would also be equipped with mufflers.

2.11 WMA 11: Bulk Storage Warehouse and Hydrofracture Test Well Area

The Location of Bulk Storage Warehouse and Hydrofracture Test Well Area is shown on Figure 2-41. Also illustrated on the figure is the location of the scrap material landfill within WMA 11.

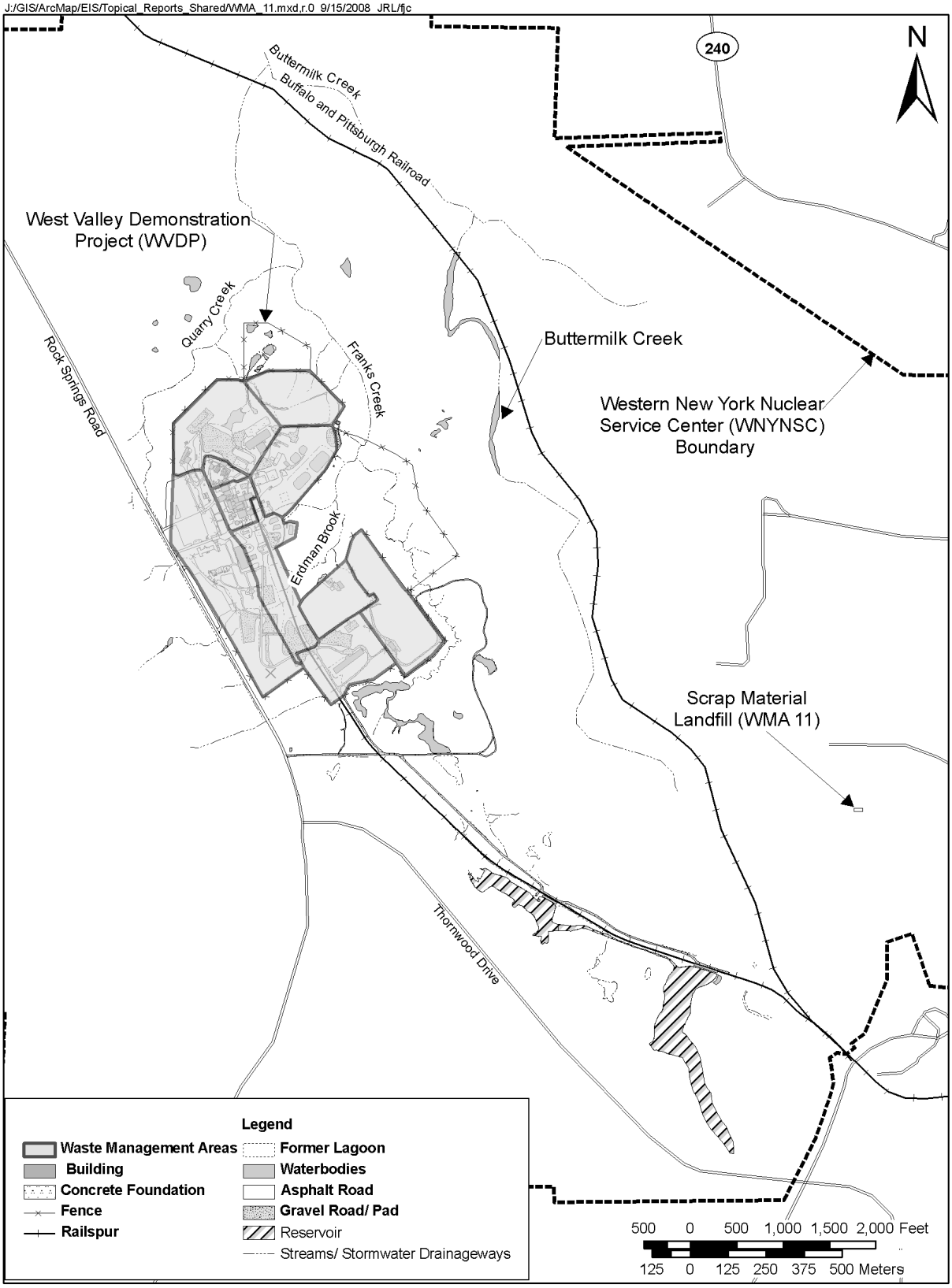


Figure 2-41. WMA 11- Bulk Storage Warehouse and Hydrofracture Test Well Area

2.11.1 Remediation Support Activities

The work planned for this WMA under the Sitewide Removal Alternative is relatively simple in terms of construction complexity. In general, all wastes that are expected to be generated during remediation would be classified as CDD. Therefore the work can be completed without confinement, using standard construction techniques. In addition, remediation support activities would be limited to implementation of the site Health and Safety procedures, sediment and erosion control procedures, and similar standard construction preparation activities.

2.11.2 Removal of the Scrap Material Landfill Waste

The Scrap Material Landfill overburden would be removed and stockpiled nearby, exposing the buried waste. This waste would then be excavated and is expected to be managed as CDD waste. The excavation would then be filled with clean fill and the original overburden replaced.

2.11.3 Remediation Completion and Closeout Activities

Once closure activities have been completed, a MARSSIM Final Status Survey would be conducted to verify that residual radioactivity levels do not exceed the established DCGLs. An independent verification survey may also be required.

After a satisfactory survey has been completed, the area would be graded level. Seed and fertilizer would then be applied to restore the area to near natural appearance.

2.11.4 Mitigative Measures

Numerous standard engineering controls would be employed at WMA 11 to mitigate airborne and aqueous emissions, and protect the workers, public, and environment from unnecessary exposure to contaminants. Some examples are included in the following:

- Dust-suppression measures would be employed during concrete demolition and waste excavation, loading, and transportation activities to reduce the generation and dissemination of dust;
- Silt fencing would be installed prior to ground disturbance to ensure that sediment-laden surface waters are appropriately filtered prior to joining the perimeter streams and waterways;
- Heavy equipment would be equipped with mufflers for noise reduction; and
- Safety planning would be a prerequisite to all site tasks, ensuring that all workers are aware of the hazards involved in the work.

2.12 WMA 12: Balance of Site

The location of WMA 12, and specifically the dams and reservoirs and the railroad spur, is illustrated in Figure 2-42.

2.12.1 Remediation Support Activities

The work planned for this WMA under the Sitewide Removal Alternative is relatively simple in terms of construction complexity. In general, all wastes that are expected to be generated during remediation would be classified as Class A, LSA, or CDD. Therefore the work can be completed without confinement, using standard construction techniques. In addition, remediation support activities would be limited to implementation of the site Health and Safety procedures, sediment and erosion control procedures, and similar standard construction preparation activities.

2.12.2 Removal of Dams and Reservoirs

There two water supply reservoirs located in WMA 12, the South Reservoir and the North Reservoir. A 75-foot-high earthen dam confines the South Reservoir, while a 50-foot-high earthen dam confines the North Reservoir. The South Reservoir drains to the North Reservoir through a short canal. The North Reservoir has a control structure and pump house to regulate water level. The dams and reservoirs would be closed in accordance with applicable state and federal regulations and approvals from the NYSDEC, the NYSDOH, and the USEPA. The reservoirs would be slowly drained to prevent unnecessary disturbance of sediment downstream. After the water level has been lowered, the control structure, pump house, and pipe would be demolished.

After the water level has been lowered, Dam 1 would be excavated first to allow for truck traffic over Dam 2. Both Dams would be excavated through the use of a hydraulic excavator and front-end loader. All excavated soil would be transported to an on-site lay down area, for subsequent disposal as CDD.

The steel bridge that spans across Reservoir 2 would also be removed for this alternative. The steel surface area of the reservoir bridge was based on an expanded steel bridge, actual cutting surface assumed to be 2/3 of the surface area. Bridge support trusses were given an assumed one-foot thickness. The bridge would be sectioned through the use of a cutting torch. These sections would be collected and disposed of as CDD.

2.12.3 Removal of Railroad Spur

The Railroad Spur that serviced the WVDP site would be dismantled and removed. This line runs from the Fuel Reprocessing and Storage Building to a rail line junction, northeast of Riceville Station. A portion of this spur would be removed as part of the remedial efforts proposed for WMA 6. The actions proposed for this WMA (WMA 12) would be concerned with the portion that runs from the fence line near the Rail Packaging and Storage Area to the junction with the main rail line. The length of this section is approximately 6,500 feet.

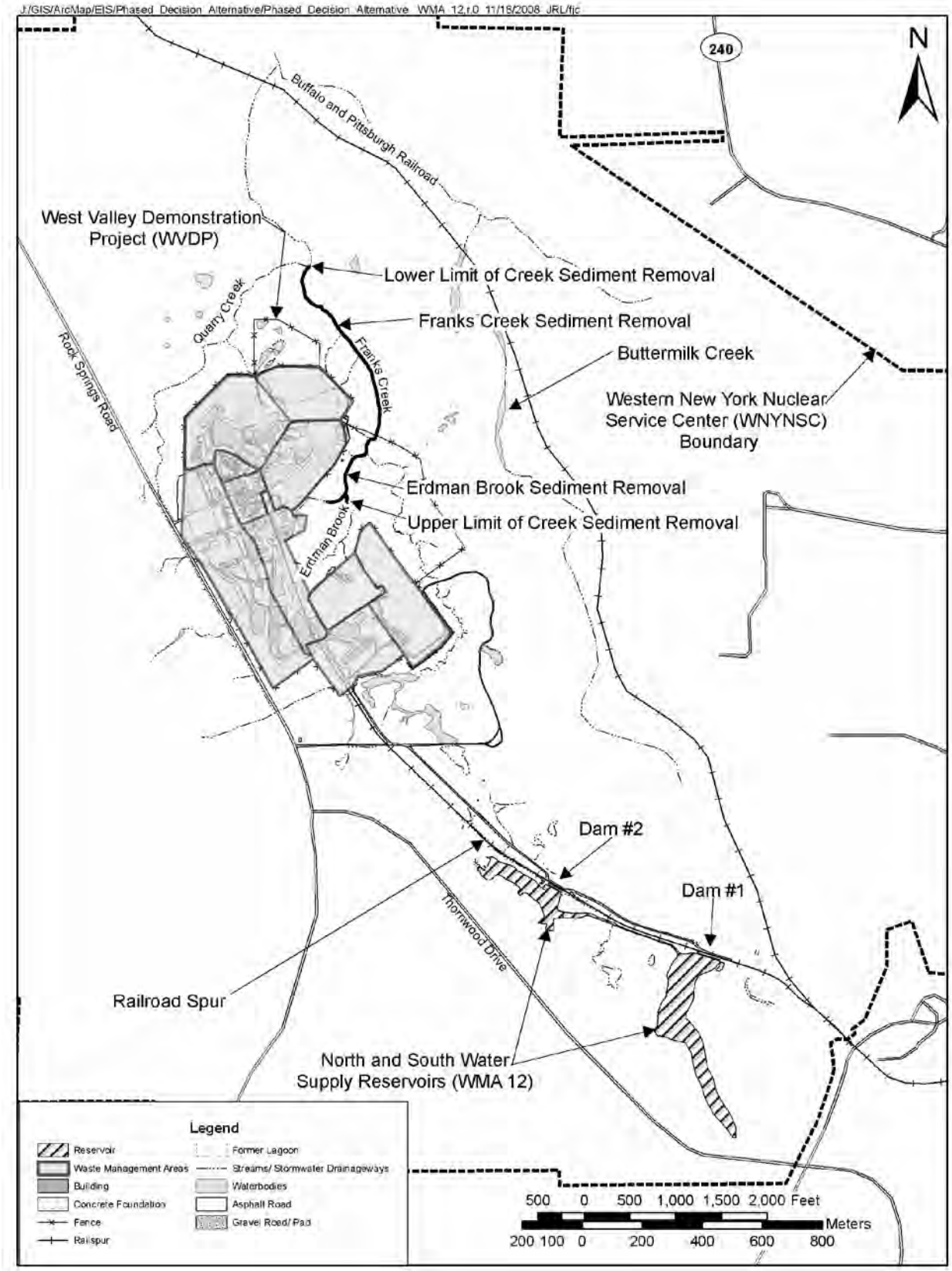


Figure 2-42. WMA 12 - Balance of Site

As part of the removal alternative, the rails and tracks would be removed by hydraulic crane and placed on trucks for transport back to the site. The removed rails and tracks would be disposed of as CDD. The ties would be characterized prior to disposal. The ties are assumed to be non-hazardous for the purpose of completing this alternative. The track ballast would be excavated by backhoe and loaded on trucks for transport back to the site, where it would be stockpiled for subsequent disposal as CDD.

2.12.4 Removal of Contaminated Stream Sediments and Radiological Control Areas

Surface water quality downstream from the Project premises has been impacted by past fuel reprocessing operations, primarily from previous discharges from Lagoon 3. Several of the discharged radionuclides, particularly cobalt-60, strontium-90, cesium-134, and cesium-137, have an affinity to become chemically absorbed to silt, which could accumulate in the stream beds of Erdman Brook and Franks Creek. Additional lower level stream sediment contamination can be found in Buttermilk Creek.

For the purposes of this evaluation, it is assumed that the stream sediment would be removed from Erdman Brook and Franks Creek between the Lagoon 3 outfall and the confluence of Franks Creek and Quarry Creek (close proximity to the site). To allow for the excavation of stream sediment, stream flow in Erdman Brook and Franks Creek would be diverted. Runoff controls would also be installed to prevent the migration of disturbed sediment downstream of this excavation. Excavated sediment would be transported to an on-site Soil Drying Facility, to reduce it moisture content.

Vegetation would be removed from the along the creek beds, as necessary, to allow access for excavation equipment. Chain saws and a front-end loader would be used to remove vegetation. The removed vegetation would be sampled and characterized for potential radiological constituents (such as Sr-90). The vegetation is assumed to be uncontaminated, with the exception of the subsurface portions (roots). The roots are assumed to be managed as LSA waste.

An access route for heavy excavation equipment would be established by removing selected trees between the road that passes Lagoon 3 and Erdman Brook. The existing access road, which is approximately 200 feet in length, would be upgraded. It is estimated that 2,520 feet of new road would also need to be constructed. Gravel would be applied to the route, providing support for the heavy equipment.

Two earthen berms would be installed upstream and downstream (one berm each) of the intended excavation area to divert water from the area. These berms would be approximately eight feet wide at the base and five feet high. The berms would be constructed through the use of a power shovel and drum roller. Any water trapped between the two berms would be removed using portable dewatering pumps.

The streambed would be excavated down to a depth of approximately one foot over the entire excavation area. Both a hydraulic excavator and front-end loader

would be used to remove the sediment and place them on dump trucks. The dump trucks would transport the sediment to an on-site Soil Drying Facility. After the sediment has been dried, the solidified material would be managed as LSA waste.

In addition to the area described above, several areas known or believed to contain contamination would be excavated and processed as well. These areas consist of: The LSA 2 Hardstand soils, the area adjacent to LSA 3, the overgrown area south of the Solvent Dike, an area east of Lagoons 2 and 3, the RR tracks by the old warehouse, the ditch south of the old warehouse, and several areas near but outside of the NDA.

2.12.5 Removal of Parking Lots and Roadways

The Main and South Parking Lots and site roadways would be removed under the Sitewide Removal Alternative. The parking lots and roadways comprise a collective area of about 1,580,000 ft^2. These common support areas typically consist of three to four inches of asphalt overlying a six- to 12-inch gravel base. The asphalt materials would be removed and retained on site for subsequent beneficial reuse as fill or in support of site improvements.

2.12.6 Remediation Completion and Closeout

Remediation completion and closeout would involve MARSSIM surveys of all impacted and remediated areas, collection and analysis of confirmation samples, as needed, and site backfilling and restoration. Stream areas would be restored with fill material similar in nature to the material removed. If needed, erosion resistant armoring would be installed in areas of high erosion potential. Upland areas would be backfilled with common, imported material, graded and seeded to promote growth of vegetative cover.

2.12.7 Mitigative Measures

Due to the concrete-demolition work proposed for WMA 12, sediment control and dust-suppression measures would be employed to reduce the amount of exposed soil that would be airborne or would be carried away in storm water runoff. The restoration of the stream area would also include the installation of geotextiles, which should assist the reduction of the amount of soil carried away by stream flow and storm water runoff. The heavy equipment used in the demolition activities would also be equipped with mufflers. Work in the contaminated areas (the removal of contaminated sediment) would require the use of PPE and contamination controls, as well as the use of contamination reduction zones and buffer areas.

2.13 North Plateau Groundwater Plume

The North Plateau Groundwater Plume, which extends from WMA 1 through WMAs 2, 3, 4, and 6, as shown on Figure 2-43, is estimated to extend down to approximately 25 ft below ground surface (bgs). The aerial extent of the plume is approximately 20 acres. Due to the size and extent of the plume, the remediation (excavation) will address the following remediation systems currently in place:

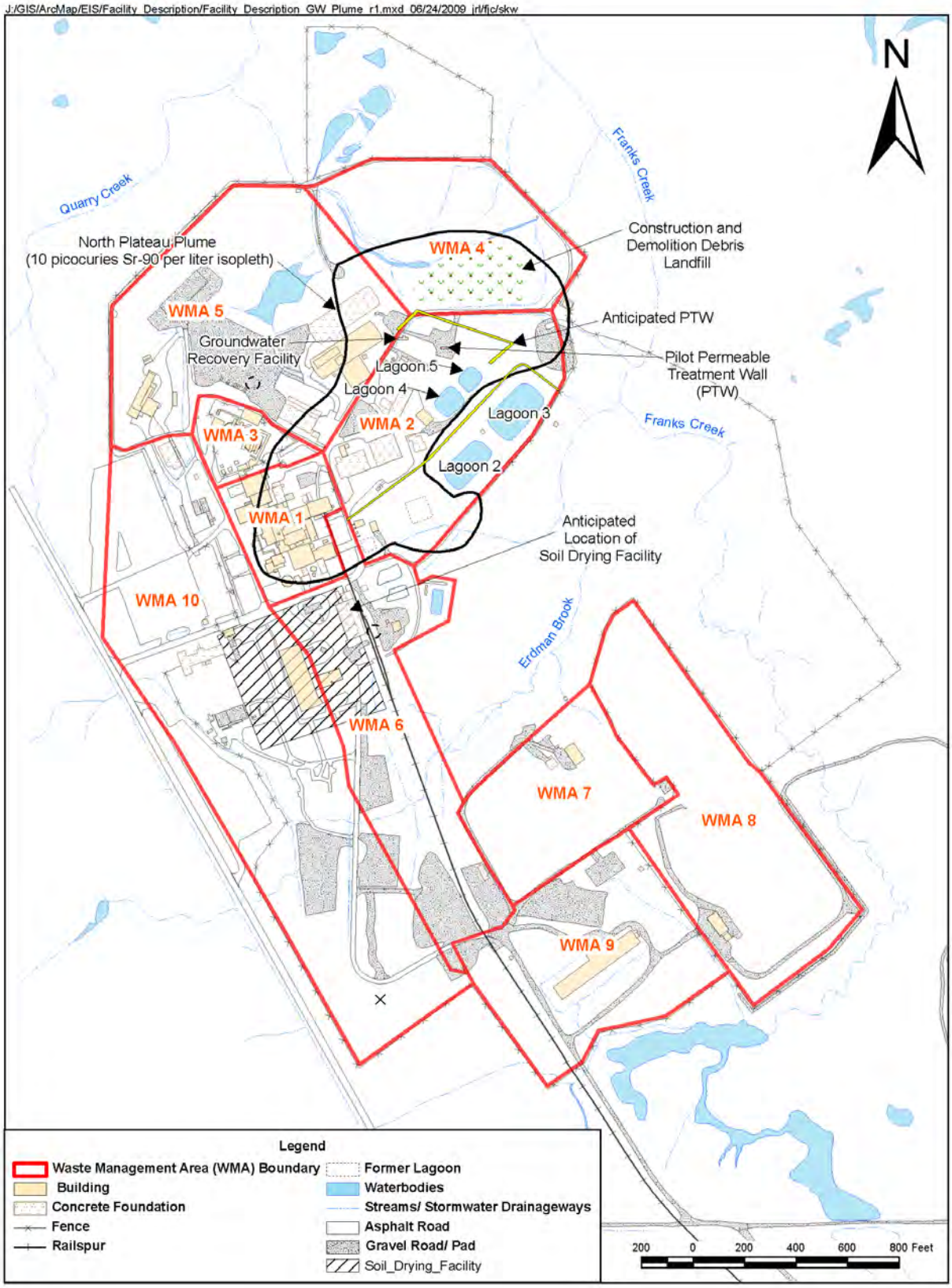


Figure 2-43. North Plateau Groundwater Plume

- The North Plateau Groundwater Recovery System installed in 1995 to control the western lobe of the plume;
- The pilot-scale permeable treatment wall installed in 1999 within the leading edge of the eastern lobe of the plume; and
- The full-scale treatment consisting of a Permeable Treatment Wall (PTW) installed across the western lobe.

The location of these systems relative to the area of the plume is shown in Figure 2-43. For the purposes of the Technical Reports, the North Plateau Plume is divided into two parts: the source area beneath WMA 1 (addressed previously), and the non-source area, addressed in this section. The proposed remedial activities to remove the subsurface contamination can be separated into four major components: Remediation support activities, plume dewatering and treatment, contaminated soil excavation, and remediation completion, closeout, and restoration activities. The North Plateau Plume excavation and the various other significant excavations that are discussed under this alternative are expected to envelope all of the monitoring systems. There is no separate estimate or costs or impacts due to removal of these monitoring systems.

2.13.1 Remediation Support Activities

Soil Drying Facility

The major support component of the NPP remediation is the Soil Drying Facility (SDF), which includes a dryer, soil staging areas, and a rail spur for waste shipment. Other support elements for the NPP remediation would involve characterization sampling and surveying of both soil and groundwater, as necessary, to confirm the boundaries of contamination. Due to the size of the excavation, approximately 6,500 feet of fencing would also be installed around the perimeter of the work site to restrict access, prevent unwanted exposures, and ensure the protection of human health. All regulatory permits and approvals would be acquired prior to remedial work, and the few areas that contain above ground structures would be cleared prior to the start of construction.

Due to the large volume of contaminated soils that would be generated during excavation of the entire North Plateau Groundwater Plume and other miscellaneous areas on the North Plateau, there is an advantage in locating the Soil Drying Facility near the Rail Spur, and outside of the excavation areas. The area selected is located just south of the southern portion of the Plume. Utilizing an existing facility like the Remote-Handled Waste Facility would be considered if there were some remote handling component to the soil management. However, the bulk management capability of the new facility does not currently exist in an existing facility. Therefore, existing facilities were no longer considered and a new facility was planned.

The SDF would be constructed to process contaminated saturated soils excavated from the plume area. Contaminated stream sediment from WMA 12 and saturated soil from WMAs 2 and 4 would also be processed at the Soil Drying Facility. The facility would remain functional until all contaminated, saturated soil has been processed, packaged, and shipped.

The major process equipment in the SDF consist of a feed bin, a conveyor, a rotary dryer, a soil cooler, a radial soil stacker, off-gas bag house, HEPA filters, thermal oxidizer and stack. Four areas would be constructed to support the waste processing area. They would comprise (1) a 350-foot by 350-foot lined, excavated waste staging area, (2) an approximately 40,000 ft^2 soil feed area constructed with crushed stone, (3) a sheet-metal-covered, soil output staging and railcar loading area, and (4) approximately 6,000 feet of track for the railcar staging area (Figure 2-44).

Removal of Miscellaneous Facilities

The North Plateau Groundwater Recovery System, Pilot Scale Permeable Treatment Wall and Full-Scale Permeable Treatment Wall would all be in operation at the time of the Sitewide Removal Alternative implementation. Since these facilities are all located within the impacted area, they are assumed to be removed and managed with the saturated soils from the NPP.

2.13.2 Plume Dewatering and Treatment

Prior to the excavation of contaminated plume soil, the groundwater within the NPP would be extracted from the subsurface and treated. This would be performed using a groundwater cutoff wall with sheet pile, a sump and ditch removal system, and a skid-mounted treatment system. To effectively cleanup the groundwater to unrestricted use, sheet pile would be driven through the aquifer and securely into the confining Lavery till to create a barrier against continuous groundwater flow. The sheeting would be located beyond the 10 pCi/L isopleth such that it (1) encompasses the groundwater exceeding the drinking water MCL for strontium-90 of 8 pCi/L (40 CFR 141.66), (2) allows for excavation sloping requirements, and (3) eliminates the need to install anchoring for stability. Approximately 6,000 feet of sheet piling would be installed.

The groundwater removal system would be established after the sheet pile has been installed. Ditches and sumps would be constructed within the area of contamination arranged to promote groundwater collection into sumps located as far down-gradient as possible. The ditches would be approximately three feet wide and excavated into the Lavery till. Gravel along with slotted drain pipe would be placed along the bottoms of the ditches, which would then be filled with gravel as needed to improve aquifer drainage. Approximately 5,000 to 6,000 feet of drainage ditch would be necessary to dewater the Plume.

The extracted groundwater would be pumped from the sumps through piping and fed to the skid-mounted treatment system that would consist of an inorganic ion-exchange material specifically designed for removal of strontium-90 (Figure 2-45). Based upon hydrological and geological characteristics of the North Plateau, approximately 23 million gallons of groundwater, with the most contaminated containing strontium-90 concentrations over 100,000 pCi/L, would require treatment.

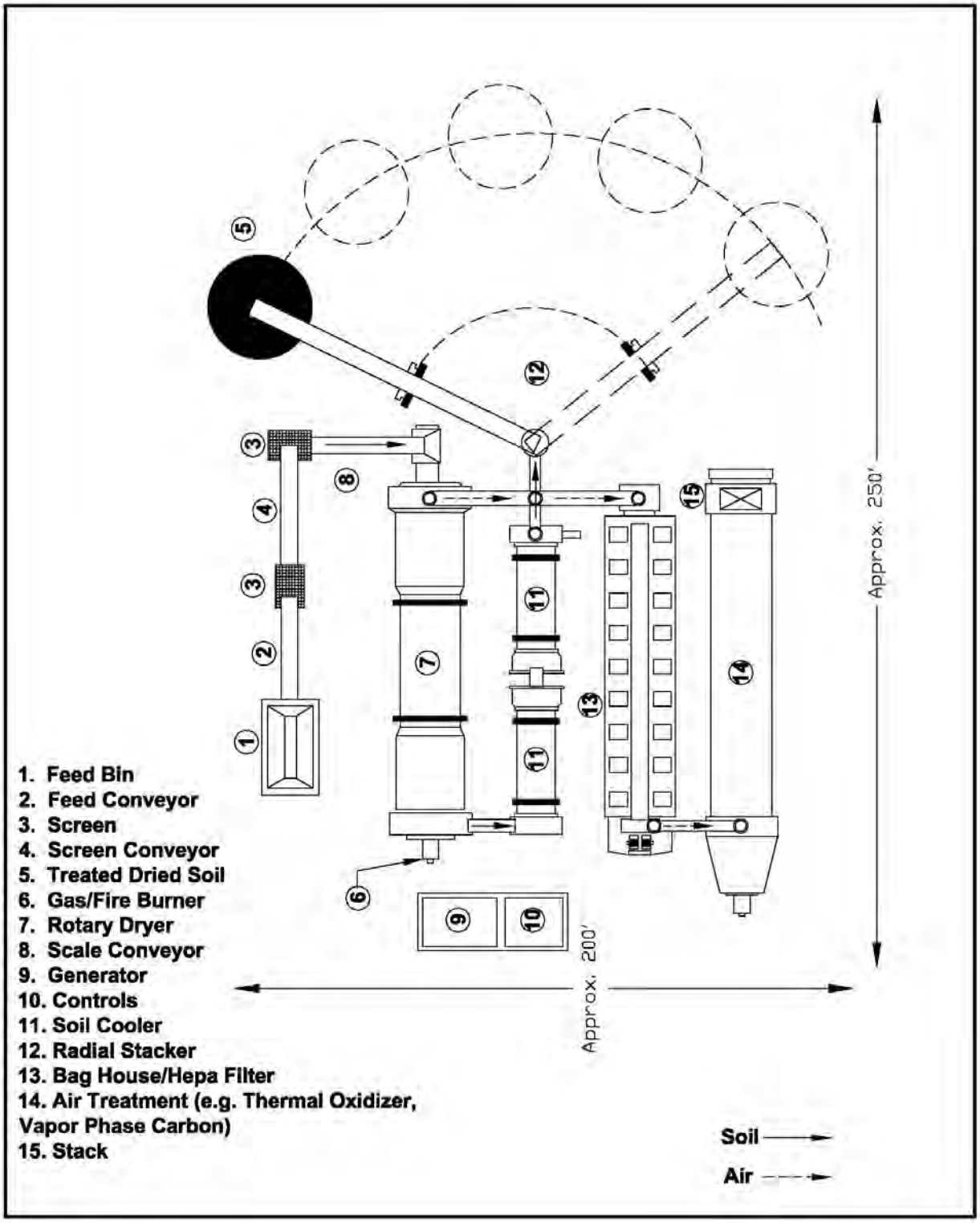


Figure 2-44. Conceptual Soil Drying Facility – Schematic

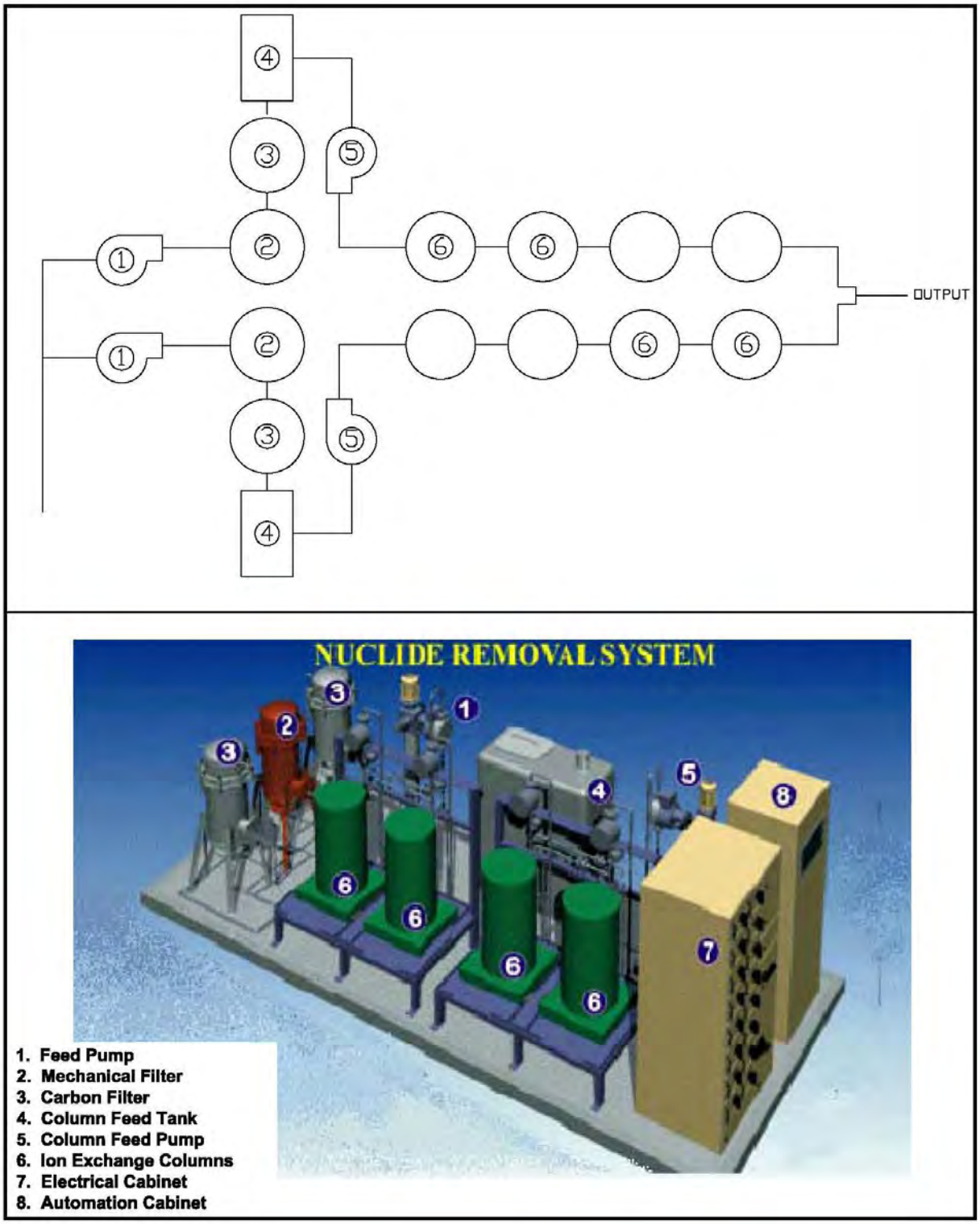


Figure 2-45. North Plateau Groundwater Plume Water Pretreatment System Schematic

2.13.3 Soil Excavation and Management

Approximately 450,000 yd^3 of contaminated soil within the existing 10 pCi/L isopleth for strontium-90 would be removed from the non-source area, downgradient of WMA 1 to facilitate future unrestricted use of the North Plateau area. It was assumed that the bottom of the excavation would be approximately one foot below the Lavery till. The surface area of the NPP was determined from the fourth quarter 2007 10 pCi/L gross beta contour line. To delineate between contaminated soils and soil that was not impacted by the NPP, maximum groundwater elevations were measured from specific monitoring wells using 1991 to 2007 data. With the lateral extent of the plume and the height of soil within the plume area, a total volume of soil was calculated. The volume of uncontaminated soils only was calculated using the ground surface elevation and the maximum groundwater elevation data, the vertical extent of which was then multiplied by the NPP surface area. Finally, the volume of contaminated soil was determined by subtracting the uncontaminated fraction by the total soil volume. As discussed above, the sheet pile would be installed a sufficient distance beyond this boundary to allow ample space for excavation equipment to efficiently maneuver around the site. As a result, approximately 250,000 yd^3 of uncontaminated and overburden soil would be excavated during remedial activities as well.

Excavation would be accomplished using standard equipment, such as excavators, bulldozers, and front end loaders, and it would extend into the Lavery till. When the excavation reaches significant depths, an access road would be constructed in “clean” areas using on-site borrow for egress and ingress of construction equipment. Contaminated soil that is sufficiently dry to meet transportation and disposal requirements would be sampled for waste characterization purposes and loaded into railcars, bypassing the Soil Drying Facility. Saturated soil would be hauled to the Soil Drying Facility for processing before being packaged, sampled, and transported off site for disposal. As the dewatering system is encountered during excavation, it would be removed, drained, dismantled as necessary, packaged for disposal, and transported off site for disposal.

Once the contamination boundaries are reached during excavation operations, a MARSSIM Final Status Survey would be performed to verify that residual radioactivity levels do not exceed the established requirements. Backfilling operations using approved soil would commence after the verification survey is complete and regulatory approval is received.

Since the excavation would cover almost 20 acres, an infiltration prevention system would be instituted to minimize precipitation into the sheeted area, thus reducing the amount of water that would need to be removed and treated. The system would consist of an impermeable cover placed over the unexcavated and backfilled portions of the NPP and extended to the sheet piling. The cover material would be similar to an impermeable 40-mil thermo-plastic membrane. This membrane would be rolled back as excavation and backfilling operations of the NPP progresses. Approximately 1.9 million ft^2 of impermeable membrane would be required.

2.13.4 Remediation Completion and Closeout Activities

The primary activity comprising completion and closeout is backfilling the excavation. Clean, excavated soils would be placed back first, then the remainder of the excavation backfill would be supplied from a clean off-site source. Since the sheet pile was placed at the perimeter of the contaminated groundwater plume, it is proposed that the piles would be extracted and salvaged. If detected, elevated levels of radioactivity would be removed from the sheet pile prior to salvaging. All disturbed soil within the sheeted area would be graded, as necessary, with conventional construction equipment to restore the area to existing conditions. All remaining bare soil areas would then be seeded and fertilized to ensure adequate vegetative cover.

The SDF would be demolished and removed after all site soil requiring drying is processed. Exterior surfaces of the equipment would be spray washed and a spray fixative would be applied. The equipment would be dismantled; segmented, if necessary, and disposed of off site. A spray fixative would also be applied to the interior surfaces of the soil staging confinement structure to allow for demolition. All demolition activities would be performed using conventional methods and equipment.

The paved waste staging and the railcar loading/staging areas would also be demolished by conventional methods. The debris generated from this demolition would be managed as LSA waste.

The skid-mounted treatment system would be decontaminated as necessary, and returned to the vendor for recycling/reuse. The approximately 600 ft^3 of spent ion-exchange media produced from treatment operations would be packaged as appropriate (assumed to be Class B) and sent off site for disposal. Lastly, the perimeter fencing used to control unwanted access to the remediation site (approximately 19,500 ft^3) would be removed and managed as CDD.

2.13.5 Mitigative Measures

During the remediation of the NPP, standard engineering controls would be employed to mitigate airborne and aqueous emissions, and protect the workers, public, and environment from unnecessary exposure to contaminants. Some examples include the following:

- Fencing would be installed to control access and establish a “hot zone” barrier;
- Dust-suppression measures would be employed during concrete and steel demolition tasks and waste excavation and transportation activities, mitigating dust generation associated with this work;
- Silt fencing would be installed prior to ground disturbance to ensure that sediment-laden surface waters are appropriately filtered prior to joining the perimeter streams and waterways;

- Utilization of appropriate treatment of dryer off-gas and/or groundwater discharges;
- Heavy equipment would be equipped with mufflers for noise reduction;
- Liner systems would be used to limit infiltration and control runoff; and
- Safety planning would be a prerequisite to all site tasks, ensuring that workers are aware of the hazards involved in the work.

2.14 Cesium Prong

The total area of the Cesium Prong estimated for excavation covers approximately 82 acres of land north of the Main Plant, where 95% of the airborne activity released from the ventilation system rests within roughly the upper five centimeters of soil (Figure 2-46). The area proposed for remediation extends approximately 2,500 ft from the release point, while the outer extent of the Cesium Prong extends approximately 1.6 miles from the release point. The Cesium Prong extends from WMA 1 through WMAs 3, 5, 10, and 12. Remediation of the Cesium Prong is addressed in three components: minor support activities, surface soil excavation, and restoration.

2.14.1 Remediation Support Activities

No major support activities or facilities would be needed to cleanup the Cesium Prong. Characterization, investigation, and design work would be performed, as necessary, to confirm extent of contamination, and all regulatory approvals and permits would be acquired prior to work commencing. Since a fence already exists, no additional barriers would be established to prevent unwanted access. If site clearing is needed to remove trees larger than 12 inches in diameter, then a clearing and grubbing crew would be employed. However, it is assumed that felling and piling trees would be addressed with dozer and loader excavation crews.

2.14.2 Soil Excavation and Management

Approximately six inches of surface soil would be removed from the Cesium Prong area to ensure unrestricted release conditions are achieved. The excavated soil and debris would be sampled for characterization purposes, and would be managed as LSA waste. Standard equipment, such as bulldozers and front end loaders, would be used for excavation and loading activities. Conventional dust-suppression, soil staging, and surface water control procedures would be used, as necessary, to prevent the spread of contamination and ensure waste moisture requirements for transportation and disposal are met. These mitigation measures should require minimal effort based on the shallow excavation depth.

Once excavation limits are reached and free releasable material is encountered, MARSSIM Final Status Surveys would be performed to verify that residual radioactivity levels do not exceed the established cleanup criterion. Backfilling operations using approved soil would also occur systematically as verification surveys are completed.

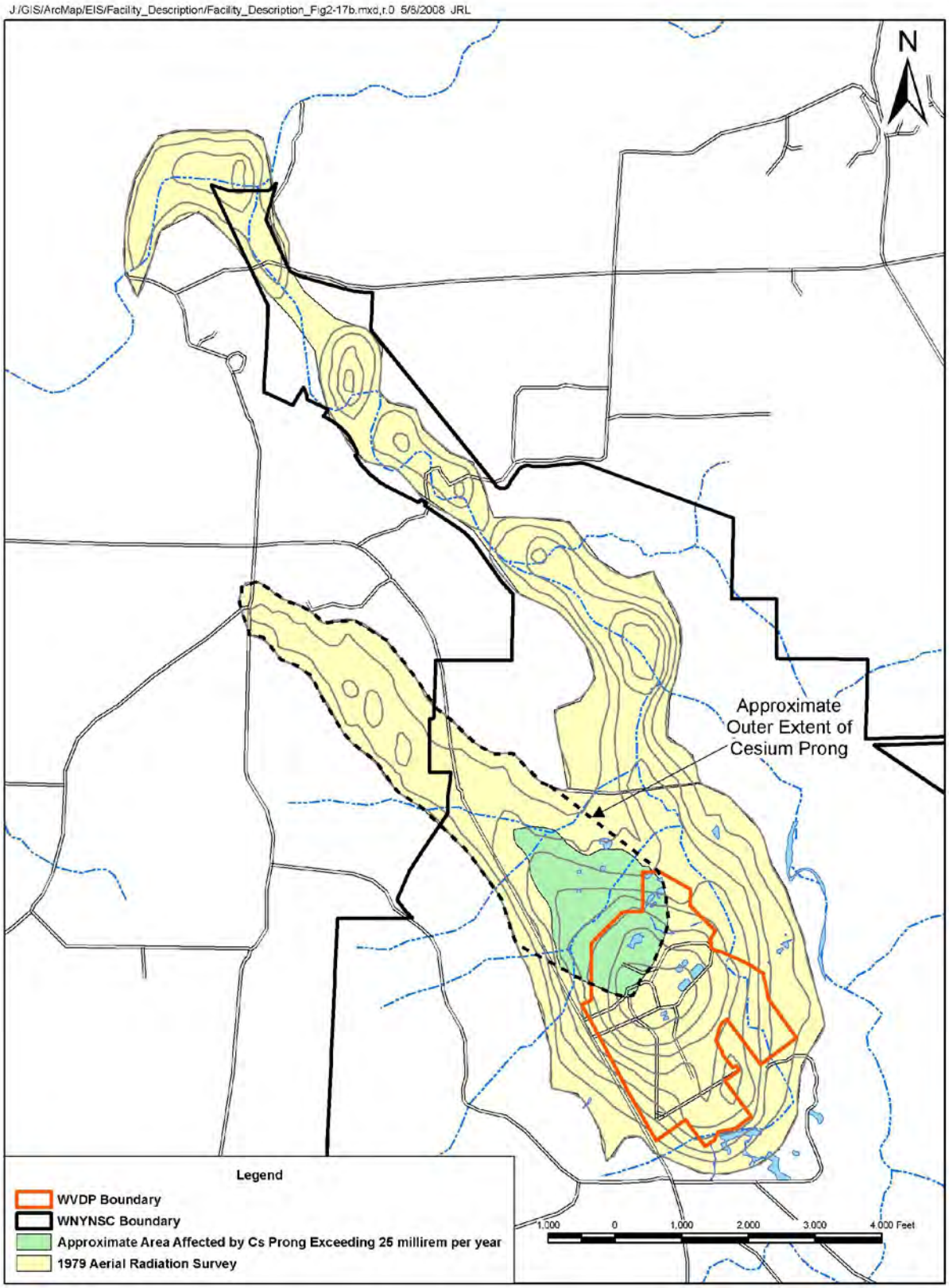


Figure 2-46. Cesium Prong

2.14.3 Remediation Completion and Closeout Activities

All disturbed soil would be graded, as necessary, with conventional construction equipment to restore the area to existing conditions. Any bare soil areas would seeded with native grasses and fertilized. Following the removal of the Cesium Prong, NPP, NDA, SDA, and any remaining facilities, all remaining groundwater monitoring wells would be removed using overdrilling and borehole grouting techniques.

2.14.4 Mitigative Measures

Since the remedial activities that would be used to address Cesium Prong contamination are straight forward, typical mitigative measures used for bulk soil excavation are anticipated. Silt fencing, surface water control, and designated equipment wash areas would be established to reduce the impacts to geological, water, and ecological resources. In addition, dust-suppression, buffer zones, and PPE protocols would be instituted to protect air quality, human health, and the environment.

3.0 DATA SUMMARY

NOTE: *The Section 3.0 tables and figures have all been replaced to reflect updates and revisions to the supporting calculations packages.*

This section presents the data generated from the calculations that were completed to estimate the resource demand (e.g., cost, personnel, environmental releases, etc.) to implement the Sitewide Removal Alternative at the WNYNSC. The data are presented in both tabular and figure form, and address four primary categories of information regarding removal of site facilities: Resource Requirements, Environmental Impacts, Generated Waste, and Costs. The project schedule is presented in addition to these categories to provide a clear understanding of the timing of the different tasks, and the annual demand of resources within these categories.

Approximately twenty tables and fourteen figures were created in these four categories, and each is discussed in more detail below. It should be noted that the tabular results are presented as they were calculated without regard for significant figures (i.e., the number of figures does not reflect the precision of the results). Accordingly, if the results are used in subsequent calculations and presented as final, then the result should be rounded to two significant figures to mitigate false precision.

3.1 Schedule

The Sitewide Removal Alternative Implementation Schedule is represented in Figure 3-1. The alternative would require an estimated 60 years for completion. This duration corresponds to a budget driven schedule, assuming a budget of $100 million per year and waste disposal primarily at the Nevada Test Site (NTS). This schedule was also based on the assumption that no storage of orphan waste would exist (see Section 4.2.2). The critical path tasks consist of removal of the NDA, removal of the SDA Northern and Southern Trenches, remediation of WMA 2, and removal of the Cesium Prong. The WMA 1, WMA 3, and North Plateau Groundwater Plume remedial activities are not considered critical path tasks since they begin and end entirely within the NDA and SDA tasks.

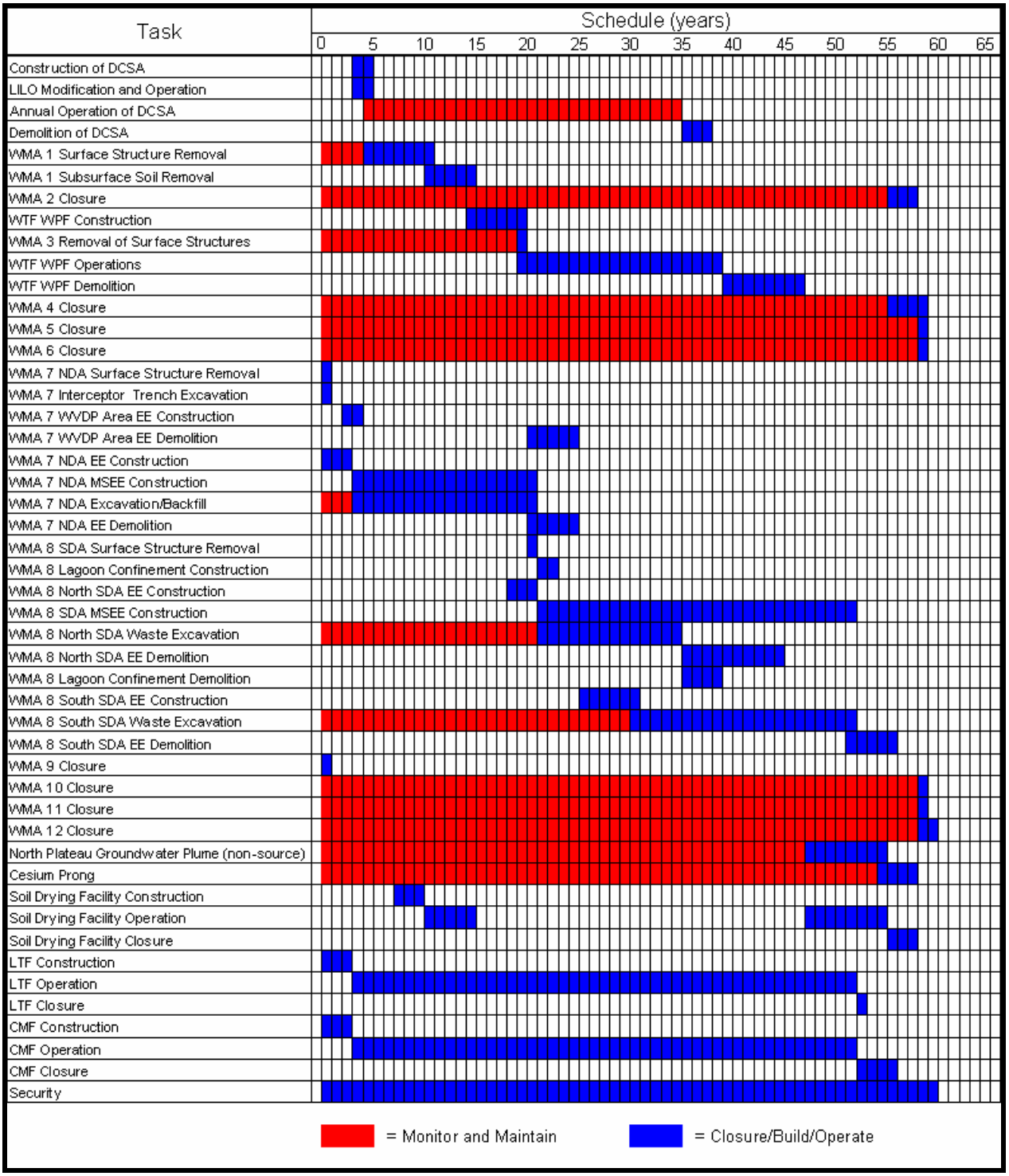


Figure 3-1. Sitewide Removal Alternative Implementation Schedule

The schedule shown is one of an almost infinite number of schedules that could be developed with the information that is available. It should be understood that this is not a proposed or recommended schedule, but is simply a representative schedule to demonstrate the duration and complexity that would result from implementing the Sitewide Removal alternative. Should this alternative be selected, further refinement of the schedule would occur after detailed design, as necessary.

3.2 Resource Requirements

The resources required for the activities necessary to complete the removal alternative, such as demolition and support facility construction, are presented in the following tables and figures. Each table is delineated into the different facilities and WMAs that make up the WNYNSC, which are presented in individual rows. The columns of each table represent the various categories of goods or services that have been estimated and summarized, such as capital purchases, waste containers, utilities, and personnel. The figures contain a standard format of an X-Y graph, with the X-axis illustrating the schedule in work-years, and the Y-axis illustrating the subject of the data table.

Despite the Removal Alternative focusing mostly on demolition and excavation activities, a number of materials would be purchased for construction purposes, such as support facilities or temporary access roads and staging areas. Items would also be needed for demolition and restoration measures (e.g., fixing agents and backfill soil), and Table 3-1 presents the quantities of acquired materials that would be consumed during the removal alternative, from steel and concrete to seed, mulch and fertilizer.

The list of capital purchases summarizes the items that would be acquired for the remediation of each WMA or Facility. Not every area within the WNYNSC would require resources to be purchased, but some WMAs and support facilities (e.g., WMAs 7 and 8, and the CMF) are estimated to need hundreds of millions of dollars in property, such as process systems, characterization units, cranes, shielded components, and remote handled equipment. Table 3-2 summarizes the capital purchases planned at each WMA during implementation of the alternative.

Tables 3-3 and 3-4 present the sum of the various types of containers that would be purchased to transport waste to DOE and commercial facilities or commercial facilities only. There would be primarily seven different containers (e.g., rolloffs to HICs) for approximately 10 different categories of waste (e.g., CDD to Mixed Waste) that would be generated from the different WMAs or Facilities during removal alternative activities.

Rolloff containers and Sealand containers are assumed to be used 20 times prior to being disposed of. All other containers are assumed to have a single use.

Utility demands estimated for the removal alternative are presented in Table 3-5. The rows are delineated by facility or WMA, while the columns represent the seven possible utilities that could be used during remediation activities under this alternative: electricity (kw-hr), natural gas (cf), diesel fuel (gal), gasoline (gal), non-potable water (gal), augmentation water (gal), and potable water (gal). Some of the areas or facilities with high utility demands include WMA 1 Closure; and WMA 7 and WMA 8 Closure, Operation of CMF, LTF, and SDF, Long-Term Monitoring and Maintenance, and Security.

Tables 3-6 and 3-7 quantify the time in work-years that personnel would be needed to complete the necessary tasks within a specific WMA or at a specific facility. Table 3-6 presents the time requirements based upon category of employee, such as indirect, direct, subcontract, professional, etc.; whereas, Table 3-7 presents the data in terms of removal activity or effort, such as operations, construction, or preparation and planning. The tables are similar in that the total number of work years for each facility or WMA should produce identical subtotals in the final column.

Table 3-1. Consumable Materials

Material	Quantity	Units
Structural Steel and Rebar:	26,222	tons
Sheet Piling:	11,216	tons
H-Piling:	1,058	tons
Concrete:	72,376	yd^3
Cement:	682	yd^3
Concrete Block:	64,400	ft^2
Soil:	1,448,428	yd^3
Clay:	93,109	yd^3
Asphalt:	76,300	ft^2
Rip Rap:	350	tons
Sand, Gravel, and Crushed Stone:	41,260	yd^3
Grout:	339	yd^3
Slurry Materials:	253,228	gal
Bentonite:	1,249	yd^3
Fixing Agent and Epoxy Coating:	208,561	yd^2
Fencing:	28,500	ft
HDPE Sheeting:	802,500	ft^2
Fabric:	33,840	ft^2
Geotextile:	8,120	yd^2
Pipe:	87,197	ft
Seed/Mulch/Fertilizer:	8,398,000	ft^2

Table 3-2. Capital Purchases

WMA/Area	Capital Cost Type	Description	Units	Quantity	Unit Cost	Total Cost
HLW Canister Removal	Equipment	Horizontal Storage Module	each	69	$300,000	$20,700,000
HLW Canister Removal	Equipment	Transfer Cask Trailer	each	1	$800,000	$800,000
HLW Canister Removal	Facility Construction	Building Construction Material Cost	ls	1	$467,488	$467,488
HLW Canister Removal	Equipment	50-ton Crane & assoc. equipment	ea	1	$360,000	$360,000
HLW Canister Removal	Equipment	Shielded Transfer Cell components	ea	1	$3,125,000	$3,125,000
HLW Canister Removal	Equipment	Canister Handling Equipment	ea	1	$1,800,000	$1,800,000
HLW Canister Removal	Equipment	Impact Limiters	sets	5	$150,000	$750,000
HLW Canister Removal	Equipment	Skid and Tie-down system	sets	5	$80,000	$400,000
HLW Canister Removal	Equipment	Lifting Yoke	each	5	$40,000	$200,000
HLW Canister Removal	Equipment	Leak Detection System	each	5	$40,000	$200,000
WMA 1	Equipment	Diamond wire saw	each	8	$75,000	$600,000
WMA 1	Equipment	Brokk unit	each	4	$122,000	$488,000
WMA 1	Equipment	Brokk Crusher	each	2	$22,500	$45,000
WMA 1	Equipment	Brokk Grapple	each	2	$10,500	$21,000
WMA 1	Equipment	Bobcat Skid-Steer	each	4	$23,000	$92,000
WMA 1	Equipment	Diamond Saw Blades	each	85,020	$25	$2,125,500
WMA 1	Equipment	Lifting/Hoisting Hardware	each	1,734	$100	$173,400
WMA 1	Equipment	Concrete Core Bits	each	130	$123	$15,990
WMA 1	Equipment	Crushing Plant	each	1	$250,000	$250,000
WMA 1	Equipment	Diamond Wire Saw	each	2	$51,000	$102,000
WMA 1	Equipment	Diamond Wire	each	29500	$25	$737,500
WMA 1	Equipment	Dedicated grout pump & manifold (Process Lines)	ls	1	$13,500	$13,500
WMA 1	Equipment	Materials for Hot Taps	ls	1	$37,480	$37,480
WMA 1	Source Area Confinement Construction	Building Construction Material Cost	ls	1	$1,373,579	$1,373,579
WMA 1	Equipment	Water Management System	ls	1	$20,754	$20,754
WMA 2	Lagoon 1 Confinement Construction	Building Construction Material Cost	ls	1	$691,530	$691,530
WMA 3	Equipment	HEPA Fitlered Ventilation System (each)	each	1	$10,000	$10,000
WTF WPF	Equipment	Remote Handled Equipment	ls	1	$22,187,125	$22,187,125
WTF WPF	Equipment	Waste Assay and Cask Load/Transfer	ls	1	$9,060,000	$9,060,000

Table 3-2. Capital Purchases

WMA/Area	Capital Cost Type	Description	Units	Quantity	Unit Cost	Total Cost
WTF WPF	Equipment	Liquid Waste Proceesing Equip.	ls	1	$2,977,710	$2,977,710
WTF WPF	WTF WPF Facility Construction	Building Construction Material Cost	ls	1	$17,665,229	$17,665,229
WTF WPF	Equipment	Remote Concrete Demolition Machines	each	2	$270,000	$540,000
WTF WPF	Equipment	CNS 10-160B RH Casks (including maint)	each	10	$1,625,000	$16,250,000
LTF	Equipment	Raw Leachate Treatment Equip.	ls	1	$564,200	$564,200
LTF	Equipment	CNS 10-160B RH Casks (including maint)	each	2	$1,625,000	$3,250,000
LTF	Equipment	Leachate Treatment Utilities	ls	1	$27,500	$27,500
LTF	LTF Building Construction	Building Construction Material Cost	ls	1	$70,124	$70,124
LTF	O & M Equipment	Process Materials	ls	1	$246,560	$246,560
LTF	O & M Equipment	Maintenance Hardware	ls	1	$160,000	$160,000
LTF	O & M Equipment	Process Materials	ls	1	$57,017	$57,017
LTF	O & M Equipment	Maintenance Materials	ls	1	$37,000	$37,000
LTF	O & M Equipment	Process Materials	ls	1	$53,627	$53,627
LTF	O & M Equipment	Maintenance Hardware	ls	1	$34,800	$34,800
CMF	Equipment	Rad Monitor./Character. System	each	1	$300,000	$300,000
CMF	Equipment	Miscellaneous In-Cell Items	each	24	$50,000	$1,200,000
CMF	Equipment	Remote Mechanical Tools	each	6	$32,000	$192,000
CMF	Equipment	Cranes	each	5	$1,300,000	$6,500,000
CMF	Equipment	Manipulators	each	11	$750,000	$8,250,000
CMF	Equipment	Characterization Units	each	18	$2,000,000	$36,000,000
CMF	Equipment	Assemblies/Systems	each	11	$250,000	$2,750,000
CMF	Equipment	Rotary Dryer	each	1	$242,000	$242,000
CMF	CMF Building Construction	Building Construction Material Cost	ls	1	$7,425,483	$7,425,483
CMF	Equipment	Mechanical Decon. Unit	each	2	$60,000	$120,000
CMF	Equipment	HEPA Filtered Vacuum	each	2	$17,000	$34,000
WMA 7	WVDP EE BuildingConstruction	Building Construction Material Cost	ls	1	$977,993	$977,993
WMA 7	Equipment	80 Ton Gantry Crane	ls	1	$570,000	$570,000
WMA 7	Equipment	Crane Buckets and Equipment	ls	1	$28,500	$28,500
WMA 7	Equipment	Excavator, PC-400LC (new)	ls	1	$329,000	$329,000

Table 3-2. Capital Purchases

WMA/Area	Capital Cost Type	Description	Units	Quantity	Unit Cost	Total Cost
WMA 7	NDA EE Building Construction	Building Construction Material Cost	ls	1	$3,409,877	$3,409,877
WMA 7	MSEE Component	Standard Shielded Wall Panel	each	156	$31,000	$4,836,000
WMA 7	MSEE Component	Supply of Modified Wall Panel	each	24	$46,500	$1,116,000
WMA 7	MSEE Component	Supply of Specialty Glass	each	2	$295,000	$590,000
WMA 7	MSEE Component	10' Roof Panels	each	20	$11,600	$232,000
WMA 7	MSEE Component	10' Roof Panels (modified)	each	2	$23,000	$46,000
WMA 7	MSEE Component	20' Roof Panels	each	28	$22,700	$635,600
WMA 7	MSEE Component	40' Roof Panels	each	16	$40,600	$649,600
WMA 7	MSEE Equipment	Specialty Crane (Z-Mast)	each	2	$10,000,000	$20,000,000
WMA 7	MSEE Equipment	Electrical components	ls	1	$127,600	$127,600
WMA 7	MSEE Equipment	Cameras and Controllers	ls	1	$1,404,350	$1,404,350
WMA 7	WVDP Area Operational Equipment	Sprung™ Structure Materials	each	2	$963,096	$1,926,192
WMA 7	WVDP Area Operational Equipment	Dozer & Excavator, modified	pair	2	$690,000	$1,380,000
WMA 7	WVDP Area Operational Equipment	Robots	each	3	$170,000	$510,000
WMA 7	NFS Area Operational Equipment	Dozer & Excavator, modified	pair	1	$690,000	$690,000
WMA 7	NFS Area Operational Equipment	Robots	each	3	$170,000	$510,000
WMA 8	SDA Lagoon Confinement Construction	Building Construction Material Cost	ls	1	$2,278,476	$2,278,476
WMA 8	SDA North EE Building Construction	Building Construction Material Cost	ls	1	$4,607,274	$4,607,274
WMA 8	SDA South EE Building Construction	Building Construction Material Cost	ls	1	$6,605,236	$6,605,236
WMA 8	MSEE Component	Standard Shielded Wall Panel	each	779	$31,000	$24,149,000
WMA 8	MSEE Component	Supply of Modified Wall Panel	each	14	$46,500	$651,000
WMA 8	MSEE Component	Supply of Specialty Glass	each	1	$295,000	$295,000
WMA 8	MSEE Component	40' Roof Panels	each	390	$40,600	$15,834,000
WMA 8	MSEE Equipment	Specialty Crane (Z-Mast)	each	6	$10,000,000	$60,000,000

Table 3-2. Capital Purchases

WMA/Area	Capital Cost Type	Description	Units	Quantity	Unit Cost	Total Cost
WMA 8	MSEE Equipment	Electrical components	ls	1	$140,310	$140,310
WMA 8	MSEE Equipment	Cameras and Controllers	ls	1	$1,404,350	$1,404,350
SDF	Equipment	Rotary Dryer	ls	1	$242,000	$242,000
SDF	Equipment	Trommel Screen	ls	1	$175,000	$175,000
SDF	Equipment	Conveyors	ls	1	$30,000	$30,000
SDF	SDF Railroad Construction	Rail Road Track Materials	ls	1	$543,200	$543,200
SDF	SDF Building Construction	Building Construction Material Cost	ls	1	$2,282,462	$2,282,462
North Plateau Plume	Non-Source Area Excavation	Skid Mounted Treatment, sump, pumps	ls	1	$1,507,970	$1,507,970

Table 3-3. Waste Containers for DOE/Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes Stong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
HLW Canister Removal																
Construction of DCSA																
LILO Modification and Operation		1	10								22					
Operation of DCSA																
Demolition of DCSA	73															
WMA 1 Closure																
Surface Structure Removal	9	88	3,484	11	937				3,179		1,192	14	28	83		
Subsurface Soil Removal	2	257	10,220								1,458					
WMA 2 Closure	10	134	5,326								3,333			280		
WMA 3 Closure																
Removal of Surface Structures	16	4	142								46		5			
WTF WPF Construction	7	1	14								6					
WTF WPF Operations		37	1,452		106	34		1,051	1,440		88					
WTF WPF Demolition		164	6,546		14						495			6		
WMA 4 Closure		78	3,088								28	19				
WMA 5 Closure	36	11	404								312					
WMA 6 Closure	15	5	162								1					
LTF Construction	1															
LTF Operation								140			305	136				
LTF Closure		1	47								54					
CMF Construction	10															
CMF Operation											1,453					
CMF Closure	18	6	1,396								179					
WMA 7 Closure																
Surface Structure Removal	3	1	12								1					

Table 3-3. Waste Containers for DOE/Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes Stong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
Interceptor Trench Excavation		6	240								4					
NDA EE Construction	21										2					
NDA MSEE Construction	8	11	402								23					
WVDP Area EE Construction	7															
NDA Excavation/Backfill		142	23,147						148	10,000	3,098	3	5	8	264	105
WVDP Area EE Demolition		23	918								31					
NDA EE Demolition		36	3,715								190					
WMA 8 Closure																
Surface Structure Removal	3		9		189						7					
SDA MSEE Construction	32		1,874													
South SDA EE Construction	29										13					
North SDA EE Construction	21										3					
Lagoon Confinement Construction	6										1					
SDA Waste Excavation			38,846							9,922	25,885	24			150	317
Lagoon Confinement Demolition			1,386								67					
North SDA EE Demolition			5,162								263					
South SDA EE Demolition			7,018								357					
WMA 9 Closure	47	6	218								1					
WMA 10 Closure	18															
WMA 11 Closure	7															
WMA 12 Closure	483	24	950								83					

Table 3-3. Waste Containers for DOE/Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes Stong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
Soil Drying Facility Construction	10															
Soil Drying Facility Operation											37					
Soil Drying Facility Closure		6	2,962								119					
North Plateau Groundwater Plume (non-source area)	4		57,082								100				4	
Cesium Prong			8,293								68					
Monitoring & Maintenance	2			61	2,358						1,733					
Security																
TOTALS	**898**	**1,042**	**184,525**	**72**	**3,604**	**34**	**0**	**1,191**	**4,767**	**19,922**	**41,058**	**196**	**38**	**377**	**418**	**422**

Table 3-4. Waste Containers for Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes, Strong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
HLW Canister Removal																
Construction of DCSA																
LILO Modification and Operation			10								22					
Operation of DCSA																
Demolition of DCSA	73															
WMA 1 Closure																
Surface Structure Removal	9		3,484	11	937				3,179		1,192	14			15	44
Subsurface Soil Removal	2		10,220								1,458					
WMA 2 Closure	10		5,326								3,333					162
WMA 3 Closure																
Removal of Surface Structures	16		142								46				3	
WTF WPF Construction	7		14								6					
WTF WPF Operations			1,452		106	34		1,051	1,440		88					
WTF WPF Demolition			6,546		14						495					3
WMA 4 Closure			3,088								28	19				
WMA 5 Closure	36		404								312					
WMA 6 Closure	15		162								1					
LTF Construction	1															
LTF Operation								140			305	136				
LTF Closure			47								54					
CMF Construction	10															
CMF Operation											1,453					
CMF Closure	18		1,396								178					

Table 3-4. Waste Containers for Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes, Strong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
WMA 7 Closure																
Surface Structure Removal	3		12								1					
Interceptor Trench Excavation			240								4					
NDA EE Construction	21										2					
NDA MSEE Construction	8		402								23					
WVDP Area EE Construction	7															
NDA Excavation/Backfill			23,147						148	10,000	3,098	3			267	110
WVDP Area EE Demolition			918								31					
NDA EE Demolition			3,715								189					
WMA 8 Closure																
Surface Structure Removal	3		9		189						7					
SDA MSEE Construction	32		1,874													
South SDA EE Construction	29										13					
North SDA EE Construction	21										3					
Lagoon Confinement Construction	6										1					
SDA Waste Excavation			38,846							9,922	25,885	24			150	317
Lagoon Confinement Demolition			1,386								67					
North SDA EE Demolition			5,162								263					
South SDA EE Demolition			7,018								357					

Table 3-4. Waste Containers for Commercial Facilities Disposal

Effort	20 CY Rolloffs (each)	Sealand Containers (each)	Lift Liners (each)	55-gal Drums (each)							B-25 Boxes, Strong/Tight (each)		B-25 Boxes, Type A (each)		HICs (each)	
	CDD	LSA	LSA	Hazardous	Class A	Class B	CH Class C	RH Class C	TRU	GTCC	Class A	Mixed	Class B	CH Class C	Class B	Class C
WMA 9 Closure	47		218								1					
WMA 10 Closure	18															
WMA 11 Closure	7															
WMA 12 Closure	483		950								83					
Soil Drying Facility Construction	10															
Soil Drying Facility Operation											37					
Soil Drying Facility Closure			2,962								118					
North Plateau Groundwater Plume (non-source area)	4		57,082								100				4	
Cesium Prong			8,293								68					
Monitoring & Maintenance	2			61	2,358						1,733					
Security																
TOTALS	**898**	**0**	**184,525**	**72**	**3,604**	**34**	**0**	**1,191**	**4,767**	**19,922**	**41,055**	**196**	**0**	**0**	**439**	**636**

Table 3-5. Utilities

Effort	Electricity (kw-hr)	Natural Gas (CF)	Diesel Fuel (gal)	Gasoline (gal)	Non-Potable Water (gal)	Augmentation Water (gal)	Potable Water (gal)
HLW Canister Removal							
Construction of DCSA	1,429,549	8,034,689	58,752	3,473	1,480,418	0	326,083
LILO Modification and Operation	2,234,442	12,558,544	3,105	0	2,313,952	0	509,681
Operation of DCSA	4,357,391	24,490,443	0	0	4,512,444	0	993,930
Demolition of DCSA	1,982,142	11,140,504	69,540	0	2,052,674	0	452,131
WMA 1 Closure							
Surface Structure Removal	33,069,685	185,866,112	1,537,788	125,696	34,246,435	0	7,543,268
Subsurface Soil Removal	9,663,587	54,313,592	171,995	1,319	10,007,456	2,811,300	2,204,285
WMA 2 Closure	13,112,678	73,698,994	219,026	1,057	13,579,279	1,584,000	2,991,031
WMA 3 Closure							
Removal of Surface Structures	1,411,995	7,936,032	60,890	2,105	1,462,240	0	322,079
WTF WPF Construction	16,672,078	93,704,380	366,309	99,086	17,265,336	0	3,802,938
WTF WPF Operations	67,209,821	377,748,630	82,170	0	69,601,412	0	15,330,707
WTF WPF Demolition	23,012,641	129,341,120	1,275,906	0	23,831,521	0	5,249,234
WMA 4 Closure	1,361,806	7,653,944	44,550	0	1,410,264	0	310,631
WMA 5 Closure	2,245,704	12,621,841	144,938	22,329	2,325,615	0	512,250
WMA 6 Closure	460,624	2,588,910	18,250	543	477,015	0	105,069
LTF Construction	415,139	2,333,263	1,375	3,502	429,911	0	94,694
LTF Operation	14,576,942	81,928,799	0	0	15,095,647	37,800,000	3,325,032
LTF Closure	462,015	2,596,726	9,622	2,765	478,455	0	105,387
CMF Construction	14,765,287	82,987,380	324,641	218,992	15,290,694	0	3,367,994
CMF Operation	124,604,478	721,531,739	367,000	0	129,038,397	0	28,422,554
CMF Closure	5,443,271	30,593,565	186,595	59,618	5,636,964	0	1,241,622
WMA 7 Closure							
Surface Structure Removal	92,350	519,045	5,862	388	95,636	0	21,065
Interceptor Trench Excavation	159,476	896,327	8,656	0	165,151	0	36,377
NDA EE Construction	5,989,303	33,662,505	125,153	72,158	6,202,426	0	1,366,173
NDA MSEE Construction	2,130,951	11,976,879	98,469	0	2,206,779	0	486,075
WVDP Area EE Construction	1,157,141	6,503,638	99,051	0	1,198,316	0	263,946
NDA Excavation/Backfill	40,520,403	227,742,412	68,684	349	41,962,279	0	9,242,793

Table 3-5. Utilities

Effort	Electricity (kw-hr)	Natural Gas (CF)	Diesel Fuel (gal)	Gasoline (gal)	Non-Potable Water (gal)	Augmentation Water (gal)	Potable Water (gal)
WVDP Area EE Demolition	1,443,308	8,112,020	75,350	1,692	1,494,666	0	329,222
NDA EE Demolition	9,092,931	51,106,256	108,470	271,755	9,416,494	0	2,074,118
WMA 8 Closure							
Surface Structure Removal	314,513	1,767,699	3,695	1,756	325,704	0	71,741
SDA MSEE Construction	7,830,816	44,012,616	324,076	0	8,109,467	0	1,786,226
South SDA EE Construction	11,670,653	65,594,181	207,538	138,319	12,085,941	0	2,662,102
North SDA EE Construction	8,064,013	45,323,285	171,722	100,300	8,350,962	0	1,839,419
Lagoon Confinement Construction	2,134,687	11,997,878	45,662	26,132	2,210,648	0	486,927
SDA Waste Excavation	108,132,962	607,754,602	236,464	631	111,980,759	0	24,665,365
Lagoon Confinement Demolition	3,225,023	18,126,043	34,379	101,394	3,339,782	0	735,635
North SDA EE Demolition	12,639,175	71,037,696	194,808	356,383	13,088,926	0	2,883,023
South SDA EE Demolition	17,185,640	96,590,825	223,606	504,597	17,797,173	0	3,920,082
WMA 9 Closure	1,786,694	10,042,001	93,053	49	1,850,271	0	407,549
WMA 10 Closure	1,018,886	5,726,584	47,387	0	1,055,142	0	232,410
WMA 11 Closure	302,813	1,701,941	11,339	0	313,588	0	69,072
WMA 12 Closure	4,829,923	27,146,280	137,975	5,791	5,001,790	0	1,101,716
Soil Drying Facility Construction	4,181,773	23,503,394	170,164	6,392	4,330,577	0	953,872
Soil Drying Facility Operation	1,774,875	228,375,572	114,294	0	1,838,032	0	404,853
Soil Drying Facility Closure	5,670,879	31,872,826	65,746	161,156	5,872,672	0	1,293,540
North Plateau Groundwater Plume (non-source area)	8,226,887	46,238,710	816,701	3,357	8,519,632	27,200,000	1,876,571
Cesium Prong	4,579,016	25,736,076	64,403	0	4,741,956	0	1,044,484
Monitoring & Maintenance	56,283,195	316,336,205	12,227	33,673	58,285,973	negligible	12,838,320
Security	64,813,056	364,277,760	0	38,776	67,119,360	0	14,784,000
TOTALS	**723,742,600**	**4,307,350,500**	**8,507,400**	**2,365,500**	**749,496,200**	**69,395,300**	**165,087,300**

Table 3-6. Personnel Required by Job Category

Effort	Direct Hourly (wk-yrs)	Indirect Hourly (wk-yrs)	Non-Exempt (wk-yrs)	Management and Professional (wk-yrs)	Sub-Contract Direct Hourly (wk-yrs)	Total (wk-yrs)
HLW Canister Removal						
Construction of DCSA	9.38	0.36	4.78	12.34	2.79	29.64
LILO Modification and Operation	10.76	2.74	10.43	20.93	1.47	46.33
Operation of DCSA	0.00	1.10	14.56	37.63	37.08	90.36
Demolition of DCSA	4.70	0.50	6.62	17.12	12.16	41.10
WMA 1 Closure						
Surface Structure Removal	273.68	8.34	110.47	285.56	7.71	685.75
Subsurface Soil Removal	68.21	2.44	32.28	83.44	14.01	200.39
WMA 2 Closure	106.64	3.31	43.80	113.23	4.93	271.91
WMA 3 Closure						
Removal of Surface Structures	9.68	0.36	4.72	12.19	2.33	29.28
WTF WPF Construction	11.68	4.20	55.69	143.96	130.18	345.72
WTF WPF Operations	320.55	97.56	334.49	641.10	0.00	1393.70
WTF WPF Demolition	22.33	5.80	76.87	198.71	173.49	477.20
WMA 4 Closure	2.15	0.34	4.55	11.76	9.44	28.24
WMA 5 Closure	12.07	0.57	7.50	19.39	7.04	46.57
WMA 6 Closure	2.43	0.12	1.54	3.98	1.49	9.55
LTF Construction	1.91	0.10	1.39	3.58	1.62	8.61
LTF Operation	124.03	3.68	48.69	125.87	0.00	302.28
LTF Closure	2.93	0.12	1.54	3.99	1.01	9.58
CMF Construction	0.00	3.72	49.32	127.50	125.64	306.18
CMF Operation	594.29	180.87	620.13	1188.58	0.00	2583.87
CMF Closure	33.67	1.37	18.18	47.00	12.65	112.87
WMA 7 Closure						
Surface Structure Removal	0.00	0.02	0.31	0.80	0.79	1.92
Interceptor Trench Excavation	0.00	0.04	0.53	1.38	1.36	3.31
NDA EE Construction	0.00	1.51	20.01	51.72	50.96	124.20
NDA MSEE Construction	0.00	0.54	7.12	18.40	18.13	44.19

Table 3-6. Personnel Required by Job Category

Effort	Direct Hourly (wk-yrs)	Indirect Hourly (wk-yrs)	Non-Exempt (wk-yrs)	Management and Professional (wk-yrs)	Sub-Contract Direct Hourly (wk-yrs)	Total (wk-yrs)
WVDP Area EE Construction	0.00	0.29	3.87	9.99	9.85	24.00
NDA Excavation/Backfill	219.26	46.28	184.56	377.07	13.08	840.25
WVDP Area EE Demolition	5.35	0.36	4.82	12.46	6.93	29.93
NDA EE Demolition	20.53	2.29	30.38	78.52	56.84	188.56
WMA 8 Closure						
Surface Structure Removal	1.46	0.08	1.05	2.72	1.21	6.52
SDA MSEE Construction	0.00	1.97	26.16	67.62	66.63	162.38
South SDA EE Construction	0.00	2.94	38.99	100.78	99.30	242.01
North SDA EE Construction	0.00	2.03	26.94	69.63	68.62	167.22
Lagoon Confinement Construction	0.00	0.54	7.13	18.43	18.16	44.27
SDA Waste Excavation	502.72	156.96	538.15	1031.46	13.01	2242.31
Lagoon Confinement Demolition	11.76	0.81	10.77	27.85	15.68	66.88
North SDA EE Demolition	32.26	3.19	42.22	109.14	75.28	262.09
South SDA EE Demolition	43.87	4.33	57.41	148.40	102.37	356.37
WMA 9 Closure	14.71	0.45	5.97	15.43	0.49	37.05
WMA 10 Closure	1.37	0.26	3.40	8.80	7.30	21.13
WMA 11 Closure	0.10	0.08	1.01	2.61	2.48	6.28
WMA 12 Closure	35.84	1.22	16.13	41.71	5.25	100.16
Soil Drying Facility Construction	0.00	1.05	13.97	36.11	35.58	86.72
Soil Drying Facility Operation	0.00	0.45	5.93	15.33	15.10	36.80
Soil Drying Facility Closure	13.39	1.43	18.94	48.97	34.86	117.59
North Plateau Groundwater Plume (non-source area)	42.69	2.07	27.48	71.04	27.31	170.60
Cesium Prong	27.59	1.15	15.30	39.54	11.37	94.95
Existing Facility Maintenance	304.14	26.61	178.68	631.08	26.61	1167.12
Security				376.32	967.68	1344.00
TOTALS	**2888.1**	**576.6**	**2734.8**	**6511.2**	**2297.3**	**15007.9**

Table 3-7. Personnel Required by Activity

Effort	Preparation and Planning (wk-yrs)	Construction (wk-yrs)	Operation (wk-yrs)	Closure (wk-yrs)	Total (wk-yr)
HLW Canister Removal					
Construction of DCSA	3.42	26.22	0.00	0.00	29.6
LILO Modification and Operation	6.27	7.72	32.35	0.00	46.3
Operation of DCSA	11.96	0.00	78.39	0.00	90.36
Demolition of DCSA	4.75	0.00	0.00	36.36	41.1
WMA 1 Closure					
Surface Structure Removal	79.21	0.00	104.97	501.58	685.8
Subsurface Soil Removal	23.15	0.00	0.00	177.24	200.4
WMA 2 Closure	31.41	10.63	0.00	229.88	271.9
WMA 3 Closure					
Removal of Surface Structures	3.38	0.00	0.00	25.90	29.3
WTF WPF Construction	39.93	305.79	0.00	0.00	345.7
WTF WPF Operations	195.12	0.00	1198.58	0.00	1393.7
WTF WPF Demolition	55.12	0.00	0.00	422.09	477.2
WMA 4 Closure	3.26	0.00	0.00	24.98	28.2
WMA 5 Closure	5.38	0.00	0.00	41.19	46.6
WMA 6 Closure	1.10	0.00	0.00	8.45	9.6
LTF Construction	0.99	7.61	0.00	0.00	8.6
LTF Operation	34.91	0.00	267.36	0.00	302.3
LTF Closure	1.11	0.00	0.00	8.47	9.6
CMF Construction	35.36	270.82	0.00	0.00	306.2
CMF Operation	361.74	0.00	2222.13	0.00	2583.9
CMF Closure	13.04	0.00	0.00	99.84	112.9
WMA 7 Closure					
Surface Structure Removal	0.22	0.00	0.00	1.69	1.92
Interceptor Trench Excavation	0.38	0.00	0.00	2.93	3.31
NDA EE Construction	14.35	109.85	0.00	0.00	124.20
NDA MSEE Construction	5.10	0.00	0.00	39.08	44.19
WVDP Area EE Construction	2.77	21.22	0.00	0.00	24.00

Table 3-7. Personnel Required by Activity

Effort	Preparation and Planning (wk-yrs)	Construction (wk-yrs)	Operation (wk-yrs)	Closure (wk-yrs)	Total (wk-yr)
NDA Excavation/Backfill	112.33	0.00	0.00	727.93	840.25
WVDP Area EE Demolition	3.46	0.00	0.00	26.47	29.93
NDA EE Demolition	21.78	0.00	0.00	166.78	188.56
WMA 8 Closure					
Surface Structure Removal	0.75	0.00	0.00	5.77	6.52
SDA MSEE Construction	18.76	0.00	0.00	143.63	162.38
South SDA EE Construction	27.95	214.06	0.00	0.00	242.01
North SDA EE Construction	19.31	147.91	0.00	0.00	167.22
Lagoon Confinement Construction	5.11	39.15	0.00	0.00	44.27
SDA Waste Excavation	313.92	0.00	0.00	1928.38	2242.31
Lagoon Confinement Demolition	7.72	0.00	0.00	59.15	66.88
North SDA EE Demolition	30.27	0.00	0.00	231.82	262.09
South SDA EE Demolition	41.16	0.00	0.00	315.21	356.37
WMA 9 Closure	4.28	0.00	0.00	32.77	37.05
WMA 10 Closure	2.44	0.00	0.00	18.69	21.13
WMA 11 Closure	0.73	0.00	0.00	5.55	6.28
WMA 12 Closure	11.57	0.00	0.00	88.59	100.16
Soil Drying Facility Construction	10.02	76.70	0.00	0.00	86.72
Soil Drying Facility Operation	4.25	0.00	32.55	0.00	36.80
Soil Drying Facility Closure	13.58	0.00	0.00	104.01	117.59
North Plateau Groundwater Plume (non-source area)	19.70	0.00	0.00	150.89	170.60
Cesium Prong	10.97	0.00	0.00	83.99	94.95
Monitoring & Maintenance	0.00	0.00	1167.12	0.00	1167.12
Security	0.00	0.00	1344.00	0.00	1344.00
TOTALS	**1613.5**	**1237.7**	**6447.5**	**5709.3**	**15007.9**

Figure 3-2 illustrates the personnel required for implementation of the Sitewide Removal Alternative by implementation year. This figure was developed assuming that various jobs could be performed simultaneously. A work force of about 300 from the start of site closure to approximately year 50 during which time closure activities would have been performed at WMA 1, WMA 3, WMA 7, and WMA 8. The peak staff requirements occur between years 5 and 10 when the operations at the CMF, LTF, and DCSA begin, in addition to remediation at WMA 1 and WMA 7.

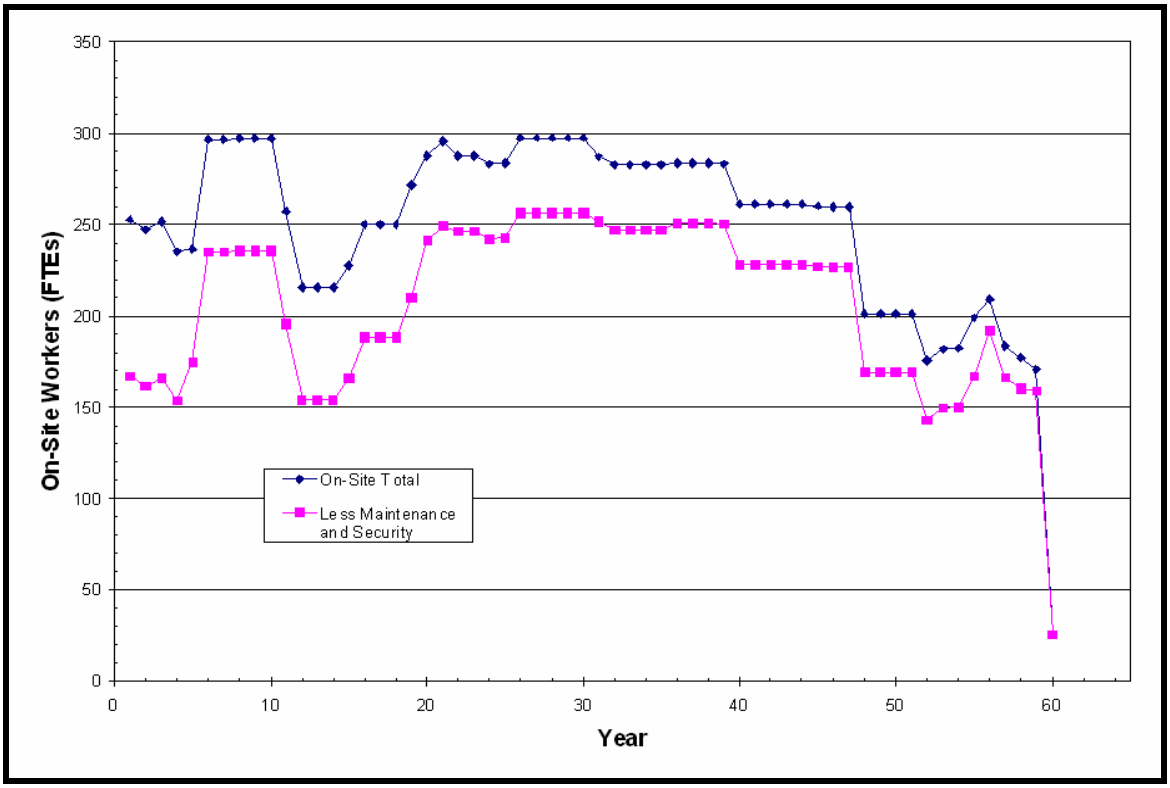


Figure 3-2. Personnel Requirements by Implementation Year

Labor efforts that were summarized in the previous table according to work years were also quantified based upon cost. Therefore, the headings in the rows and columns are identical for Tables 3-7 and 3-8; however, this table encapsulates the preparation, construction, operation, and closure efforts in 2008 dollars according to WMA or Facility.

Three major support facilities would be operated to effectively perform the removal alternative, and they include the SDF, CMF, and LTF. Since these facilities sustain various removal operations throughout the WNYNSC, Table 3-9 quantifies the volume of contaminated media (i.e., soil and water) that is treated at these facilities from specific locations. The percentage of total facility throughput is also calculated based upon the total volume of treated material.

Table 3-8. Labor Costs Required by Activity (2008 Dollars)

Effort	Preparation and Planning (dollars)	Construction (dollars)	Operation (dollars)	Closure (dollars)	Total (dollars)
HLW Canister Removal					
Construction of DCSA	$727,959	$6,450,841	$0	$0	$7,178,800
LILO Modification and Operation	$1,298,745	$1,420,143	$6,041,712	$0	$8,760,600
Operation of DCSA	$2,220,773	$0	$14,553,327	$0	$16,774,100
Demolition of DCSA	$1,008,565	$0	$0	$6,629,035	$7,637,600
WMA 1 Closure					
Surface Structure Removal	$16,770,213	$0	$19,050,802	$91,172,586	$126,993,600
Subsurface Soil Removal	$4,904,448	$0	$0	$32,416,352	$37,320,800
WMA 2 Closure	$6,650,318	$1,993,700	$0	$41,655,282	$50,299,300
WMA 3 Closure					
Removal of Surface Structures	$718,330	$0	$0	$5,841,070	$6,559,400
WTF WPF Construction	$8,493,416	$59,012,084	$0	$0	$67,505,500
WTF WPF Operations	$40,201,189	$0	$213,146,511	$0	$253,347,700
WTF WPF Demolition	$11,718,343	$0	$0	$76,969,457	$88,687,800
WMA 4 Closure	$693,227	$0	$0	$4,545,173	$5,238,400
WMA 5 Closure	$1,141,464	$0	$0	$7,927,336	$9,068,800
WMA 6 Closure	$234,019	$0	$0	$1,545,281	$1,779,300
LTF Construction	$211,018	$1,400,182	$0	$0	$1,611,200
LTF Operation	$7,391,249	$0	$48,436,851	$0	$55,828,100
LTF Closure	$235,169	$0	$0	$1,970,831	$2,206,000
CMF Construction	$7,528,853	$54,595,147	$0	$0	$62,124,000
CMF Operation	$74,531,460	$0	$412,672,140	$0	$487,203,600
CMF Closure	$2,763,694	$0	$0	$18,140,606	$20,904,300
WMA 7 Closure					
Surface Structure Removal	$47,085	$0	$0	$309,615	$356,700
Interceptor Trench Excavation	$81,259	$0	$0	$533,541	$614,800
NDA EE Construction	$3,052,726	$21,037,374	$0	$0	$24,090,100
NDA MSEE Construction	$1,086,303	$0	$0	$7,616,097	$8,702,400

Table 3-8. Labor Costs Required by Activity (2008 Dollars)

Effort	Preparation and Planning (dollars)	Construction (dollars)	Operation (dollars)	Closure (dollars)	Total (dollars)
WVDP Area EE Construction	$589,797	$4,055,503	$0	$0	$4,645,300
NDA Excavation/Backfill	$23,315,286	$0	$0	$147,773,014	$171,088,300
WVDP Area EE Demolition	$733,934	$0	$0	$4,876,166	$5,610,100
NDA EE Demolition	$4,627,837	$0	$0	$31,040,663	$35,668,500
WMA 8 Closure					
Surface Structure Removal	$159,864	$0	$0	$1,055,836	$1,215,700
SDA MSEE Construction	$3,991,819	$0	$0	$27,935,481	$31,927,300
South SDA EE Construction	$5,948,501	$41,015,199	$0	$0	$46,963,700
North SDA EE Construction	$4,110,202	$28,331,298	$0	$0	$32,441,500
Lagoon Confinement Construction	$1,088,067	$7,511,433	$0	$0	$8,599,500
SDA Waste Excavation	$64,683,746	$0	$0	$358,292,754	$422,976,500
Lagoon Confinement Demolition	$1,659,547	$0	$0	$9,268,553	$10,928,100
North SDA EE Demolition	$6,432,237	$0	$0	$43,574,263	$50,006,500
South SDA EE Demolition	$8,745,116	$0	$0	$58,620,984	$67,366,100
WMA 9 Closure	$906,105	$0	$0	$5,938,395	$6,844,500
WMA 10 Closure	$519,054	$0	$0	$3,645,246	$4,164,300
WMA 11 Closure	$154,296	$0	$0	$1,014,304	$1,168,600
WMA 12 Closure	$2,458,330	$0	$0	$21,591,370	$24,049,700
Soil Drying Facility Construction	$2,131,370	$14,631,530	$0	$0	$16,762,900
Soil Drying Facility Operation	$904,548	$0	$6,122,152	$0	$7,026,700
Soil Drying Facility Closure	$2,886,390	$0	$0	$19,612,910	$22,499,300
North Plateau Groundwater Plume (non-source area)	$4,179,718	$0	$0	$27,668,382	$31,848,100
Cesium Prong	$2,325,073	$0	$0	$15,245,627	$17,570,700
Monitoring & Maintenance	$0	$0	$128,043,500	$0	$128,043,500
Security	$0	$0	$71,863,700	$0	$71,863,700
TOTALS	**$336,260,666**	**$241,454,433**	**$919,930,694**	**$1,074,426,207**	**$2,572,072,000**

Table 3-9. Distribution of Support Facility Operations

Effort	Soil Drying Facility		Container Management Facility		Leachate Treatment Facility	
	(yd^3 treated)	(% of Total)	(yd^3 treated)	(% of Total)	(gallons treated)	(% of Total)
HLW Canister Removal						
Construction of DCSA	0	0.0%	0	0.0%	0	0.0%
LILO Modification and Operation	0	0.0%	0	0.0%	0	0.0%
Annual Operation of DCSA	0	0.0%	0	0.0%	0	0.0%
Demolition of DCSA	0	0.0%	0	0.0%	0	0.0%
WMA 1 Closure						
Surface Structure Removal	0	0.0%	0	0.0%	0	0.0%
Subsurface Soil Removal	43,040	7.5%	0	0.0%	0	0.0%
WMA 2 Closure	0	0.0%	0	0.0%	0	0.0%
WMA 3 Closure						
Removal Of Surface Structures	0	0.0%	0	0.0%	0	0.0%
WTF WPF Construction	0	0.0%	0	0.0%	0	0.0%
WTF WPF Operations	0	0.0%	0	0.0%	0	0.0%
WTF WPF Demolition	0	0.0%	0	0.0%	0	0.0%
WMA 4 Closure	12,050	2.1%	0	0.0%	0	0.0%
WMA 5 Closure	0	0.0%	0	0.0%	0	0.0%
WMA 6 Closure	0	0.0%	0	0.0%	0	0.0%
LTF Construction	0	0.0%	0	0.0%	0	0.0%
LTF Operation	0	0.0%	0	0.0%	0	0.0%
LTF Closure	0	0.0%	0	0.0%	0	0.0%
CMF Construction	0	0.0%	0	0.0%	0	0.0%
CMF Operation	0	0.0%	0	0.0%	0	0.0%
CMF Closure	0	0.0%	0	0.0%	0	0.0%
WMA 7 Closure						
Surface Structure Removal	0	0.0%	0	0.0%	0	0.0%
Interceptor Trench Excavation	0	0.0%	0	0.0%	0	0.0%
NDA EE Construction	0	0.0%	0	0.0%	0	0.0%
NDA MSEE Construction	0	0.0%	0	0.0%	0	0.0%

Table 3-9. Distribution of Support Facility Operations

Effort	Soil Drying Facility		Container Management Facility		Leachate Treatment Facility	
	(yd^3 treated)	(% of Total)	(yd^3 treated)	(% of Total)	(gallons treated)	(% of Total)
NDA Excavation/Backfill	0	0.0%	13,380	13.3%	935,000	30.8%
NDA MSEE Demolition	0	0.0%	0	0.0%	0	0.0%
NDA EE Demolition	0	0.0%	0	0.0%	0	0.0%
WMA 8 Closure						
Surface Structure Removal	0	0.0%	0	0.0%	0	0.0%
SDA MSEE Construction	0	0.0%	1	0.0%	1	0.0%
South SDA EE Construction	0	0.0%	0	0.0%	0	0.0%
North SDA EE Construction	0	0.0%	0	0.0%	0	0.0%
Lagoon Confinement Construction	0	0.0%	0	0.0%	0	0.0%
SDA Waste Excavation	0	0.0%	87,580	86.7%	2,100,000	69.2%
Lagoon Confinement Demolition	0	0.0%	0	0.0%	0	0.0%
North SDA EE Demolition	0	0.0%	0	0.0%	0	0.0%
South SDA EE Demolition	0	0.0%	0	0.0%	0	0.0%
WMA 9 Closure	0	0.0%	0	0.0%	0	0.0%
WMA 10 Closure	0	0.0%	0	0.0%	0	0.0%
WMA 11 Closure	0	0.0%	0	0.0%	0	0.0%
WMA 12 Closure	0	0.0%	0	0.0%	0	0.0%
Soil Drying Facility Construction	0	0.0%	0	0.0%	0	0.0%
Soil Drying Facility Operation	0	0.0%	0	0.0%	0	0.0%
Soil Drying Facility Closure	0	0.0%	0	0.0%	0	0.0%
North Plateau Groundwater Plume (non-source area)	520,000	90.4%	0	0.0%	0	0.0%
Cesium Prong	0	0.0%	0	0.0%	0	0.0%
Monitoring & Maintenance	0	0.0%	0	0.0%	0	0.0%
Security	0	0.0%	0	0.0%	0	0.0%
TOTALS	**575,090**		**100,961**		**3,035,001**	

3.3 Implementation Effects

In order to understand the emissions data presented in this section, it is important to understand the construction equipment use by implementation year, illustrated in Figure 3-3. This figure represents the total use (in hours) of heavy equipment (diesel or gasoline burning) over the duration of the implementation. The peak heavy construction use occurs during removal of the North Plateau Groundwater Plume, which also causes related peak construction equipment dust and emissions during this task.

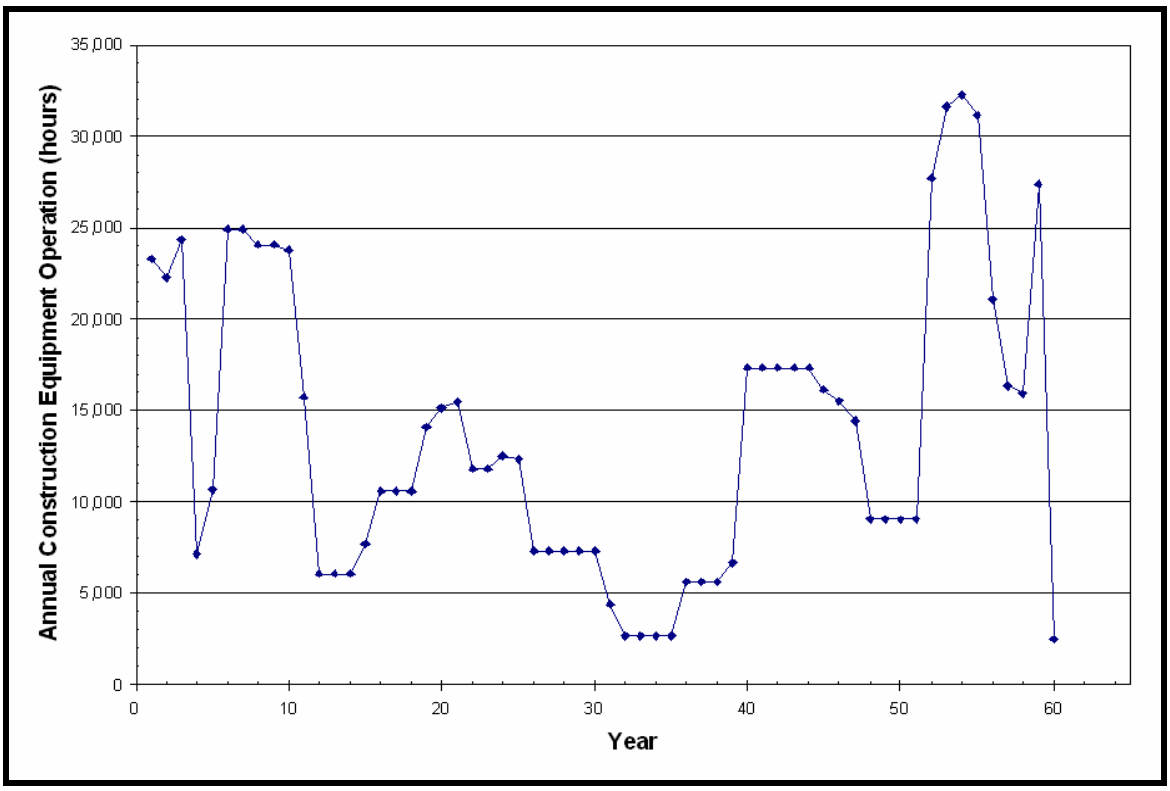


Figure 3-3. Construction Equipment Use by Implementation Year

A consequence to performing remedial work is the potential effects to human health and the environment as a result of implementation activities. Some factors that hinder the short-term effectiveness of a removal alternative could be protection of workers, risks to the community, and releases to the environment. The following tables and figures quantify these potential effects in terms of impacts to personnel and releases to the environment.

Based upon statistics generated from previous and similar construction work, the injuries and fatalities of personnel during the implementation of the Removal Alternative were estimated. Table 3-10 presents these impacts for each WMA or Facility in the form of total reportable injuries, and the work days lost and deaths as a result of the injury. The duration of the activities conducted at each location is a primary factor in these calculations.

Table 3-10. Personnel Injuries and Fatalities

Effort	Total Reportable Cases	Lost Work-Day Cases	Deaths
HLW Canister Removal			
Construction of DCSA	1.13	0.55	5.47E-04
LILO Modification and Operation	1.69	0.81	6.64E-04
Operation of DCSA	2.92	1.37	7.73E-04
Demolition of DCSA	1.56	0.76	7.58E-04
WMA 1 Closure			
Surface Structure Removal	26.10	12.64	1.26E-02
Subsurface Soil Removal	7.63	3.69	3.70E-03
WMA 2 Closure	10.35	5.01	5.01E-03
WMA 3 Closure			
Removal of Surface Structures	1.11	0.54	5.40E-04
WTF WPF Construction	13.16	6.37	6.38E-03
WTF WPF Operations	50.20	24.03	1.87E-02
WTF WPF Demolition	18.16	8.80	8.80E-03
WMA 4 Closure	1.07	0.52	5.21E-04
WMA 5 Closure	1.77	0.86	8.59E-04
WMA 6 Closure	13.16	6.37	6.38E-03
LTF Construction	0.33	0.16	1.59E-04
LTF Operation	11.50	5.57	5.57E-03
LTF Closure	0.36	0.18	1.77E-04
CMF Construction	11.65	5.65	5.65E-03
CMF Operation	93.07	44.55	3.46E-02
CMF Closure	4.30	2.08	2.08E-03
WMA 7 Closure			
Surface Structure Removal	0.07	0.04	3.52E-05
Interceptor Trench Excavation	0.13	0.06	6.10E-05
NDA EE Construction	4.73	2.29	2.29E-03
NDA MSEE Construction	1.68	0.81	8.15E-04
WVDP Area EE Construction	0.91	0.44	4.42E-04
NDA Excavation/Backfill	30.71	14.75	1.23E-02
WVDP Area EE Demolition	1.14	0.55	5.52E-04
NDA EE Demolition	7.18	3.48	3.48E-03
WMA 8 Closure			
Surface Structure Removal	0.25	0.12	1.20E-04
SDA MSEE Construction	6.18	2.99	2.99E-03
South SDA EE Construction	9.21	4.46	4.46E-03
North SDA EE Construction	6.36	3.08	3.08E-03
Lagoon Confinement Construction	1.68	0.82	8.16E-04
SDA Waste Excavation	80.77	38.66	3.00E-02
Lagoon Confinement Demolition	2.54	1.23	1.23E-03
North SDA EE Demolition	9.97	4.83	4.83E-03
South SDA EE Demolition	13.56	6.57	6.57E-03
WMA 9 Closure	1.41	0.68	6.83E-04
WMA 10 Closure	0.80	0.39	3.90E-04
WMA 11 Closure	0.24	0.12	1.16E-04
WMA 12 Closure	3.81	1.85	1.85E-03
Soil Drying Facility Construction	3.30	1.60	1.59E-03
Soil Drying Facility Operation	1.40	0.68	6.79E-04
Soil Drying Facility Closure	4.48	2.17	2.16E-03
North Plateau Groundwater Plume (non-source area)	6.49	3.15	3.15E-03
Cesium Prong	3.61	1.75	1.75E-03
Monitoring & Maintenance	37.16	17.41	1.08E-02
Security	44.19	20.75	1.04E-02
TOTALS	**555.19**	**266.24**	**0.22**

Exposure estimation for personnel during remedial efforts is developed consistent with the methodology in the Facilities Description Technical Report, and is highly variable throughout the site, as anticipated. Table 3-11, summarizes the total exposure in worker-rem for each WMA or Facility. Similar to the previous table, these values were primarily based on work effort duration, which was factored to an approximate area dose rate based on historical information. The sum-total exposure is also estimated in the table, but this value represents all areas over the life of the Removal Alternative.

Figure 3-4 illustrates the personnel radiation exposure by implementation year, and combines the schedule (Figure 3-1) with the Personnel Radiation Exposure data listed in Table 3-11. These doses are assumed to be from whole-body exposure to gamma radiation. The peaks in the chart coincide with the activity or activities that result in higher risk of worker exposure. Closure activities at WMA 3, WMA 7, and WMA 8 are expected to contribute the majority of worker dose received during implementation.

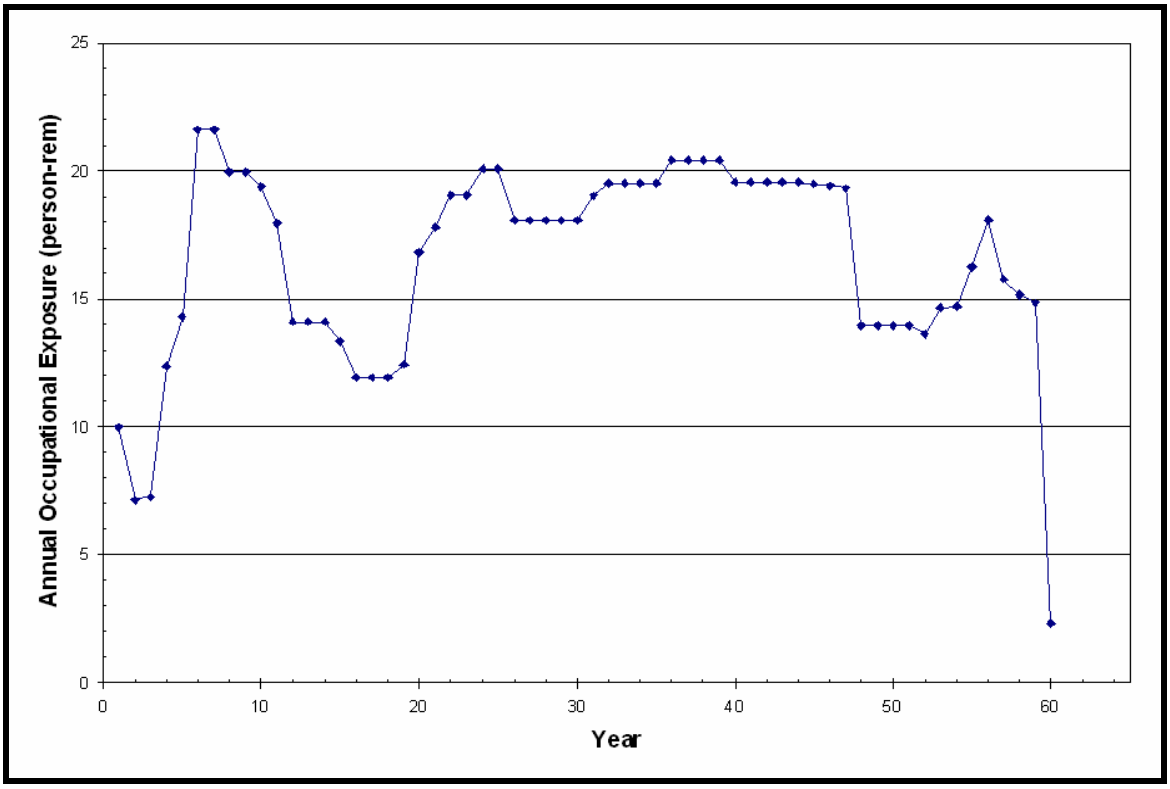


Figure 3-4. Personnel Radiation Exposure by Implementation Year

Table 3-11. Personnel Radiation Exposure

Effort	Worker-Rem
HLW Canister Removal	
Construction of DCSA	1.19
LILO Modification and Operation	1.73
Operation of DCSA	0.15
Demolition of DCSA	3.72
WMA 1 Closure	
Surface Structure Removal	62.13
Subsurface Soil Removal	18.16
WMA 2 Closure	24.64
WMA 3 Closure	
Removal Of Surface Structures	2.65
WTF WPF Construction	9.57
WTF WPF Operations	103.10
WTF WPF Demolition	43.24
WMA 4 Closure	2.56
WMA 5 Closure	4.22
WMA 6 Closure	0.87
LTF Construction	0.31
LTF Operation	15.79
LTF Closure	0.87
CMF Construction	8.02
CMF Operation	191.14
CMF Closure	10.23
WMA 7 Closure	
Surface Structure Removal	0.17
Interceptor Trench Excavation	0.30
NDA EE Construction	3.25
NDA MSEE Construction	4.00
WVDP Area EE Construction	0.63
NDA Excavation/Backfill	64.79
WVDP Area EE Demolition	2.71
NDA EE Demolition	17.08
WMA 8 Closure	
Surface Structure Removal	0.59
SDA MSEE Construction	14.71
South SDA EE Construction	6.34
North SDA EE Construction	4.38
Lagoon Confinement Construction	1.16
SDA Waste Excavation	165.87
Lagoon Confinement Demolition	6.06
North SDA EE Demolition	23.75
South SDA EE Demolition	32.29
WMA 9 Closure	3.36
WMA 10 Closure	1.91
WMA 11 Closure	0.57
WMA 12 Closure	9.07
Soil Drying Facility Construction	2.27
Soil Drying Facility Operation	1.92
Soil Drying Facility Closure	10.65
North Plateau Groundwater Plume (non-source area)	15.46
Cesium Prong	8.60
Monitoring & Maintenance	36.96
Security	50.13
TOTALS	**993.3**

Tables 3-12 and 3-13 display the quantity of the six major radionuclides released to the environment at the WNYNSC through the air and water, respectively. Each source area is listed in rows and the release quantity in curies is shown down each column with a sum-total of each radionuclide release at the bottom. A screening guideline is also presented in the table to represent 1/1000 times the total release quantity for each radionuclide. All tabular values less than this guideline appear as "neg" or are negligible to the sum total, which allows the table to show the areas or facilities with the most significant release.

Airborne releases, presented in Table 3-12, are illustrated versus time in Figure 3-5. These airborne releases are largely based on the dust generated during the various activities. Since heavy equipment is the main contributor to dust generation, the airborne releases appear consistent with Figure 3-3, Construction Equipment Use by Implementation Year.

Aqueous releases, presented in Table 3-13, are illustrated versus time in Figure 3-6. This figure presents the post treatment release in terms of total curies for the 5 principal radionuclides. The Tritium increase occurring near year 25 corresponds with the SDA trench removals, the source of most of the Tritium released from the site during implementation.

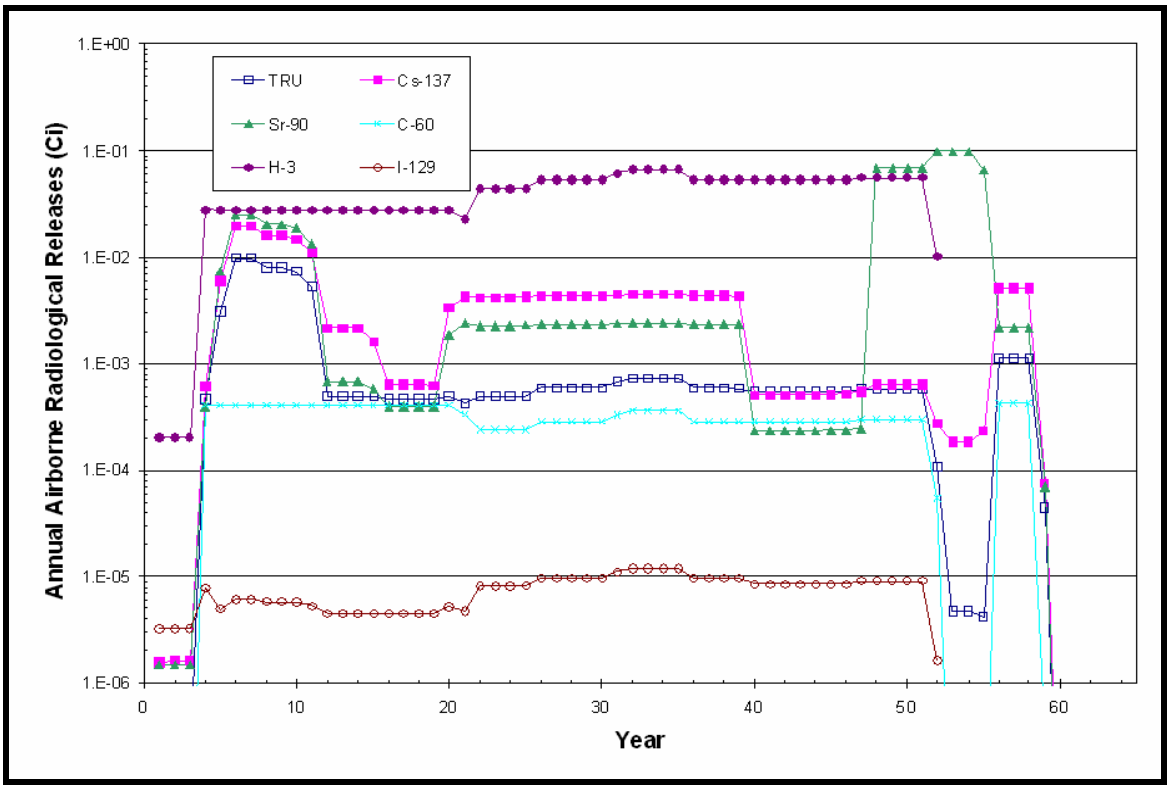


Figure 3-5. Environmental Airborne Releases by Implementation Year

Table 3-12. Airborne Releases (Curies)

Effort	Activity	H-3	Co-60	Sr-90	Cs-137	TRU	I-129
HLW Canister Removal	Construction of DCSA	neg	neg	neg	neg	neg	neg
	LILO Modification and Operation	neg	neg	neg	neg	neg	neg
	Annual Operation of DCSA	neg	neg	neg	neg	neg	neg
	Demolition of DCSA	neg	neg	neg	neg	neg	neg
WMA 1 Closure	Surface Structure Removal	neg	neg	1.28E-01	9.83E-02	4.80E-02	8.12E-06
	Subsurface Soil Removal	neg	neg	neg	5.78E-03	1.23E-04	neg
WMA 2 Closure		neg	1.27E-03	6.59E-03	1.53E-02	3.37E-03	neg
WMA 3 Closure		neg	neg	neg	neg	neg	neg
WTF WPF	WTF WPF Construction	neg	neg	neg	neg	neg	neg
	WTF WPF Operations	neg	neg	4.12E-02	7.59E-02	8.51E-04	2.08E-05
	WTF WPF Demolition	neg	neg	neg	2.51E-04	neg	neg
WMA 4 Closure		neg	neg	neg	neg	neg	neg
WMA 5 Closure		neg	neg	neg	neg	neg	neg
WMA 6 Closure		neg	neg	neg	neg	neg	neg
Leachate Treatment Facility Construction		neg	neg	neg	neg	neg	neg
Leachate Treatment Facility Operations		neg	neg	neg	neg	neg	neg
Leachate Treatment Facility Closure		neg	neg	neg	neg	neg	neg
Container Management Facility Construction		neg	neg	neg	neg	neg	neg
Container Management Facility Operations		1.53E+00	1.18E-02	1.07E-02	1.90E-02	1.83E-02	2.46E-04
Container Management Facility Closure		neg	neg	neg	neg	neg	neg
WMA 7 Closure	Surface Structure Removal	neg	neg	neg	neg	neg	neg
	Interceptor Trench Excavation	neg	neg	neg	neg	neg	neg
	NDA EE Construction	neg	neg	neg	neg	neg	neg
	WVDP Area EE Construction	neg	neg	neg	neg	neg	neg
	Operational Activities	neg	2.29E-03	2.47E-03	3.15E-03	1.59E-03	neg
	MSEE Management	neg	1.09E-03	1.17E-03	1.50E-03	7.53E-04	neg
	WVDP Area EE Demolition	neg	neg	neg	neg	neg	neg
	NDA EE Demolition	neg	neg	neg	neg	neg	neg

Table 3-12. Airborne Releases (Curies)

Effort	Activity	H-3	Co-60	Sr-90	Cs-137	TRU	I-129
WMA 8 Closure	Surface Structure Removal	neg	neg	neg	neg	neg	neg
	South SDA EE Construction	neg	neg	neg	neg	neg	neg
	North SDA EE Construction	neg	neg	neg	neg	neg	neg
	Lagoon Confinement Construction	neg	neg	neg	neg	neg	neg
	SDA Waste Excavation	4.68E-01	6.04E-04	neg	1.66E-03	3.52E-03	7.54E-05
	MSEE Management	1.42E-01	1.83E-04	neg	5.05E-04	1.07E-03	2.28E-05
	Lagoon Confinement Demolition	neg	neg	neg	neg	neg	neg
	North SDA EE Demolition	neg	neg	neg	neg	neg	neg
	South SDA EE Demolition	neg	neg	neg	neg	neg	neg
WMA 9 Closure		neg	neg	neg	neg	neg	neg
WMA 10 Closure		neg	neg	neg	neg	neg	neg
WMA 11 Closure		neg	neg	neg	neg	neg	neg
WMA 12 Closure		neg	neg	neg	neg	neg	neg
Soil Drying Facility Construction		neg	neg	neg	neg	neg	neg
Soil Drying Facility Operations		neg	neg	1.72E-03	1.89E-03	neg	neg
Soil Drying Facility Closure		neg	neg	neg	neg	neg	neg
North Plateau GW Plume		neg	neg	6.36E-01	neg	neg	neg
Cesium Prong		neg	neg	neg	2.57E-04	neg	neg
TOTAL		**2.14E+00**	**1.73E-02**	**8.27E-01**	**2.24E-01**	**7.76E-02**	**3.73E-04**

Table 3-13. Aqueous Releases (Curies)

Effort	Activity	H-3	Co-60	Sr-90	Cs-137	TRU	I-129
HLW Canister Removal	Construction of DCSA	neg	neg	neg	neg	neg	neg
	LILO Modification and Operation	neg	neg	neg	neg	neg	neg
	Annual Operation of DCSA	neg	neg	neg	neg	neg	neg
	Demolition of DCSA	neg	neg	neg	neg	neg	neg
WMA 1 Closure	Surface Structure Removal	neg	neg	neg	neg	neg	neg
	Subsurface Soil Removal	neg	neg	6.26E-04	neg	neg	neg
WMA 2 Closure		neg	4.18E-08	neg	neg	neg	neg
WMA 3 Closure		neg	neg	neg	neg	neg	neg
WTF WPF	WTF WPF Construction	neg	neg	neg	neg	neg	neg
	WTF WPF Operations	neg	1.63E-05	neg	2.04E-02	9.70E-06	neg
	WTF WPF Demolition	neg	neg	neg	neg	neg	neg
WMA 4 Closure		neg	neg	neg	neg	neg	neg
WMA 5 Closure		neg	neg	neg	neg	neg	neg
WMA 6 Closure		neg	neg	neg	neg	neg	neg
Leachate Treatment Facility Construction		neg	neg	neg	neg	neg	neg
Leachate Treatment Facility Operations		2.86E+02	3.21E-06	3.86E-01	1.82E-02	4.02E-04	neg
Leachate Treatment Facility Closure		neg	neg	neg	neg	neg	neg
Container Management Facility Construction		neg	neg	neg	neg	neg	neg
Container Management Facility Operations		neg	8.13E-06	neg	1.02E-02	4.85E-06	neg
Container Management Facility Closure		neg	neg	neg	neg	neg	neg
WMA 7 Closure	Surface Structure Removal	neg	neg	neg	neg	neg	neg
	Interceptor Trench Excavation	neg	neg	neg	neg	neg	neg
	NDA EE Construction	neg	neg	neg	neg	neg	neg
	WVDP Area EE Construction	neg	neg	neg	neg	neg	neg
	Operational Activities	neg	neg	neg	neg	neg	neg
	MSEE Management	neg	neg	neg	neg	neg	neg
	WVDP Area EE Demolition	neg	neg	neg	neg	neg	neg
	NDA EE Demolition	neg	neg	neg	neg	neg	neg

Table 3-13. Aqueous Releases (Curies)

Effort	Activity	H-3	Co-60	Sr-90	Cs-137	TRU	I-129
WMA 8 Closure	Surface Structure Removal	neg	neg	neg	neg	neg	neg
	South SDA EE Construction	neg	neg	neg	neg	neg	neg
	North SDA EE Construction	neg	neg	neg	neg	neg	neg
	Lagoon Confinement Construction	neg	neg	neg	neg	neg	neg
	SDA Waste Excavation	neg	neg	neg	neg	neg	neg
	MSEE Management	neg	neg	neg	neg	neg	neg
	Lagoon Confinement Demolition	neg	neg	neg	neg	neg	neg
	North SDA EE Demolition	neg	neg	neg	neg	neg	neg
	South SDA EE Demolition	neg	neg	neg	neg	neg	neg
WMA 9 Closure		neg	neg	neg	neg	neg	neg
WMA 10 Closure		neg	neg	neg	neg	neg	neg
WMA 11 Closure		neg	neg	neg	neg	neg	neg
WMA 12 Closure		neg	neg	neg	neg	neg	neg
Soil Drying Facility Construction		neg	neg	neg	neg	neg	neg
Soil Drying Facility Operations		neg	neg	4.79E-04	neg	neg	neg
Soil Drying Facility Closure		neg	neg	neg	neg	neg	neg
North Plateau GW Plume		neg	neg	1.19E-03	neg	neg	neg
Cesium Prong		neg	neg	neg	neg	neg	neg
TOTAL		**2.86E+02**	**2.77E-05**	**3.89E-01**	**4.89E-02**	**4.17E-04**	**0.00E+00**

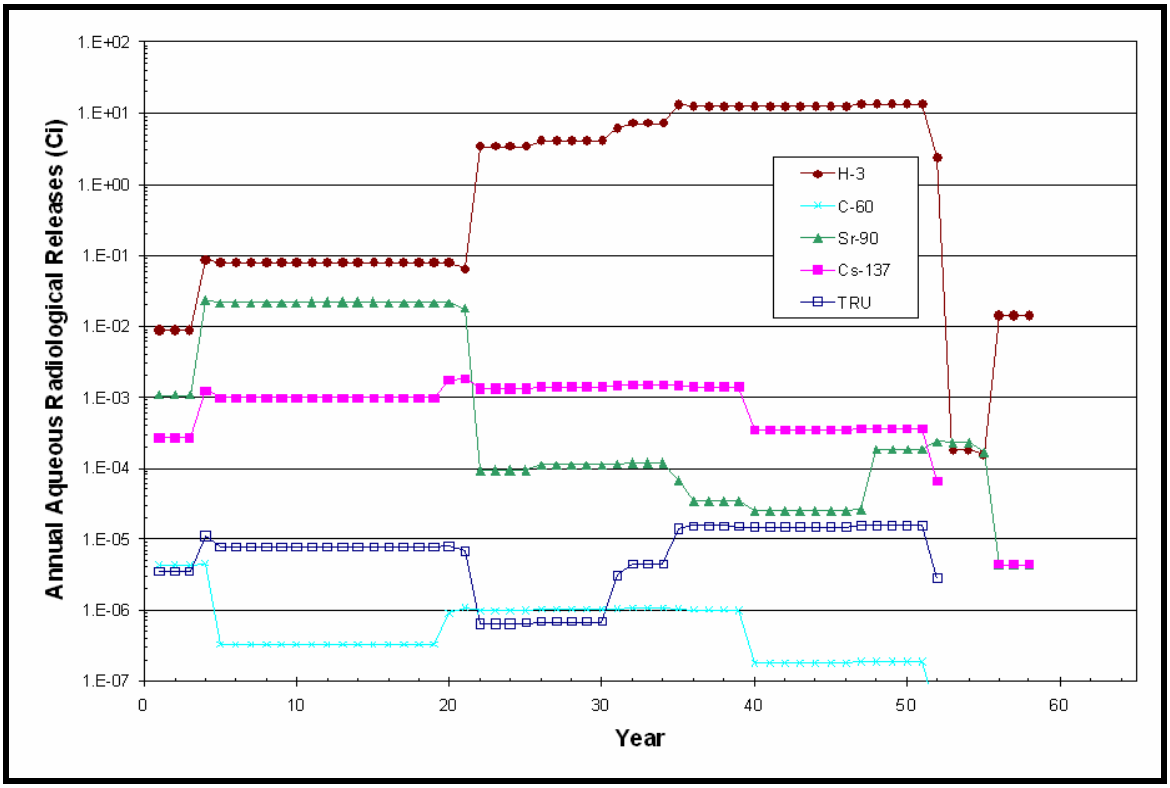


Figure 3-6. Environmental Aqueous Releases by Implementation Year

Non-radiological releases were also estimated for the removal alternative. The next two tables quantify these releases, which would be the result of operation and maintenance activities. Tables 3-13 and 3-14 present the non-radiological releases in tons associated with natural gas usage (flue gas emission) and heavy equipment operation at each WMA and Facility. These values were generated based upon worker labor hours and the estimated use of natural gas for either heating purposes, operations (e.g., soil dryer), or both.

Table 3-14. Flue Gas Releases

Effort	CO_2	NO_x	CO	TOC	PM_{10}	VOC	Methane	SO_2	Toluene	Benzene	Lead
HLW Canister Removal											
Construction of DCSA	482	0.40	0.34	0.044	0.031	0.022	9.2E-03	2.4E-03	1.4E-05	8.4E-06	2.0E-06
LILO Modification and Operation	754	0.63	0.53	0.069	0.048	0.035	1.4E-02	3.8E-03	2.1E-05	1.3E-05	3.1E-06
Operation of DCSA	1,469	1.22	1.03	0.135	0.093	0.067	2.8E-02	7.3E-03	4.2E-05	2.6E-05	6.1E-06
Demolition of DCSA	668	0.56	0.47	0.061	0.042	0.031	1.3E-02	3.3E-03	1.9E-05	1.2E-05	2.8E-06
WMA 1 Closure											
Surface Structure Removal	11,152	9.29	7.81	1.022	0.706	0.511	2.1E-01	5.6E-02	3.2E-04	2.0E-04	4.6E-05
Subsurface Soil Removal	3,259	2.72	2.28	0.299	0.206	0.149	6.2E-02	1.6E-02	9.2E-05	5.7E-05	1.4E-05
WMA 2 Closure	4,422	3.68	3.10	0.405	0.280	0.203	8.5E-02	2.2E-02	1.3E-04	7.7E-05	1.8E-05
WMA 3 Closure											
Removal of Surface Structures	476	0.40	0.33	0.044	0.030	0.022	9.1E-03	2.4E-03	1.3E-05	8.3E-06	2.0E-06
WTF WPF Construction	5,622	4.69	3.94	0.515	0.356	0.258	1.1E-01	2.8E-02	1.6E-04	9.8E-05	2.3E-05
WTF WPF Operations	22,665	18.89	15.87	2.078	1.435	1.039	4.3E-01	1.1E-01	6.4E-04	4.0E-04	9.4E-05
WTF WPF Demolition	7,760	6.47	5.43	0.711	0.491	0.356	1.5E-01	3.9E-02	2.2E-04	1.4E-04	3.2E-05
WMA 4 Closure	459	0.38	0.32	0.042	0.029	0.021	8.8E-03	2.3E-03	1.3E-05	8.0E-06	1.9E-06
WMA 5 Closure	757	0.63	0.53	0.069	0.048	0.035	1.5E-02	3.8E-03	2.1E-05	1.3E-05	3.2E-06
WMA 6 Closure	155	0.13	0.11	0.014	0.010	0.007	3.0E-03	7.8E-04	4.4E-06	2.7E-06	6.5E-07
LTF Construction	140	0.12	0.10	0.013	0.009	0.006	2.7E-03	7.0E-04	4.0E-06	2.4E-06	5.8E-07
LTF Operation	4,916	4.10	3.44	0.451	0.311	0.225	9.4E-02	2.5E-02	1.4E-04	8.6E-05	2.0E-05
LTF Closure	156	0.13	0.11	0.014	0.010	0.007	3.0E-03	7.8E-04	4.4E-06	2.7E-06	6.5E-07
CMF Construction	4,909	4.15	3.49	0.450	0.311	0.225	9.4E-02	2.5E-02	1.4E-04	8.6E-05	2.0E-05
CMF Operation	43,292	36.08	30.30	3.968	2.742	1.984	8.3E-01	2.2E-01	1.2E-03	7.6E-04	1.8E-04
CMF Closure	1,836	1.53	1.28	0.168	0.116	0.084	3.5E-02	9.2E-03	5.2E-05	3.2E-05	7.6E-06
WMA 7 Closure											
Surface Structure Removal	31	0.03	0.02	0.003	0.002	0.001	6.0E-04	1.6E-04	8.8E-07	5.4E-07	1.3E-07
Interceptor Trench Excavation	54	0.04	0.04	0.005	0.003	0.002	1.0E-03	2.7E-04	1.5E-06	9.4E-07	2.2E-07
NDA EE Construction	2,020	1.68	1.41	0.185	0.128	0.093	3.9E-02	1.0E-02	5.7E-05	3.5E-05	8.4E-06
NDA MSEE Construction	719	0.60	0.50	0.066	0.046	0.033	1.4E-02	3.6E-03	2.0E-05	1.3E-05	3.0E-06
WVDP Area EE Construction	390	0.33	0.27	0.036	0.025	0.018	7.5E-03	2.0E-03	1.1E-05	6.8E-06	1.6E-06
NDA Excavation/Backfill	13,665	11.39	9.57	1.253	0.865	0.626	2.6E-01	6.8E-02	3.9E-04	2.4E-04	5.7E-05
WVDP Area EE Demolition	487	0.41	0.34	0.045	0.031	0.022	9.3E-03	2.4E-03	1.4E-05	8.5E-06	2.0E-06
NDA EE Demolition	3,066	2.56	2.15	0.281	0.194	0.141	5.9E-02	1.5E-02	8.7E-05	5.4E-05	1.3E-05
WMA 8 Closure											
Surface Structure Removal	106	0.09	0.07	0.010	0.007	0.005	2.0E-03	5.3E-04	3.0E-06	1.9E-06	4.4E-07
SDA MSEE Construction	2,603	2.20	1.85	0.239	0.165	0.119	5.0E-02	1.3E-02	7.4E-05	4.6E-05	1.1E-05
South SDA EE Construction	3,936	3.28	2.75	0.361	0.249	0.180	7.5E-02	2.0E-02	1.1E-04	6.9E-05	1.6E-05
North SDA EE Construction	2,719	2.27	1.90	0.249	0.172	0.125	5.2E-02	1.4E-02	7.7E-05	4.8E-05	1.1E-05
Lagoon Confinement Construction	720	0.60	0.50	0.066	0.046	0.033	1.4E-02	3.6E-03	2.0E-05	1.3E-05	3.0E-06
SDA Waste Excavation	36,465	30.39	25.53	3.343	2.309	1.671	7.0E-01	1.8E-01	1.0E-03	6.4E-04	1.5E-04
Lagoon Confinement Demolition	1,088	0.91	0.76	0.100	0.069	0.050	2.1E-02	5.4E-03	3.1E-05	1.9E-05	4.5E-06
North SDA EE Demolition	4,262	3.55	2.98	0.391	0.270	0.195	8.2E-02	2.1E-02	1.2E-04	7.5E-05	1.8E-05
South SDA EE Demolition	5,795	4.83	4.06	0.531	0.367	0.266	1.1E-01	2.9E-02	1.6E-04	1.0E-04	2.4E-05
WMA 9 Closure	603	0.50	0.42	0.055	0.038	0.028	1.2E-02	3.0E-03	1.7E-05	1.1E-05	2.5E-06
WMA 10 Closure	344	0.29	0.24	0.031	0.022	0.016	6.6E-03	1.7E-03	9.7E-06	6.0E-06	1.4E-06
WMA 11 Closure	102	0.09	0.07	0.009	0.006	0.005	2.0E-03	5.1E-04	2.9E-06	1.8E-06	4.3E-07
WMA 12 Closure	1,629	1.36	1.14	0.149	0.103	0.075	3.1E-02	8.1E-03	4.6E-05	2.9E-05	6.8E-06
Soil Drying Facility Construction	1,410	1.18	0.99	0.129	0.089	0.065	2.7E-02	7.1E-03	4.0E-05	2.5E-05	5.9E-06
Soil Drying Facility Operation	13,703	11.42	9.59	1.256	0.868	0.628	2.6E-01	6.9E-02	3.9E-04	2.4E-04	5.7E-05
Soil Drying Facility Closure	1,912	1.59	1.34	0.175	0.121	0.088	3.7E-02	9.6E-03	5.4E-05	3.3E-05	8.0E-06
North Plateau Groundwater Plume (non-source area)	2,774	2.31	1.94	0.254	0.176	0.127	5.3E-02	1.4E-02	7.9E-05	4.9E-05	1.2E-05
Cesium Prong	1,544	1.29	1.08	0.142	0.098	0.071	3.0E-02	7.7E-03	4.4E-05	2.7E-05	6.4E-06
Monitoring & Maintenance	18,980	15.82	13.29	0.963	0.665	0.482	2.0E-01	5.3E-02	3.0E-04	1.8E-04	4.4E-05
Security	21,857	18.21	15.30	2.004	1.384	1.002	4.2E-01	1.1E-01	6.2E-04	3.8E-04	9.1E-05
TOTALS	**258,333**	**215**	**181**	**22.9**	**15.8**	**11.5**	**4.789**	**1.249**	**0.007**	**0.004**	**0.001**

Two of the flue gasses, carbon monoxide and nitrogen oxide, releases by implementation year (timed release of the total releases presented in Tables 3-13 and 3-14) are charted in Figures 3-7 and 3-8. In addition to flue emissions, these gases are also related to the heavy equipment use, and therefore follow the same pattern illustrated in Figure 3-3. The flue gas emissions during the implementation (due to burning natural gas) are also plotted on this figure. Flue gas emissions, again, include the flue emissions from the CMF soil dryer and the NPP soil dryer.

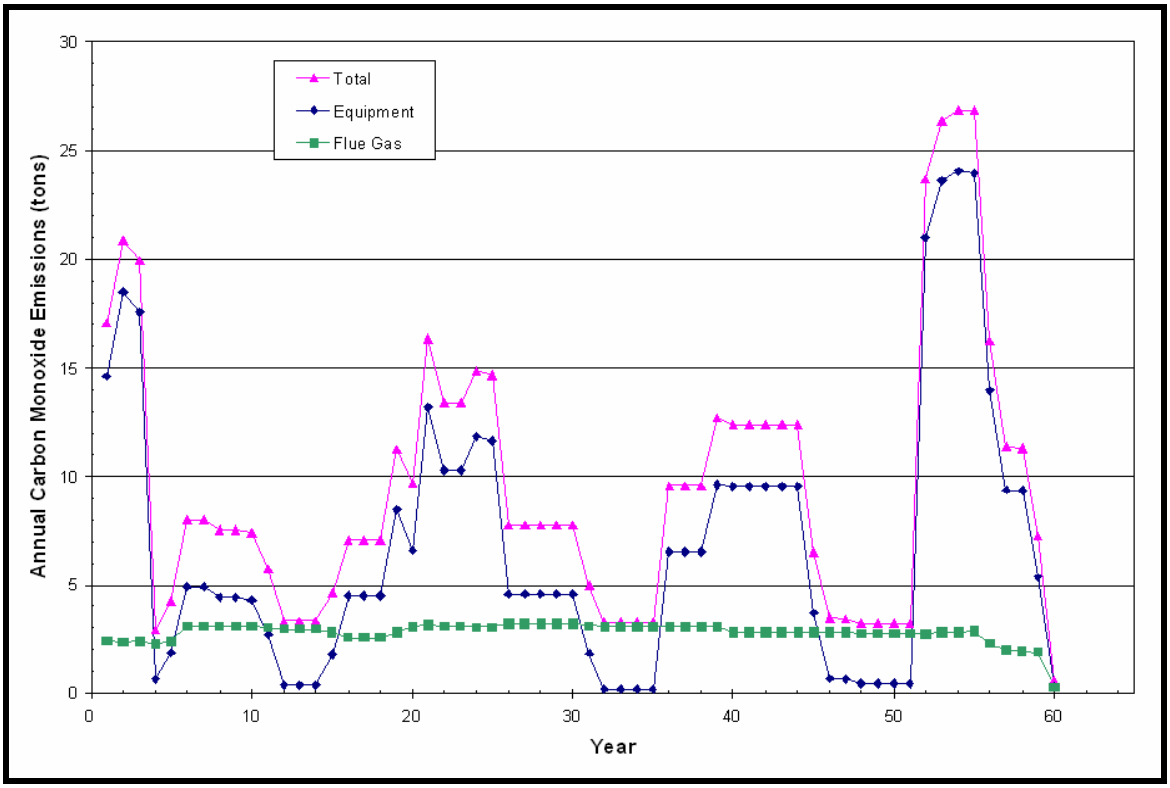


Figure 3-7. Carbon Monoxide Equipment and Flue Gas Releases by Implementation Year

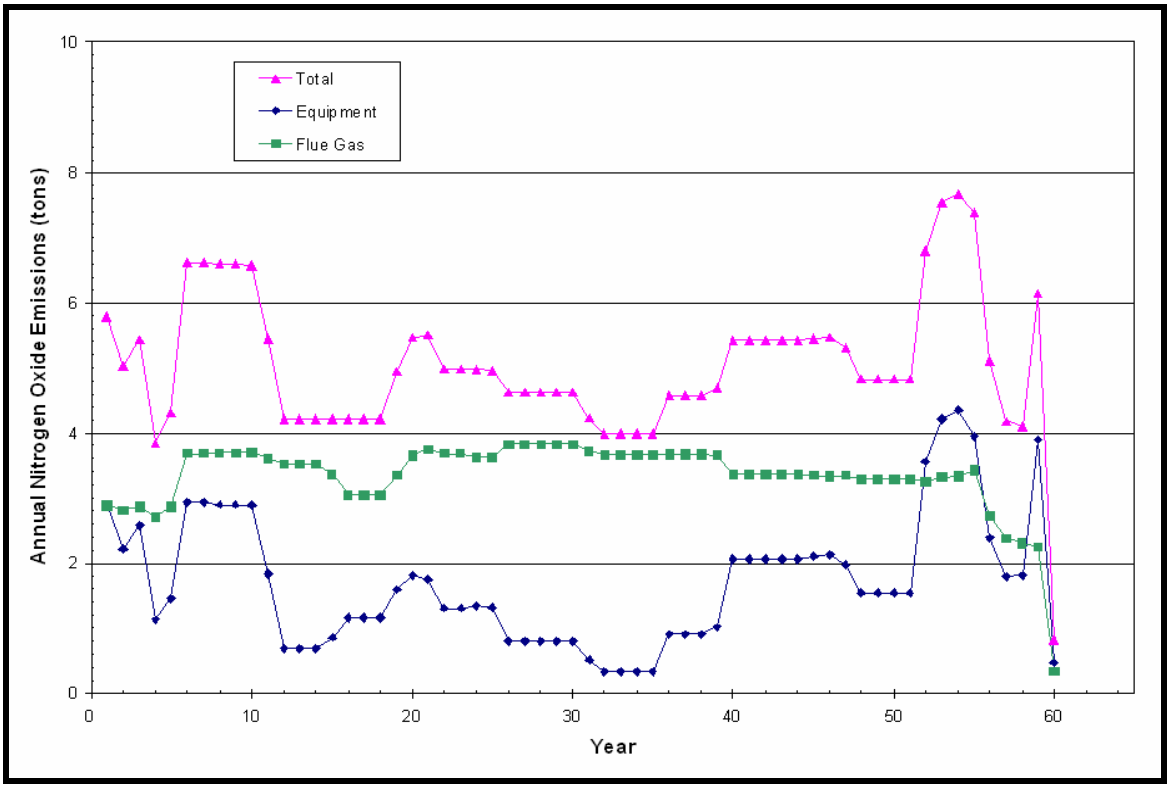


Figure 3-8. Nitrogen Oxide Equipment and Flue Gas Releases by Implementation Year

Table 3-15. Construction Equipment/Operational Releases

Effort	CO (tons)	HCs (tons)	NOx (tons)	CO2 (tons)	Benzene (tons)	PM (tons)	Dust (tons)
HLW Canister Removal							
Construction of DCSA	6.76E-01	1.55E-01	1.02E+00	6.86E+02	7.70E-04	1.99E-02	4.89E-01
LILO Modification and Operation	5.82E-03	7.30E-03	1.95E-02	3.44E+01	0.00E+00	5.20E-04	0.00E+00
Operation of DCSA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Demolition of DCSA	1.37E-01	1.63E-01	4.70E-01	7.71E+02	0.00E+00	1.20E-02	5.29E-01
WMA 1 Closure							
Surface Structure Removal	2.44E+01	4.13E+00	1.41E+01	1.83E+04	2.79E-02	4.57E-01	3.04E+01
Subsurface Soil Removal	6.30E-01	4.12E-01	1.57E+00	1.92E+03	2.92E-04	3.83E-02	1.09E+01
WMA 2 Closure	7.08E-01	5.19E-01	2.02E+00	2.44E+03	2.34E-04	4.70E-02	4.84E+00
WMA 3 Closure							
Removal of Surface Structures	5.14E-01	1.50E-01	7.28E-01	6.95E+02	4.67E-04	1.52E-02	1.42E+00
WTF WPF Construction	1.73E+01	1.24E+00	3.88E+00	5.02E+03	2.20E-02	1.80E-01	1.43E+00
WTF WPF Operations	1.65E-01	1.94E-01	5.74E-01	9.12E+02	0.00E+00	1.48E-02	0.00E+00
WTF WPF Demolition	2.81E+00	3.07E+00	1.05E+01	1.42E+04	0.00E+00	2.75E-01	1.25E+01
WMA 4 Closure	8.63E-02	1.06E-01	6.22E-01	4.95E+02	0.00E+00	1.11E-02	1.20E+00
WMA 5 Closure	4.06E+00	4.25E-01	1.60E+00	1.82E+03	4.95E-03	5.37E-02	3.33E+00
WMA 6 Closure	1.34E-01	4.53E-02	1.86E-01	2.08E+02	1.20E-04	4.57E-03	7.25E-01
LTF Construction	5.86E-01	1.64E-02	4.30E-02	4.92E+01	7.76E-04	4.02E-03	1.04E-02
LTF Operation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LTF Closure	4.82E-01	3.37E-02	1.31E-01	1.34E+02	6.13E-04	5.37E-03	8.69E-02
CMF Construction	3.71E+01	1.59E+00	4.18E+00	5.72E+03	4.85E-02	2.92E-01	6.27E-01
CMF Operation	8.72E-01	8.99E-01	3.41E+00	4.07E+03	0.00E+00	9.18E-02	0.00E+00
CMF Closure	1.03E+01	6.74E-01	2.80E+00	2.65E+03	1.32E-02	1.11E-01	3.85E+00
WMA 7 Closure							
Surface Structure Removal	7.73E-02	1.53E-02	8.49E-02	6.88E+01	8.60E-05	1.86E-03	2.78E+00
Interceptor Trench Excavation	2.33E-02	2.01E-02	9.08E-02	9.60E+01	0.00E+00	1.87E-03	3.37E-01
NDA EE Construction	1.22E+01	5.67E-01	1.77E+00	2.09E+03	1.60E-02	1.02E-01	5.06E-02
NDA MSEE Construction	2.05E-01	2.36E-01	7.44E-01	1.09E+03	0.00E+00	2.00E-02	0.00E+00
WVDP Area EE Construction	2.14E-01	2.38E-01	8.58E-01	1.10E+03	0.00E+00	2.12E-02	1.33E-01
NDA Excavation/Backfill	6.88E-01	3.96E-01	1.50E+00	1.88E+03	3.72E-04	3.24E-02	2.75E+00
WVDP Area EE Demolition	4.38E-01	1.87E-01	8.85E-01	8.53E+02	3.75E-04	1.96E-02	2.95E+00
NDA EE Demolition	4.55E+01	1.27E+00	3.51E+00	3.84E+03	6.02E-02	3.14E-01	3.48E+00
WMA 8 Closure							
Surface Structure Removal	3.00E-01	1.53E-02	6.80E-02	5.80E+01	3.89E-04	2.82E-03	2.70E-02
SDA MSEE Construction	6.54E-01	7.72E-01	2.32E+00	3.60E+03	0.00E+00	6.23E-02	0.00E+00
South SDA EE Construction	2.34E+01	1.01E+00	2.88E+00	3.64E+03	3.07E-02	1.88E-01	2.43E+01
North SDA EE Construction	1.70E+01	7.83E-01	2.45E+00	2.88E+03	2.22E-02	1.41E-01	9.38E+00
Lagoon Confinement Construction	4.43E+00	2.06E-01	6.46E-01	7.60E+02	5.79E-03	3.70E-02	3.37E-02
SDA Waste Excavation	7.48E-01	5.52E-01	2.49E+00	2.63E+03	1.40E-04	5.23E-02	8.77E+00
Lagoon Confinement Demolition	1.70E+01	4.62E-01	1.24E+00	1.36E+03	2.25E-02	1.16E-01	5.29E-01
North SDA EE Demolition	5.98E+01	1.80E+00	5.08E+00	5.61E+03	7.90E-02	4.24E-01	8.45E+00
South SDA EE Demolition	8.45E+01	2.42E+00	6.72E+00	7.37E+03	1.12E-01	5.88E-01	8.30E-01
WMA 9 Closure	2.10E-01	2.26E-01	1.01E+00	1.03E+03	1.08E-05	2.32E-02	1.16E+00
WMA 10 Closure	1.22E-01	1.10E-01	5.64E-01	5.25E+02	0.00E+00	9.97E-03	8.42E+00
WMA 11 Closure	2.66E-02	2.73E-02	1.27E-01	1.26E+02	0.00E+00	2.77E-03	3.06E-01
WMA 12 Closure	1.26E+00	3.49E-01	1.87E+00	1.59E+03	1.28E-03	4.00E-02	4.18E+00
Soil Drying Facility Construction	1.48E+00	4.32E-01	1.64E+00	1.95E+03	1.42E-03	4.62E-02	2.29E+01
Soil Drying Facility Operation	3.43E-01	2.61E-01	1.32E+00	1.27E+03	0.00E+00	2.44E-02	1.66E+01
Soil Drying Facility Closure	2.70E+01	7.60E-01	2.06E+00	2.29E+03	3.57E-02	1.86E-01	4.04E+00
North Plateau Groundwater Plume (non-source area)	2.36E+00	1.94E+00	1.12E+01	9.09E+03	7.44E-04	2.01E-01	1.31E+02
Cesium Prong	1.93E-01	1.48E-01	7.49E-01	7.14E+02	0.00E+00	1.45E-02	6.43E+00
Monitoring & Maintenance	5.63E+00	1.57E-01	4.38E-01	4.62E+02	7.46E-03	3.08E-02	0.00E+00
Security	6.45E+00	1.46E-01	3.74E-01	3.76E+02	8.59E-03	3.20E-02	0.00E+00
TOTALS	**4.13E+02**	**2.93E+01**	**1.03E+02**	**1.18E+05**	**5.25E-01**	**4.37E+00**	**3.33E+02**

This table is similar to the previous table in that is summarizes the non-radiological releases in tons based on labor hours during remedial activities. This table, however, strictly presents the releases as a result of operating construction equipment, which also includes other potential airborne contaminants.

Figures 3-9 and 3-10 illustrate the particulate material (particulates less than 10 micrometers) release and the fugitive dust released by implementation year. The generators of particulate material include both heavy equipment and flue gas exhausts, which are separately illustrated in the figure. Fugitive dust is directly related to the heavy equipment use, and once again, follows the same pattern as that illustrated in Figure 3-3, Construction Equipment Use by Implementation Year.

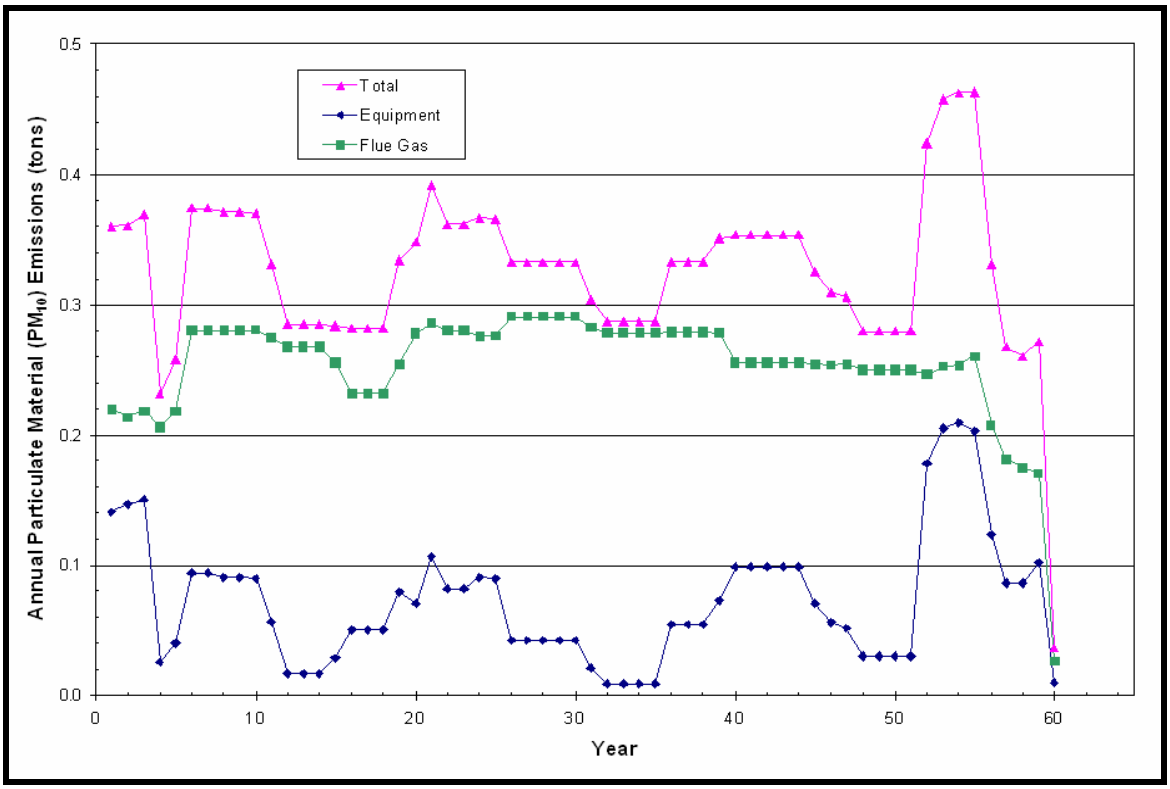


Figure 3-9. Particulate Material (PM_{10}) Release by Implementation Year

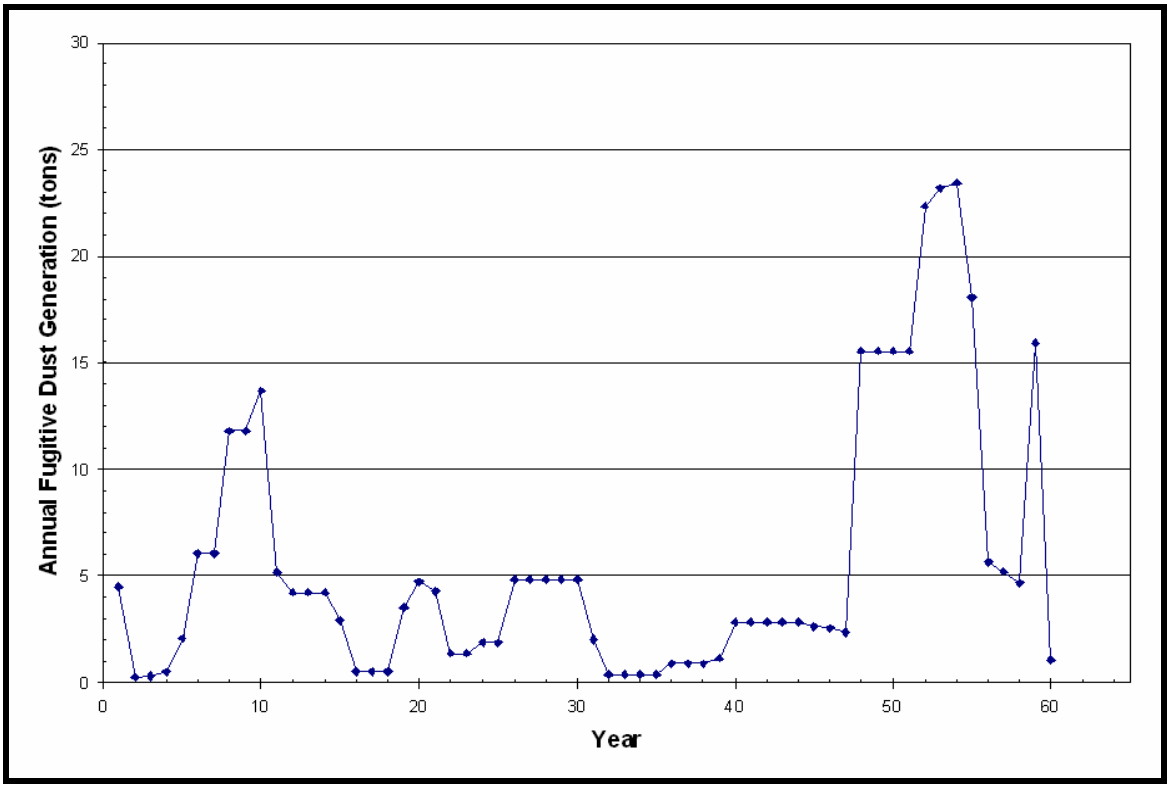


Figure 3-10. Fugitive Dust Generation by Implementation Year

3.4 Generated Waste

A large portion of waste would be generated during the removal activities under this alternative, and the data in this section facilitates an understanding of the off-site disposal options for waste packages that would be classified into one of nine different categories. Estimates of waste classification were based upon regulatory criteria (i.e., federal and disposal facility standards) and existing site data on radionuclide content in the waste material. Trash and other municipal waste that would be generated from routine personnel activities are not included in the following two tables.

Tables 3-16 and 3-17 are delineated by WMA in rows and disposal facility location in columns based on commercial facilities only or DOE facilities combined with commercial facilities. The packaged waste volumes are further defined by one of the following classifications: CDD, hazardous, LSA, Class A, Class B, Class C, GTCC, TRU, or Mixed wastes. Table 3-16 combines those LSA/Class A and Class B/C wastes that would not go to a DOE facility, but rather are analyzed as going to the commercial facilities of Energy Solutions and Barnwell, respectively. Waste volumes may vary due to differences in waste packaging requirements at each of the disposal sites. For example, disposal of 50ft^3 of a Class B waste at NTS (DOE facility) would require the waste to be packaged in B-25 boxes. Although the volume of waste is only 50 ft^3, the disposal volume, or "packaged volume" is 103 ft^3, based on the outside dimension for the box. In comparison, disposal of the same material at Energy Solutions, might require the waste to be packaged in HICS, with a disposal volume or "packaged volume" of 205 ft^3. This can be observed in a few of the rows in the sum-total column along the right side of both tables.

Table 3-16. Packaged Volume for Disposal at DOE/Commercial Facilities

Effort	Waste Volume (ft^3)											
	Commercial		NTS				TBD[1]	WIPP	Energy Solutions		Commercial[2]	TOTAL
	Construction Demolition Debris	Hazardous	LSA	Class A	Class B	Class C	GTCC	TRU	LSA/Class A	Mixed	Class B/C	
HLW Canister Removal												
Construction of DCSA												**0**
LILO Modification and Operation			2,172	2,266								**4,438**
Operation of DCSA												**0**
Demolition of DCSA	391,474											**391,474**
WMA 1 Closure												
Surface Structure Removal	43,271	83	897,911	129,804	2,884	8,549		23,843		1,442		**1,107,785**
Subsurface Soil Removal	6,000		2,636,195	150,174								**2,792,369**
WMA 2 Closure	50,009		1,373,661	343,299		28,840						**1,795,808**
WMA 3 Closure												
Removal of Surface Structures	83,069		36,385	4,738	515							**124,707**
WTF WPF Construction	36,000		3,476	618								**40,094**
WTF WPF Operations			374,563	9,859	255	7,883		10,800				**403,360**
WTF WPF Demolition			1,688,730	51,090		618						**1,740,438**
WMA 4 Closure			796,190	2,884						1,957		**801,031**
WMA 5 Closure	190,578		104,006	32,136								**326,719**
WMA 6 Closure	75,984		41,769	103								**117,856**
LTF Construction	2,196											**2,196**
LTF Operation				5,047		173			26,368	14,008	878	**46,473**
LTF Closure			1,765	834					14,728			**17,328**
CMF Construction	54,000											**54,000**
CMF Operation				22,454					127,205			**149,659**
CMF Closure	93,400		53,985	2,766					321,586			**471,737**
WMA 7 Closure												
Surface Structure Removal	12,988		2,640	103								**15,731**
Interceptor Trench Excavation			61,868	412								**62,280**
NDA EE Construction	111,586			206								**111,792**
NDA MSEE Construction	39,018								105,740			**144,758**
WVDP Area EE Construction	36,960											**36,960**

Table 3-16. Packaged Volume for Disposal at DOE/Commercial Facilities

Effort	Waste Volume (ft^3)											
	Commercial		NTS				TBD[1]	WIPP	Energy Solutions		Commercial[2]	TOTAL
	Construction Demolition Debris	Hazardous	LSA	Class A	Class B	Class C	GTCC	TRU	LSA/Class A	Mixed	Class B/C	
NDA Excavation/Backfill			1,463,796	247,097	515	824	75,000	1,110	4,579,957	309	75,645	**6,444,253**
WVDP Area EE Demolition			236,842	3,193								**240,035**
NDA EE Demolition			364,026	7,437					606,071			**977,533**
WMA 8 Closure												
Surface Structure Removal	15,973								4,339			**20,312**
SDA MSEE Construction	172,320								483,443			**655,763**
South SDA EE Construction	153,090								1,339			**154,429**
North SDA EE Construction	112,590								309			**112,899**
Lagoon Confinement Construction	30,213								103			**30,316**
SDA Waste Excavation							74,415		12,688,405	2,472	95,735	**12,861,027**
Lagoon Confinement Demolition									364,258			**364,258**
North SDA EE Demolition									1,358,658			**1,358,658**
South SDA EE Demolition									1,847,322			**1,847,322**
WMA 9 Closure	250,744		55,920	103								**306,767**
WMA 10 Closure	95,901											**95,901**
WMA 11 Closure	32,883											**32,883**
WMA 12 Closure	2,607,007		245,052	8,549								**2,860,608**
Soil Drying Facility Construction	53,568											**53,568**
Soil Drying Facility Operation				305					3,506			**3,811**
Soil Drying Facility Closure			61,098	981					713,906			**775,985**
North Plateau Groundwater Plume (non-source area)	19,500			10,300	820				14,727,000			**14,757,620**
Cesium Prong									2,146,574			**2,146,574**
Monitoring & Maintenance	21,135	449		173,332								**194,917**
Security												
TOTALS	**4,791,455**	**532**	**10,502,050**	**1,210,089**	**4,989**	**46,886**	**149,415**	**35,753**	**40,120,817**	**20,188**	**172,258**	**57,054,430**

(1) Disposal facility for GTCC waste to be determined once a disposal facility for GTCC waste becomes available.
(2) Barnwell packaging requirements were used in this estimate, but the waste may be disposed of at a different facility.

Table 3-17. Packaged Volume for Disposal at Commercial Facilities

Effort	Waste Volume (ft^3)									
	Commercial		Energy Solutions			Commercial[1]		TBD[2]		Total
	Construction Demolition Debris	Hazardous	LSA	Class A	Mixed	Class B	Class C	TRU	GTCC	
HLW Canister Removal										
Construction of DCSA										
LILO Modification and Operation			2,172	2,266						**4,438**
Operation of DCSA										
Demolition of DCSA	391,474									**391,474**
WMA 1 Closure										
Surface Structure Removal	43,271	83	897,911	129,804	1,442	3,075	9,020	23,843		**1,108,447**
Subsurface Soil Removal	6,000		2,636,195	150,174						**2,792,369**
WMA 2 Closure	50,009		1,373,661	343,299			33,210			**1,800,178**
WMA 3 Closure										
Removal of Surface Structures	83,069		36,385	4,738		615				**124,807**
WTF WPF Construction	36,000		3,476	618						**40,094**
WTF WPF Operations			374,563	9,859		255	7,883	10,800		**403,360**
WTF WPF Demolition			1,688,730	51,090			615			**1,740,435**
WMA 4 Closure			796,190	2,884	1,957					**801,031**
WMA 5 Closure	190,578		104,006	32,136						**326,719**
WMA 6 Closure	75,984		41,769	103						**117,856**
LTF Construction	2,196									**2,196**
LTF Operation				31,415	14,008		1,050			**46,473**
LTF Closure			11,766	5,459						**17,225**
CMF Construction	54,000									**54,000**
CMF Operation				149,659						**149,659**
CMF Closure	93,400		359,900	18,334						**471,634**
WMA 7 Closure										
Surface Structure Removal	12,988		2,640	103						**15,731**
Interceptor Trench Excavation			61,868	412						**62,280**
NDA EE Construction	111,586			206						**111,792**
NDA MSEE Construction	39,018		103,371	2,369						**144,758**
WVDP Area EE Construction	36,960									**36,960**
NDA Excavation/Backfill			5,971,756	319,094	309	54,735	22,550	1,110	75,000	**6,444,554**
WVDP Area EE Demolition			236,842	3,193						**240,035**
NDA EE Demolition			957,963	19,467						**977,430**
WMA 8 Closure										
Surface Structure Removal	15,973		2,200	2,139						**20,312**
SDA MSEE Construction	172,320		483,443							**655,763**

Table 3-17. Packaged Volume for Disposal at Commercial Facilities

Effort	Waste Volume (ft^3)									
	Commercial		Energy Solutions			Commercial[1]		TBD[2]		Total
	Construction Demolition Debris	Hazardous	LSA	Class A	Mixed	Class B	Class C	TRU	GTCC	
South SDA EE Construction	153,090			1,339						**154,429**
North SDA EE Construction	112,590			309						**112,899**
Lagoon Confinement Construction	30,213			103						**30,316**
SDA Waste Excavation			10,022,250	2,666,155	2,472	30,750	64,985		74,415	**12,861,027**
Lagoon Confinement Demolition			357,357	6,901						**364,258**
North SDA EE Demolition			1,331,569	27,089						**1,358,658**
South SDA EE Demolition			1,810,551	36,771						**1,847,322**
WMA 9 Closure	250,744		55,920	103						**306,767**
WMA 10 Closure	95,901									**95,901**
WMA 11 Closure	32,883									**32,883**
WMA 12 Closure	2,607,007		245,052	8,549						**2,860,608**
Soil Drying Facility Construction	53,568									**53,568**
Soil Drying Facility Operation				3,811						**3,811**
Soil Drying Facility Closure			763,728	12,154						**775,882**
North Plateau Groundwater Plume (non-source area)	19,500		14,727,000	10,300		820				**14,757,620**
Cesium Prong			2,139,570	7,004						**2,146,574**
Monitoring & Maintenance	21,135	449		173,332						**194,917**
Security										
TOTALS	**4,791,455**	**532**	**47,599,803**	**4,232,740**	**20,188**	**90,250**	**139,313**	**35,753**	**149,415**	**57,059,448**

(1) Barnwell packaging requirements were used in this estimate, but the waste may be disposed of at a different facility.
(2) Disposal facility for GTCC waste to be determined once a disposal facility for GTCC waste becomes available.

The estimated volume of construction and demolition debris generated at the site by implementation year is illustrated by Figure 3-11. The figure illustrates peak debris generation during construction and clean demolition activities (beginning and end of the project), with periods of low debris generation occurring during operational periods,, such as the CMF and LTF operations, as well as periods of demolition of contaminated facilities.

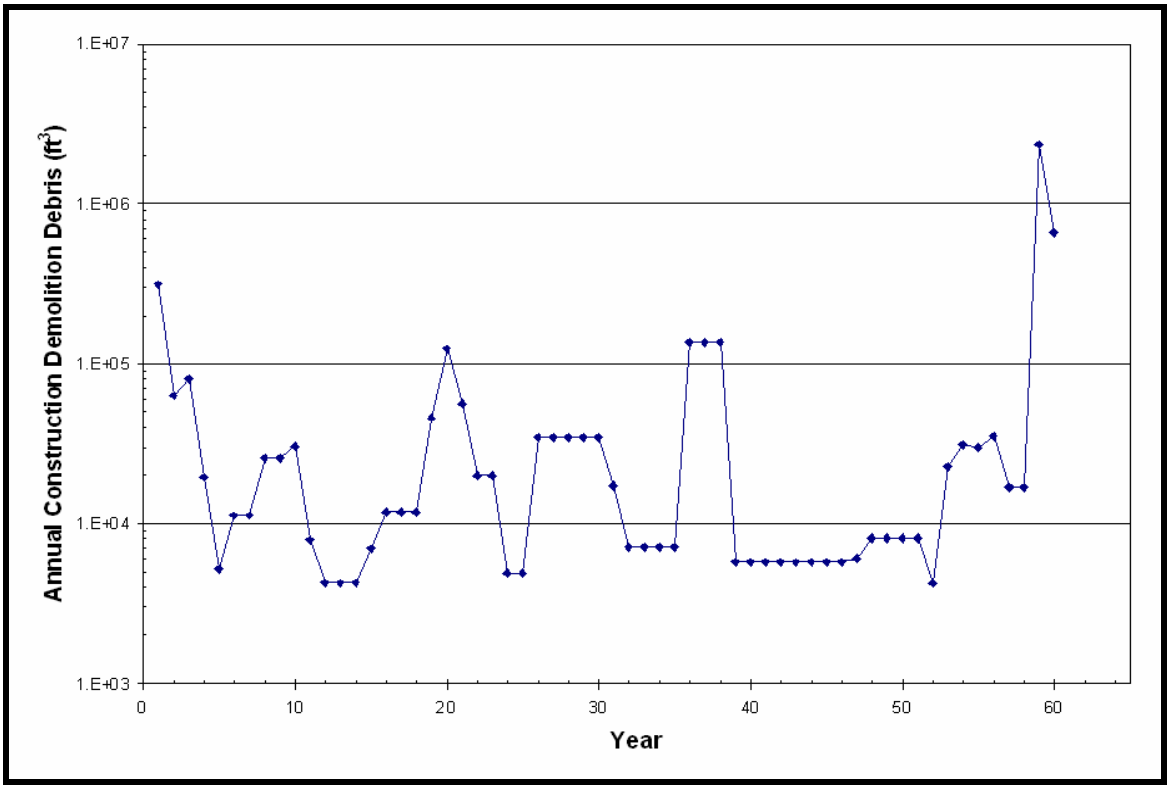


Figure 3-11. Volume of Construction and Demolition Debris by Implementation Year

The volume of packaged waste for DOE/commercial disposal, charted by implementation year, is illustrated by Figure 3-12. This figure is based on the data presented in Table 3-16, Packaged Volume for Disposal at DOE/Commercial Facilities, using the implementation schedule, Figure 3-1 as a timeline. This table is useful in understanding the waste management and shipping efforts that would be required throughout the implementation, as well as identifying and understanding the peak shipping periods during the project. Similarly, Figure 3-13 illustrates the Volume of Packaged Waste for Commercial Disposal by Implementation Year.

3.4.1 Waste Volume Uncertainties

The assumptions applied to the development of the Sitewide Removal Alternative have been developed in a conservative manner based on the interpretation of conditions that will likely exist during implementation. However, there are several situations that may serve to disrupt the current assumptions, including:

- Supplemental characterization activities associated with the design process may result in reclassification of some waste streams. The reclassification

process could result in either a higher or lower classification of specific waste streams.

For example, the overburden soils in WMA 7 (approximately 1,074,480 ft^3) and WMA 8 (approximately 3,136,320 ft^3) are currently scheduled for removal and subsequent disposal as LSA waste. These overburden soils may be largely unimpaired by radioactive constituents, and as such, could be potentially managed as CDD waste or even retained on site for beneficial reuse as fill. As supported by supplementary characterization data, approximately 4.2 million ft^3 of waste volume could be taken out of the radioactive waste stream with the potential for reduction of an equal volume of imported fill.

- Where surface pads or surface structure slabs (pads) are being removed the current TRs assume that there is no need to chase contamination (over excavation) beneath the surface pad itself. Most of the pads are assumed to be classified as CDD waste. If contamination is present at concentration levels warranting over excavation, the pads and excavated soils beneath the pads would be managed and disposed of as LSA waste; and

- In site areas with known soil impairment it is generally assumed that excavations will be limited to about 1 to 2 feet below the interpreted depth of soils with impairment above the DCGLs. In areas with deeper excavations (e.g., the Main Plant Source area), the planned excavations would extend approximately one foot into the Lavery till. MARSSIM surveys would be utilized to assess the remedial activities and to confirm the appropriate depth of excavation. The extent of supplemental excavation activities, beyond the estimated one foot, may significantly increase waste volumes in respect to the current volume estimates.

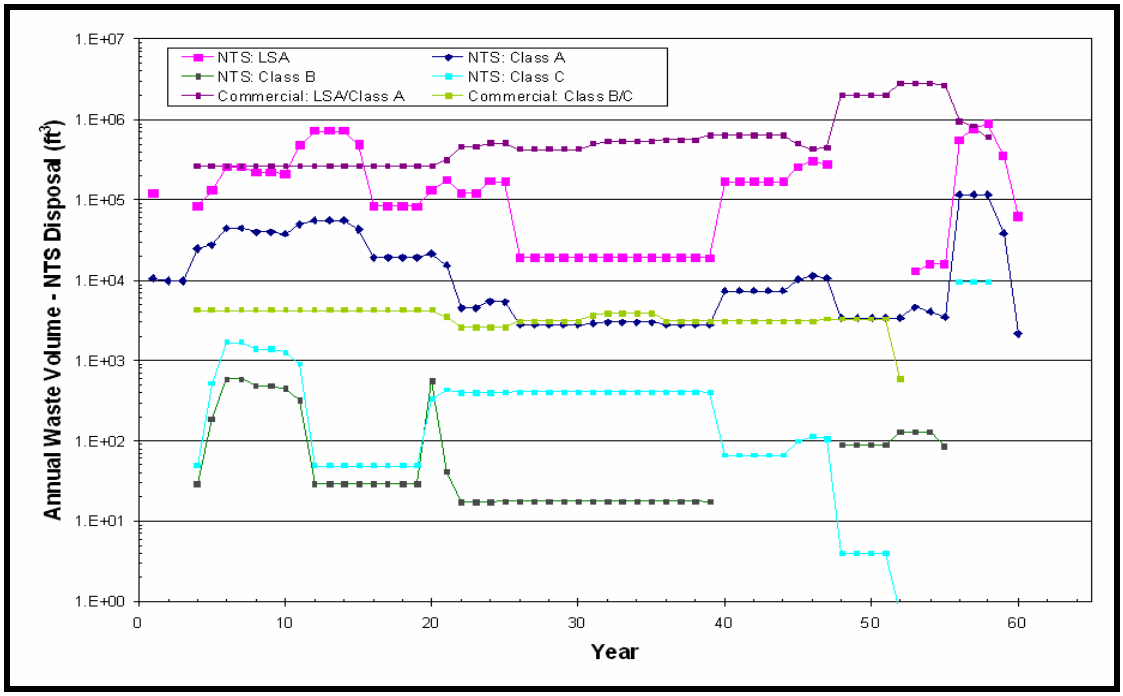


Figure 3-12. Volume of Packaged Waste for DOE/Commercial Disposal by Implementation Year

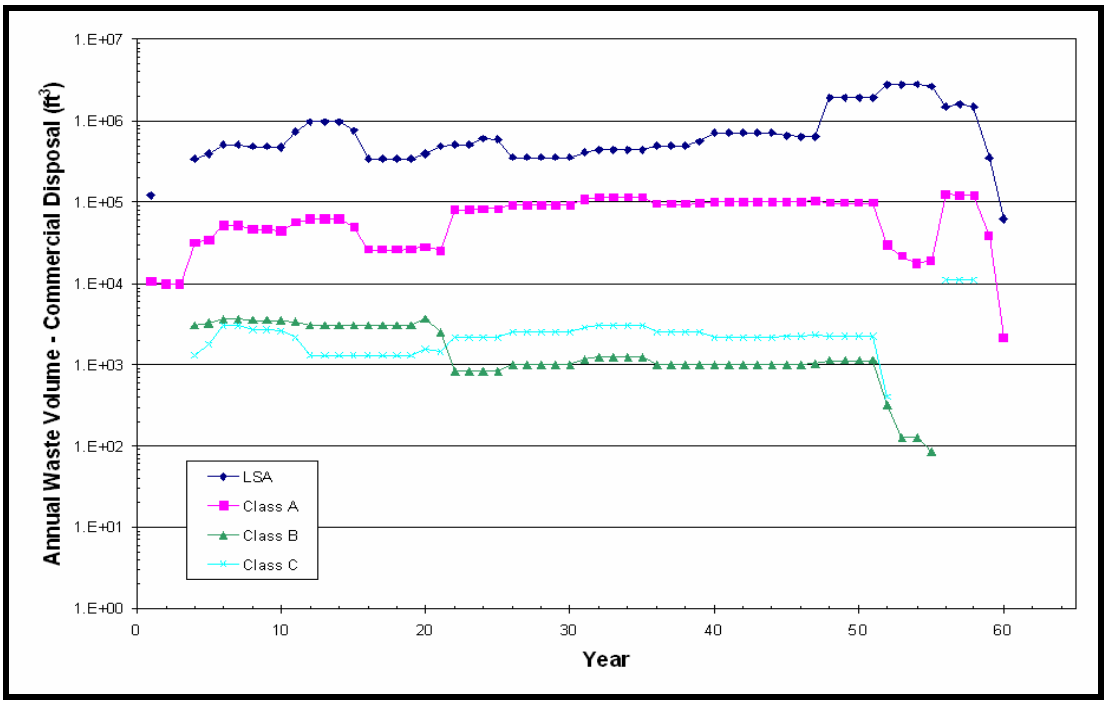


Figure 3-13. Volume of Packaged Waste for Commercial Disposal by Implementation Year

3.5 Costs

For purposes of Sitewide Removal Alternative cost estimates, cost was separated into the four major categories of materials, labor, waste disposal, and contingencies, which were generated for each WMA or Facility.

The two cost tables produced in the report are nearly identical with the exception of the location where the waste would be disposed of. For example, Table 3-18 displays the costs for each WMA and Facilities as represented by waste transported to DOE facilities and commercial facilities; whereas, Table 3-19 presents the costs related to waste transported to Commercial facilities only. Since the disposal facilities are different under each scenario, a few ancillary costs are different as well, such as waste packaging, transportation, and subsequent contingency costs. The distinctions are most noticeable in the sum-total costs in the last row, where labor costs are identical and waste disposal costs are different by approximately $150 million.

Waste disposal costs for which there are uncertainty are listed separately at the bottom of the tables as "Non-Project Costs." Until an appropriate disposal facility is determined through the GTCC EIS process, the waste disposal options and related costs for GTCC and TRU wastes remain uncertain. The approach used to estimate these costs is described in the Facility Description and Methodology Technical Report. The estimated costs for disposing of TRU wastes being analyzed in the WV EIS are based on a cubic-foot-equivalent cost of $2,300/ft^3 assuming disposal at WIPP. Since the GTCC EIS process is still progressing, a range of disposal cost estimates, based on available information, is

being used for GTCC wastes. For the lower end of the range, the TRU disposal cost estimate is used. The upper end of the range is based on disposing of GTCC waste at a federal repository at the estimated cost of $21,000 per cubic foot. To show how this range affects the overall cost of the alternative, the range of GTCC disposal costs and the range of the overall alternative costs are presented on Tables 3-18 and 3-19.

Based upon knowledge of past site operations, there are various wastes that would be generated under the WMA-3 complete removal, which came in contact with the high level waste liquids. Table 3-20 presents the estimated volumes of these wastes both prior to and following packaging for disposal. A likely scenario for disposal of these wastes would be to classify them as TRU and low-level (Class A and C) under a determination that they qualify as Waste Incidental to Reprocessing (WIR). An alternative to the WIR classification, would be to classify the "wetted" components as HLW.

For comparison purposes, each of these potential disposal options is evaluated for the Waste Tank Farm. Tables 3-21 and 3-22 present the results of this evaluation. The WIR option assumes that the components would be managed as LLW and TRU wastes. The HLW option assumes Tanks 8D-1, 8D-2, and 8D-4, as well as the wetted pump and transfer piping surfaces, and the STS equipment, would need to be managed as HLW. Since the difference between these two options only applies to waste disposal costs, these costs are the only items compared. Removal costs, worker exposure, resource requirements, and environmental releases are the same for both of these options

Figure 3-14 illustrates the annual breakdown in spending of the assumed annual $100 million site budget, using a stacked bar chart. Based on the chart, approximately 60% of the annual site budget is spent on remediation of WMA 3, WMA 7, and WMA 8, including operation of the support facilities (WTFWPF, LTF, and CMF) between years 3 and 55.

3.5.1 Cost Uncertainties

As discussed in the previous section, there is uncertainty associated with the estimated disposal costs. This is largely illustrated by the range in estimated disposal costs for GTCC wastes as shown on Tables 3-18 and 3-19.

The project cost structure is potentially impacted by many of the same elements associated with the volume and/or classification of waste. The reclassification of the WMA 7 and WMA 8 overburden soils from LSA waste to CDD waste, as discussed in Section 3.4.1, potentially allowing beneficial on-site reuse, presents a cost avoidance opportunity ranging to about 119 million dollars for the combined WMA 7 and WMA 8 areas. Other factors potentially impacting cost include uncertainties associated with the performance of untried remedial activities (e.g., the decommissioning of the WMA 3 high-level waste tanks and/or the WMA 7 and WMA 8 excavation of waste whose specific nature and classification is unknown using the respective Environmental Enclosures and the Modular Shielded Environmental Enclosures (MSEEs) and associated equipment. The robust Performance Category 3 design criteria for the Environmental Enclosures places a premium on the construction of these buildings that ranges to 29% of the construction cost or costs in the range of 40.1 million dollars for the collective WMA 7 and WMA 8 structures. This premium follows the life cycle cost of these structures.

It is anticipated that these cost uncertainties and similar project elements will be addressed during the remedial design process, augmented, as needed, by supplemental focused design and/or characterization work. The intent of the supplemental work activities would be to reduce the possibility of the emergence of "unknowns" during the implementation of remedial field activities.

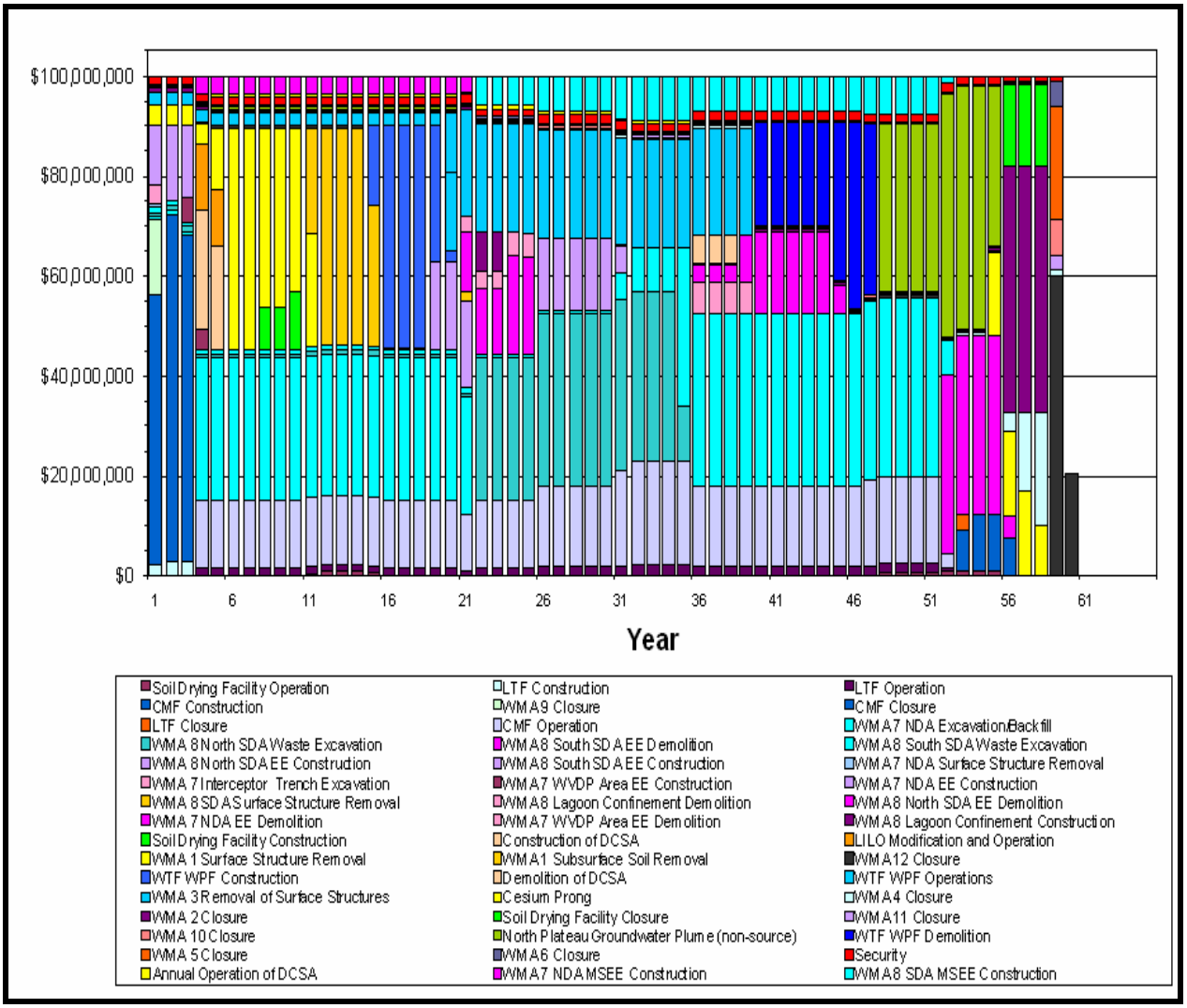


Figure 3-14. Total Costs (Y2008) by Implementation Year

Table 3-18. DOE/Commercial Facilities Waste Disposal (2008 Dollars)

Effort	Total Materials Cost	Total Labor Cost	Total Waste Disposal Cost	Total Contingency Cost	Total Cost
HLW Canister Removal					
Construction of DCSA	$32,015,800	$7,178,800	$0	$5,403,100	$44,597,700
LILO Modification and Operation	$9,547,000	$8,760,600	$153,000	$6,114,800	$24,575,400
Operation of DCSA	$43,400	$16,774,100	$0	$4,209,800	$21,027,300
Demolition of DCSA	$2,198,400	$7,637,600	$3,641,000	$3,369,400	$16,846,400
WMA 1 Closure					
Surface Structure Removal	$21,774,000	$126,993,600	$34,803,200	$45,893,200	$229,464,000
Subsurface Soil Removal	$12,463,600	$37,320,800	$94,356,800	$36,035,500	$180,176,700
WMA 2 Closure	$12,201,800	$50,299,300	$56,012,500	$29,628,500	$148,142,100
WMA 3 Closure					
Removal of Surface Structures	$782,300	$6,559,400	$2,344,800	$2,421,700	$12,108,200
WTF WPF Construction	$74,750,400	$67,505,500	$558,900	$35,703,900	$178,518,700
WTF WPF Operations	$25,364,000	$253,347,700	$14,648,900	$133,855,600	$427,216,200
WTF WPF Demolition	$18,165,700	$88,687,800	$59,455,600	$41,577,300	$207,886,400
WMA 4 Closure	$2,525,500	$5,238,400	$27,566,100	$8,832,600	$44,162,600
WMA 5 Closure	$2,440,300	$9,068,800	$6,491,100	$4,500,400	$22,500,600
WMA 6 Closure	$395,600	$1,779,300	$2,163,000	$1,084,600	$5,422,500
LTF Construction	$5,365,300	$1,611,200	$22,600	$1,085,500	$8,084,600
LTF Operation	$3,671,500	$55,828,100	$2,635,900	$15,534,100	$77,669,600
LTF Closure	$176,800	$2,206,000	$356,700	$684,900	$3,424,400
CMF Construction	$88,528,300	$62,124,000	$502,200	$37,663,200	$188,817,700
CMF Operation	$13,852,500	$487,203,600	$3,222,400	$251,333,800	$755,612,300
CMF Closure	$2,582,700	$20,904,300	$6,896,100	$7,595,900	$37,979,000
WMA 7 Closure					
Surface Structure Removal	$89,200	$356,700	$241,900	$172,100	$859,900
Interceptor Trench Excavation	$281,300	$614,800	$2,154,000	$762,700	$3,812,800
NDA EE Construction	$7,668,400	$24,090,100	$1,053,000	$8,203,000	$41,014,500
NDA MSEE Construction	$42,998,400	$8,702,400	$4,084,600	$8,581,500	$64,366,900
WVDP Area EE Construction	$2,091,200	$4,645,300	$424,200	$1,790,300	$8,951,000
NDA Excavation/Backfill	$30,848,600	$171,088,300	$176,563,200	$126,920,600	$505,420,700
WVDP Area EE Demolition	$1,379,400	$5,610,100	$8,253,700	$3,811,000	$19,054,200
NDA EE Demolition	$6,203,000	$35,668,500	$19,908,800	$15,445,200	$77,225,500
WMA 8 Closure					
Surface Structure Removal	$127,800	$1,215,700	$271,000	$403,800	$2,018,300
SDA MSEE Construction	$148,145,100	$31,927,300	$9,959,100	$30,016,600	$220,048,100
South SDA EE Construction	$12,397,400	$46,963,700	$1,461,400	$15,205,800	$76,028,300
North SDA EE Construction	$8,532,900	$32,441,500	$1,067,400	$10,510,500	$52,552,300
Lagoon Confinement Construction	$3,706,000	$8,599,500	$363,600	$3,167,300	$15,836,400
SDA Waste Excavation	$65,360,100	$422,976,500	$257,962,100	$308,134,000	$1,054,432,700
Lagoon Confinement Demolition	$2,383,500	$10,928,100	$7,147,600	$5,114,900	$25,574,100
North SDA EE Demolition	$8,169,500	$50,006,500	$29,527,600	$21,926,000	$109,629,600
South SDA EE Demolition	$11,097,500	$67,366,100	$40,125,200	$29,647,300	$148,236,100
WMA 9 Closure	$1,055,600	$6,844,500	$4,286,400	$3,046,700	$15,233,200
WMA 10 Closure	$501,700	$4,164,300	$1,102,200	$1,442,200	$7,210,400
WMA 11 Closure	$787,000	$1,168,600	$306,400	$565,700	$2,827,700
WMA 12 Closure	$7,452,400	$24,049,700	$32,893,700	$16,099,100	$80,494,900
Soil Drying Facility Construction	$5,626,100	$16,762,900	$499,700	$5,722,400	$28,611,100
Soil Drying Facility Operation	$1,370,400	$7,026,700	$104,000	$2,125,300	$10,626,400
Soil Drying Facility Closure	$3,984,800	$22,499,300	$12,288,200	$9,693,200	$48,465,500
North Plateau Groundwater Plume (non-source area)	$46,230,300	$31,848,100	$172,084,400	$62,540,800	$312,703,600
Cesium Prong	$5,348,100	$17,570,700	$25,011,700	$11,982,700	$59,913,200
Monitoring & Maintenance	$29,387,000	$128,043,500	$5,667,500	$40,512,100	$203,610,100
Security	$0	$71,863,700	$0	$17,965,900	$89,829,600
TOTALS	$782,067,600	$2,572,072,000	$1,130,643,400	$1,434,036,500	$5,918,819,500
GTCC Waste Disposal			$343,620,000–$3,137,400,000		$343,620,000–$3,137,400,000
TRU Waste Disposal			$82,231,900		$82,231,900
HLW Canister Disposal			$137,500,000		$137,500,000
Total Non-Project Cost			$563,351,900–$3,357,131,900		$563,351,900–$3,357,131,900
TOTAL ALTERNATIVE COST	$782,067,600	$2,572,072,000	$1,693,995,300–$4,487,775,300	$1,434,036,500	$6,482,171,400–$9,275,951,400

Table 3-19. Commercial Facilities Waste Disposal (2008 Dollars)

Effort	Total Materials Cost	Total Labor Cost	Total Waste Disposal Cost	Total Contingency Cost	Total Cost
HLW Canister Removal					
Construction of DCSA	$32,015,800	$7,178,800	$0	$5,403,100	$44,597,700
LILO Modification and Operation	$9,537,600	$8,760,600	$99,200	$6,099,000	$24,496,400
Annual Operation of DCSA	$43,400	$16,774,100	$0	$4,209,800	$21,027,300
Demolition of DCSA	$2,198,400	$7,637,600	$3,641,000	$3,369,400	$16,846,400
WMA 1 Closure					
Surface Structure Removal	$21,128,200	$126,993,600	$33,562,200	$45,421,400	$227,105,400
Subsurface Soil Removal	$10,150,900	$37,320,800	$33,920,500	$20,348,300	$101,740,500
WMA 2 Closure	$11,458,000	$50,299,300	$53,122,500	$28,720,100	$143,599,900
WMA 3 Closure					
Removal of Surface Structures	$755,300	$6,559,400	$2,230,600	$2,386,400	$11,931,700
WTF WPF Construction	$74,741,400	$67,505,500	$531,400	$35,694,800	$178,473,100
WTF WPF Operations	$25,031,100	$253,347,700	$11,896,100	$133,304,000	$423,578,900
WTF WPF Demolition	$16,696,700	$88,687,800	$38,346,300	$35,932,800	$179,663,600
WMA 4 Closure	$1,823,300	$5,238,400	$9,667,200	$4,182,200	$20,911,100
WMA 5 Closure	$2,341,300	$9,068,800	$4,096,200	$3,876,900	$19,383,200
WMA 6 Closure	$350,600	$1,779,300	$1,382,600	$878,200	$4,390,700
LTF Construction	$5,365,300	$1,611,200	$22,600	$1,085,500	$8,084,600
LTF Operation	$3,671,500	$55,828,100	$2,773,400	$15,568,500	$77,841,500
LTF Closure	$166,200	$2,206,000	$277,500	$662,500	$3,312,200
CMF Construction	$88,528,300	$62,124,000	$502,200	$37,663,200	$188,817,700
CMF Operation	$13,852,500	$487,203,600	$3,215,200	$251,332,000	$755,603,300
CMF Closure	$2,527,200	$20,904,300	$5,659,600	$7,272,800	$36,363,900
WMA 7 Closure					
Surface Structure Removal	$79,900	$356,700	$174,100	$152,900	$763,600
Interceptor Trench Excavation	$227,300	$614,800	$1,040,900	$471,000	$2,354,000
NDA EE Construction	$7,668,400	$24,090,100	$1,058,100	$8,204,300	$41,020,900
NDA MSEE Construction	$42,899,000	$8,702,400	$2,223,900	$8,091,500	$61,916,800
WVDP Area EE Construction	$2,091,200	$4,645,300	$424,200	$1,790,300	$8,951,000
NDA Excavation/Backfill	$29,595,800	$171,088,300	$144,367,600	$118,558,500	$463,610,200
WVDP Area EE Demolition	$1,172,400	$5,610,100	$3,981,100	$2,691,000	$13,454,600
NDA EE Demolition	$5,877,500	$35,668,500	$21,235,800	$15,695,600	$78,477,400
WMA 8 Closure					
Surface Structure Removal	$127,800	$1,215,700	$271,000	$403,800	$2,018,300
SDA MSEE Construction	$148,145,100	$31,927,300	$9,959,100	$30,016,600	$220,048,100
South SDA EE Construction	$12,397,400	$46,963,700	$1,461,400	$15,205,800	$76,028,300
North SDA EE Construction	$8,532,900	$32,441,500	$1,067,400	$10,510,500	$52,552,300
Lagoon Confinement Construction	$3,706,000	$8,599,500	$363,600	$3,167,300	$15,836,400
SDA Waste Excavation	$65,360,100	$422,976,500	$257,962,100	$308,134,000	$1,054,432,700
Lagoon Confinement Demolition	$2,383,500	$10,928,100	$7,147,600	$5,114,900	$25,574,100
North SDA EE Demolition	$8,169,500	$50,006,500	$29,527,600	$21,926,000	$109,629,600
South SDA EE Demolition	$11,097,500	$67,366,100	$40,125,200	$29,647,300	$148,236,100
WMA 9 Closure	$1,001,200	$6,844,500	$3,013,200	$2,714,800	$13,573,700
WMA 10 Closure	$501,700	$4,164,300	$1,102,200	$1,442,200	$7,210,400
WMA 11 Closure	$787,000	$1,168,600	$306,400	$565,700	$2,827,700
WMA 12 Closure	$7,236,500	$24,049,700	$27,293,100	$14,644,900	$73,224,200
Soil Drying Facility Construction	$5,626,100	$16,762,900	$499,700	$5,722,400	$28,611,100
Soil Drying Facility Operation	$1,370,400	$7,026,700	$104,000	$2,125,300	$10,626,400
Soil Drying Facility Closure	$3,929,200	$22,499,300	$11,012,000	$9,360,200	$46,800,700
North Plateau Groundwater Plume (non-source area)	$46,230,300	$31,848,100	$172,084,400	$62,540,800	$312,703,600
Cesium Prong	$5,348,100	$17,570,700	$25,011,700	$11,982,700	$59,913,200
Monitoring & Maintenance	$29,387,000	$128,043,500	$5,667,500	$40,512,100	$203,610,100
Security	$0	$71,863,700	$0	$17,965,900	$89,829,600
TOTALS	$773,331,800	$2,572,072,000	$973,431,200	$1,392,769,200	$5,711,604,200
GTCC Waste Disposal			$343,620,000–$3,137,400,000		$343,620,000–$3,137,400,000
TRU Waste Disposal			$82,231,900		$82,231,900
HLW Canister Disposal			$137,500,000		$137,500,000
Total Non-Project Cost			$563,351,900–$3,357,131,900		$563,351,900–$3,357,131,900
TOTAL ALTERNATIVE COST	$773,331,800	$2,572,072,000	$1,536,783,100–$4,330,563,100	$1,392,769,200	$6,274,956,100–$9,068,736,100

Table 3-20. Volume of WMA-3 Components Potentially Classified as HLW

Location/Area	Unpackaged Volume (cf)	WIR Classification
Removal of NFS and Vit Process Lines	608	A
Removal of Mob and Transfer Pumps (8D-1)	515	C
Removal of Mob and Transfer Pumps (8D-2 and 4)	582	TRU
Tank 8D-1 Radionuclide Removal	1,308	TRU
STS Equipment Removal	1,500	TRU
Demolition of 8D-1	6,417	C
Demolition of 8D-2	6,417	TRU
Demolition of 8D-4	147	TRU

Table 3-21. Cost of Waste Disposal Assuming all Contact Wastes are Classified as WIR

Waste Classification	Unpackaged Volume (cf)	Packaged Volume (CF)	Disposal Cost	Unit Cost
Class A and C Waste	7,540	8,630	$494,400	@ $50/cf
TRU Waste	9,954	10,158	$23,363,400	@ $2,300/cf

Total Disposal for WIR Option $23,857,800

Table 3-22. Cost of Waste Disposal Assuming all Contact Wastes are Classified as HLW

Waste Classification	Unpackaged Volume (cf)	Packaged Volume (CF)	Disposal Cost	Unit Cost
HLW Waste	17,494	17,852	$374,892,000	@ $21,000/cf

Total Disposal for HLW Option $374,892,000

4.0 POST-IMPLEMENTATION AND STEWARDSHIP ACTIVITIES

NOTE: *The Section 4.0 tables have all been revised to reflect updates and revisions to the supporting calculations packages.*

4.1 Introduction

For waste management under this alternative an optimistic convention for estimating waste disposition has been assumed. However, this section evaluates a scenario of waste management for the Sitewide Removal Alternative, whereby all current regulatory uncertainties involving Greater than Class C (GTCC) waste, Pre-WVDP/Commercial Class B and Class C waste, TRU waste and the Waste Incidental to Reprocessing (WIR) determination remain unresolved.

4.2 Post-Implementation Waste Management

Due to current regulatory issues surrounding disposition of the GTCC, Pre-WVDP/commercial Class B and Class C waste, TRU waste and the potential WIR wastes, the potential impacts of ongoing site storage and management of these wastes were estimated so that the EIS Lead Agencies would be able to consider the potential impacts.

This section presents an estimate of a resource requirements to support a reasonably foreseeable waste management scenario whereby the wastes generated through the implementation of the Sitewide Removal Alternative that could fall within the disposal uncertainty envelopes described above remain at the West Valley site in storage for an indefinite period of time. Therefore routine waste storage activity estimates are presented on an annual basis.

4.2.1 Operation of the Container Management Facility Storage Area

A small staff would be required to maintain the ventilation and utilities in the CMF, and to perform routine inspections of the storage area. A subcontractor crew of four individuals would staff the CMF, 8 hours a day, 250 days a year. This crew would perform the required inspections in the storage area, and maintain and repair equipment in the CMF. A security staff of three individuals per shift, 24 hours a day, 365 days a year, would be on site to provide security during the storage operations at the CMF. Annual operating costs for the subcontractor maintenance at the CMF are included in the costs reported in Table 4-7.

4.2.2 Resource Requirements, Impacts, and Costs Associated with the Operation of the Orphan Waste Scenario Container Management Facility

The total resource requirements, impacts, and costs associated with the operation of the orphan waste scenario CMF are presented in Tables 4-1 through 4-15.

Table 4-1. Resource Requirements - Consumable Materials - PPE

Effort	PPE (sets)
CMF Interim Waste Storage Area Operations (Annual)	104

Table 4-2. Resource Requirements - Consumable Materials – Containers for DOE/Commercial Disposal

Effort	Lift Liners (each)	Roll-Off/Sealand Containers (each)	55-gal Drums (each)	B-25 Boxes, strong/tight (each)	B-25 Boxes, Type A (each)
CMF Interim Waste Storage Area Operations (Annual)	0	0	15	0	0

Table 4-3. Resource Requirements - Consumable Materials - Containers for Commercial Disposal

Effort	Lift Liners (each)	Roll-Off/ Sealand Containers (each)	55-gal Drums (each)	B-25 Boxes, strong/tight (each)	B-25 Boxes, Type A (each)	HICs (each)
CMF Interim Waste Storage Area Operations (Annual)	0	0	15	0	0	0

Table 4-4. Resource Requirements - Utilities

Effort	Electricity (kw-hr)	Natural Gas (ft^3)	Diesel Fuel (gal)	Gasoline (gal)	Potable Water (gal)	Raw Water (gal)
CMF Interim Waste Storage Area Operations (Annual)	932,696	5,242,160	10,120	0	212,750	965,885

Table 4-5. Resource Requirements - Personnel Required by Job Category

Effort	M&O Direct (Wk-yrs)	M&O Maint (Wk-yrs)	M&O Hourly Overhead (Wk-yrs)	M&O Exempt Overhead (Wk-yrs)	Subcontract Direct (Wk-yrs)
CMF Interim Waste Storage Area Operations (Annual)	0	0	0	0	19.3

Table 4-6. Resource Requirements - Personnel Required by Activity

Effort	Preparation and Planning (Wk-yrs)	New Construction (Wk-yrs)	Operations Decontamination (Wk-yrs)	Demolition and Restoration (Wk-yrs)
CMF Interim Waste Storage Area Operations (Annual)	0	0	19.3	0

Table 4-7. Resource Requirements - Labor Costs Required by Activity (2008 Dollars)

Effort	Preparation and Planning (dollars)	Construction (dollars)	Operation (dollars)	Closure (dollars)
CMF Interim Waste Storage Area Operations (Annual)	$0	$0	$2,917,900	$0

Table 4-8. Estimated Personnel Injuries and Fatalities

Effort	Total Reportable Cases	Lost Work-Day Cases	Fatalities
CMF Interim Waste Storage Area Operations (Annual)	0.85	0.43	6.96×10^{-4}

Table 4-9. Estimated Personnel Radiation Exposure

Effort	Exposure (Rem)
CMF Interim Waste Storage Area Operations (Annual)	1.47×10^{-1}

Table 4-10. Environmental Nonradiological Flue Gas Releases

Effort	NO_x (tons)	CO (tons)
CMF Interim Waste Storage Area Operations (Annual)	0.26	0.22

Note: Environmental aqueous and airborne radiological releases are considered negligible.

Table 4-11. Construction Equipment/Operational Releases

Effort	Particulate (tons)	CO (tons)	HCs (tons)	NO_x (tons)
CMF Interim Waste Storage Area Operations (Annual)	0.0028	0.0166	0.0244	0.172

Table 4-12. Volume of Packaged Waste - Includes Radioactive Waste Disposal at DOE/Commercial Facilities

Effort	Waste Volume (ft^3)											
	Commercial		NTS				Unknown	WIPP	Energy Solutions		Barnwell	TOTAL
	Construction Demolition Debris	Hazardous	LSA	Class A	Class B	Class C	GTCC	TRU	LSA/A	Mixed	Class B/C	
CMF Interim Waste Storage Area Operations (Annual)	0	0	0	113	0	0	0	0	0	0	0	113

Table 4-13. Volume of Packaged Waste - Includes Radioactive Waste Disposal at Commercial Facilities

Effort	Waste Volume (ft^3)									
	Commercial		Energy Solutions			Barnwell		Unknown	WIPP	TOTAL
	Construction Demolition Debris	Hazardous	LSA	Class A	Mixed	Class B	Class C	GTCC	TRU	
CMF Interim Waste Storage Area Operations (Annual)	0	0	0	113	0	0	0	0	0	113

Table 4-14. Estimated Costs (Y2008) - Includes Radioactive Waste Disposal at DOE/Commercial Facilities

Effort	Total Materials Cost	Total Labor Cost	Total Waste Disposal Cost	Total Contingency Cost	Total Cost
CMF Interim Waste Storage Area Operations (Annual)	$28,600	$2,917,900	$12,000	$739,700	$3,698,200

Table 4-15. Estimated Costs (Y2008) - Includes Radioactive Waste Disposal at Commercial Facilities

Effort	Total Materials Cost	Total Labor Cost	Total Waste Disposal Cost	Total Contingency Cost	Total Cost
CMF Interim Waste Storage Area Operations (Annual)	$28,600	$2,917,900	$17,000	$741,000	$3,704,500

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Revision Log

- Augment Acronyms and Abbreviations to reflect expanded text supporting WMA 3 Tank Closure terminology.
- Minor revisions to Table 1-1 to update anticipated conditions at the EIS Starting Point.
- Revise the underlying base maps for Figures 1-2, 2-3, 2-26, 2-27, 2-36, 2-39, 2-40, and 2-43 to be consistent with Figures in other sections of the EIS in representing paved vs. gravel roads and identification gravel pad or concrete foundation areas and other minor features.
- Made minor clarifications throughout text to clarify planned depth of excavations, pending confirmation through the MARSSIM survey process.
- Added text clarifying the flushing of the Neutralization Pit, prior to demolition and subsequent management of flushing fluids.
- Corrected areal extent of WTFWPF to eliminate previous discrepancy in text size reference. Added clarification for provision of an emergency generator to support WTFWPF activities and minimize waste processing down time.
- Expanded WMA 3 text addressing plans for the decommissioning and removal of tanks 8D-1, 8D-2, 8D-3 and 8D-4 to provide more detail of these activities.
- Revised text to reflect the retention of non-impacted rail track ballast in WMA-6 for on-site beneficial use vs. off-site disposal as CDD.
- Added text discussing the location of the Container Management Facility (CMF) occupying some of the current location of the Drum Cell and acknowledging potential retention and use of the Drum Cell in support of decommissioning activities, requiring minor relocation of the CMF.
- Revised WMA 7 and WMA 8 text to reflect a more consistent conceptual design for the Environmental Enclosures and Modular Shielded Environmental Enclosures (MSEEs) and related equipment planned to support waste excavation activities in these areas.
- Added discussion of the decommissioning and removal of the WMA-7 upgradient barrier wall.
- Provided clarification that WMA-8 Tanks T-2 and T-3 were never placed into service and would be segmented and managed as CDD waste
- Added text clarifying that the WMA-8 excavation would include the subsurface concrete wall and soil-bentonite barrier wall previously installed along the west side of Trench 14.
- Added text to clarify that WMA 10 wastes were anticipated to be managed as CDD.
- Provided clarification that excavated soil from the dams and rail ballast in WMA 12 would be managed as CDD waste.
- Added discussion of the removal of WMA 12 parking lots and roadways covering a collective area of approximately 1,580,000 ft^2.
- Removed discussion and identification of the location of the Permeable Reactive Barrier from text and figures.

- Table 3-1 has been updated to show new quantities of Construction Materials.
- Table 3-2 has been updated to show new quantities of Capital Purchases and to eliminate items that are short term use or less than $5,000.
- Revised estimated schedule to complete TR activities from 64 years to 60 years.
- Added Sections 3.4.1 and 3.5.1 discussing Waste Volume Uncertainties and Cost Uncertainties, respectively. Augmented Section 3.5 test reiterating uncertainty associated with TRU and GTCC waste disposal costs.
- Updated WNYNSC acreage to 3,338 to match other EIS documents.
- Added discussion to Section 2.1.1 regarding assumptions made in the movement and loading of canisters at the DSCA.
- Changed reference to “end effectors” to “tools” throughout text.
- Added clarification to Section 2.1.5 regarding the potential removal of the sheetpile barrier sections and continuation of the excavation of soil in response to identification of contamination below the planned excavation depth in the MPPB area.
- Added a definition defining “appropriate backfill material” and revised “clean material” to “appropriate backfill material” throughout text.
- Added discussion to Section 2.3.1 clarifying the installation and operation of a Tank and Vault Drying System at WMA 3 at the starting point of the EIS.
- Augment WTFWPF text to provide additional details of the elements of the conceptual design.
- Added text to Sections 2.7 and 2.8 clarifying the general sequence of remedial activities.
- Provided additional details in Section 2.7.1 on the sizing and components of the Leachate Treatment Facility and on the conceptual elements of the Container Management Facility.
- Added text to Section 2.8.1 identifying the reuse of MSEEs used to support removal activities in the WMA 8 area.
- Minor reordering and editing of Sections 3.4.1 and 3.5.1 to reflect decreasing magnitudes of uncertainty related to waste volumes and cost.
- Supplement Section 3.5 text to identify waste management and disposal assumptions for GTCC class waste, including a projected range of disposal costs. Updated Tables 3-18 and 3-19 to reflect the respective range of anticipated disposal costs.