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Revision 14

M-91 Transuranic Mixed/Mixed Low-Level Waste Project Management Plan

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Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Executive Summary

The Hanford Site, managed by the U.S. Department of Energy (DOE), produced about 60 percent of the United States' plutonium from the mid-1940s to the late 1980s in support of national defense efforts. Much of the legacy waste and contaminated materials from the Hanford Site defense mission remains on the Central Plateau of the Hanford Site.

The *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a),[1] commonly known as the Tri-Party Agreement (TPA), is a legal agreement between the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), and DOE (hereinafter the Tri-Parties) that identifies cleanup actions and schedules, referred to as milestones, to manage a portion of this remaining legacy waste and contaminated material. The scope of the M-091 Milestone series (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*)[2] is to complete removal of the retrievably stored waste from the burial grounds and eliminate dispose of the legacy mixed low-level waste (MLLW) and transuranic mixed (TRUM) waste in storage by September 30, 2030. When these milestones are complete, DOE will have successfully treated the MLLW and shipped the TRUM waste offsite for disposal.

The Tri-Parties approved a number of changes to the M-091 Milestone series in September 2010. These changes refocused the major milestone from the acquisition of facilities to the treatment of Hanford Site *Resource Conservation and Recovery Act of 1976*[3] MLLW to satisfy land disposal restriction standards prior to disposal at the Hanford Site, and the certification and shipment of TRUM waste to the Waste Isolation Pilot Plant in Carlsbad, New Mexico.

This project management plan (PMP) contains the status of work completed and outlines the DOE strategy for completing the remaining work in the M-091 Milestones. This PMP outlines a revised strategy for completing the M-091 work scope. This revised strategy is

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[1] Ecology, EPA, and DOE, 1989a, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

[2] Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

[3] *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq. Available at: http://epw.senate.gov/rcra.pdf.

currently being negotiated with the stakeholders and has yet to be approved or incorporated into the TPA (Ecology et al., 1989a).

The revised strategy reflects the progress on the work scope, prioritization of cleanup goals, limitations of funding, and need to prioritize the treatment and processing of MLLW and TRUM waste. The revised strategy also emphasizes the need to provide the necessary capabilities to complete the remaining work scope.

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Terms

AMWTP	Advanced Mixed Waste Treatment Project
AR	Administrative Record
CBFO	DOE Carlsbad Field Office
CCP	Central Characterization Project
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH	contact-handled
CWC	Central Waste Complex
CY	calendar year
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FS	feasibility study
FY	fiscal year
HERTR	high-energy real-time radiography
ID	inner diameter
LDR	land disposal restriction
LLBG	low-level burial ground
LLW	low-level waste
MLLW	mixed low-level waste
MWT	mixed waste trench
OD	outer diameter
OU	operable unit
PFP	Plutonium Finishing Plant
PMP	project management plan
PUREX	Plutonium Uranium Extraction Plant
RCRA	*Resource Conservation and Recovery Act of 1976*

REDOX	Reduction-Oxidation Plant
RH	remote-handled
RI	remedial investigation
ROD	record of decision
RSW	retrievably stored waste
RTD	removal, treatment (as needed), and disposal
SAP	sampling and analysis plan
SLB-2	standard large box-2
SuperHENC	super-high-efficiency neutron coincidence
SWB	standard waste box
SWITS	Solid Waste Information and Tracking System
TPA	Tri-Party Agreement
Tri-Parties	DOE, EPA, and Ecology
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUM	transuranic mixed
TRUPACT-II	Transuranic Package Transporter Model 2
TSD	treatment, storage, and/or disposal
WBS	work breakdown structure
WIPP	Waste Isolation Pilot Plant
WMA	waste management area
WRAP	Waste Receiving and Processing Facility

1 Project Overview

The Hanford Site, managed by the U.S. Department of Energy (DOE), produced about 60 percent of the United States' plutonium from the mid-1940s to the late 1980s in support of national defense efforts. The 1,518 km^2 (586 mi^2) site is located in southeastern Washington State. The Central Plateau covers approximately 194 km^2 (75 mi^2) in the center of the Hanford Site. Much of the legacy waste and contaminated materials from the Site's defense mission remains on the Central Plateau.

The *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a), commonly known as the Tri-Party Agreement (TPA), is a legal agreement between the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), and DOE (hereinafter the Tri-Parties) that identifies cleanup actions and schedules referred to as milestones. The scope of the M-091 Milestone series (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, commonly known as the TPA Action Plan) is to complete retrieval and eliminate the backlog of Hanford Site mixed low-level waste (MLLW) and transuranic mixed (TRUM) waste in storage by September 30, 2030. When these milestones are completed, DOE will have retrieved the retrievably stored waste (RSW) from the burial grounds, treated and disposed of the MLLW, repackaged the TRUM waste into certifiable containers, and shipped the TRUM waste offsite for disposal.

Because cleanup of the Hanford Site is a complex and challenging undertaking, an overview of the entire Hanford Site cleanup goals has been included into this project management plan (PMP). In July 2010, DOE issued DOE/RL-2009-10, *Hanford Site Cleanup Completion Framework*, which describes the overall site cleanup strategy and the approach to completing the remainder of the cleanup mission. This document defines the principal components of cleanup and provides the context for individual cleanup activities by establishing the approaches and common goals for the decisions needed to complete the cleanup mission. The framework document identifies the goals for cleanup as shown in Figure 1-1.

These goals embody more than 20 years of dialogue among the Tri-Parties, Tribal Governments, State of Oregon, stakeholders, and the public. These goals provide a set of principles that guide all aspects of Hanford Site cleanup and help set priorities to apply resources and sequence cleanup efforts for the greatest benefit. Cleanup activities occurring at various areas of the site support the achievement of one or more of these goals.

While the Completion Framework Report (DOE/RL-2009-10) is not a budget document, it is important for DOE to state its priorities for cleanup. These priorities help to guide budget requests and ensure that cleanup funds support the DOE vision for completing cleanup. Cleanup priorities help DOE to schedule portions of work and to allocate cleanup funds to achieve the most benefit. Not all work can be done at the same time; therefore, priorities are generally risk based.

The Tri-Parties approved changes to the M-091 Milestones in September 2010. Changes to the M-091 Milestones were considered extensive enough that Ecology and DOE decided to issue the change package (M-91-09-01) as a replacement of the M-091 Milestone series. An overview of the changes follows:

- The major M-091 Milestone previously focused on the acquisition and modification of facilities/ capabilities to support retrieval, storage, and treatment of wastes. Ecology and DOE refocused the major milestone on the original milestone goal, to treat all Hanford Site *Resource Conservation and Recovery Act of 1976* (RCRA) MLLW to satisfy land disposal restriction (LDR) treatment standards, and certify and ship TRUM waste to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico, for disposal. The WIPP is the only disposal facility authorized by law for TRUM waste and which has been exempted from the LDR treatment standards by the *Waste Isolation Pilot Plant Land*

Withdrawal Act Amendments. Interim milestones were established to support the actions necessary to achieve the major milestone including waste retrieval, treatment, certification, and shipment and the acquisition of necessary facilities and/or capabilities.

Goals for Cleanup
Goal 1: Protect the Columbia River.
Goal 2: Restore groundwater to its beneficial use to protect human health, the environment, and the Columbia River.
Goal 3: Cleanup River Corridor waste sites and facilities to: • Protect groundwater and the Columbia River. • Shrink the active cleanup footprint to the Central Plateau. • Support anticipated future land uses.
Goal 4: Clean up Central Plateau waste sites and facilities to; • Protect groundwater and the Columbia River. • Minimize the footprint of areas requiring long-term waste management activities. • Support anticipated future land uses
.**Goal 5**: Safely mitigate and remove the threat of Hanford's tank waste. • Safely store tank waste until it is retrieved for treatment. • Safely and effectively immobilize tank waste. • Close tank farms and mitigate the impacts from past releases of tank waste to the ground.
Goal 6: Safely manage and transfer legacy materials scheduled for offsite disposition including special nuclear material (including plutonium), spent nuclear fuel, transuranic waste, and immobilized high-level waste.
Goal 7: Consolidate waste treatment, storage, and disposal operations on the Central Plateau.
Goal 8: Develop and implement institutional controls and long-term stewardship activities that protect human health, the environment, and Hanford's unique cultural, historical and ecological resources after cleanup activities are complete.

Figure 1-1. Goals for Hanford Site Cleanup

- The previous M-091-45 Milestone required DOE to replace a to-be-determined date for the M-091-01 Milestone, which originally required DOE to complete acquisition of facilities and modification of existing and planned facilities by June 30, 2012. Ecology and DOE have agreed that DOE will prepare a conceptual design for facilities by 2016 and replace the M-091-01 to-be-determined date at that time (2016).

- The change package milestones provide a comprehensive and easily understood series of milestones to measure progress on the safe and stable processing and shipping of Hanford Site waste covered by the M-091 Milestone series and address public comments in order to make the milestones easier to read and understand.

DOE developed this PMP in accordance with the TPA (Ecology et al., 1989a), Section 11.5, "Waste Material Stream Project Management Work Plans," prepared under Milestone series M-090-00, M-091-00, and M-092-00 of the TPA Action Plan (Ecology et al., 1989b). This PMP contains the current status of completed work along with the DOE plan to accomplish the remaining work under the M-091 Milestone series.

A goal of the Tri-Parties is to integrate the Hanford Site cleanup activities to the extent possible to enable efficient and effective management of waste. The three agencies agreed to integrate the plan for managing transuranic (TRU) and TRUM waste under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) cleanup actions, with the plan to manage similar waste forms under the M-091 work scope. This PMP also addresses the acquisition of capabilities necessary to prepare TRU and TRUM waste generated under CERCLA cleanup actions.

1.1 Goals and Objectives

The focus of the M-091 Milestones is on the acquisition and modification of facilities; the capabilities to support retrieval, storage, and treatment of wastes; and the determination of the disposition path for all waste packages to document and to implement treatment and shipment methods as outlined in the TPA (Ecology et al., 1989a) milestones. The Tri-Parties renegotiated the milestones to refocus the goal on treating all Hanford Site RCRA MLLW and on certifying and shipping TRUM waste to WIPP.

The latest change to the milestones set a deadline of 2030 to remove all legacy TRUM waste from the Hanford Site. When the M-091 Milestones are completed, the RSW will have been removed from the burial grounds, the backlog of MLLW will have been treated, and the TRUM waste will have been repackaged into certifiable containers and shipped offsite for processing.

1.2 Scope

The scope of the M-091 Milestone series includes all MLLW and TRUM waste in aboveground storage as of June 30, 2009, and RSW in the low-level burial grounds (LLBGs). Waste in aboveground storage is defined as the waste stored within the Central Waste Complex (CWC), T Plant, and the Waste Receiving and Processing Facility (WRAP). The RSW is defined as waste that was placed in LLBG 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B after May 6, 1970, and was believed to meet TRU waste criteria when it was placed in one of these burial grounds.

Descriptions and maps of the LLBGs are included in Appendix C. An aerial view of the Hanford Site 200 West Area is presented in Figure 1-2. An aerial view of the 218-E-12B Burial Ground in the 200 East Area of the Hanford Site is presented in Figure 1-3.

The M-091 Milestone series scope is as follows:

- Complete treatment of MLLW and TRUM waste (M-091-00).
- Complete acquisition of capabilities for treating large-container TRUM waste and remote-handled (RH)-TRUM waste (M-091-01).
- Submit TRUM waste/MLLW PMP (M-091-03).
- Retrieve contact-handled (CH)-RSW (M-091-40).
- Retrieve RH-RSW (M-091-41).
- Treat small-container, CH-MLLW (M-091-42).
- Treat large-container MLLW and RH-MLLW (M-091-43).
- Certify large-container TRUM waste and RH-TRUM waste (M-091-44).
- Certify and ship small-container, CH-TRUM waste (M-091-46).

Figure 1-2. Aerial View of Hanford Site 200 West Area (April 2010)

Figure 1-3. Aerial View of Retrieval Areas in the 218-E-12B Burial Ground in Hanford Site 200 East Area (September 2011)

In the M-091 Milestone series, the following container size definitions are used:

- When referring to MLLW, small containers are less than 10 m^3 (353 ft^3), including 208 L (55 gal) drums. A large container is defined as any container that is not defined as a small container.
- When referring to TRUM waste, small containers are 208 L (55 gal) drums or smaller containers, even if overpacked in 322 L (85 gal) drums, and WIPP standard waste boxes (SWBs). A WIPP SWB is a 1.8 m^3 (63.6 ft^3) steel container that is approximately 0.94 m (3.08 ft) in height, 1.8 m (5.9 ft) in length, and 1.4 m (4.59 ft) in width. A large container is defined as any container that is not defined as a small container.

A summary of the CERCLA cleanup actions that have the potential to generate waste with TRU constituents greater than 100 nCi/g, along with projected volumes, is provided in Chapter 7. These wastes are not included within the scope of the M-091 milestones. Schedules from the CERCLA cleanup actions authorized in records of decision (RODs) and action memoranda are included with a projected shipment schedule of TRU waste to WIPP. Milestone schedules for CERCLA cleanup actions still in the investigatory phase are provided in Appendix E.

The currently approved CERCLA cleanup actions generating (or anticipated to generate) TRU/TRUM waste include the following:

- Plutonium Finishing Plant (PFP)
- 100 K Basins
- 200E Critical Mass Laboratory
- U Plant
- 618-10 and 618-11 Burial Grounds (300-FF-2)
- 200-PW-1 and 200-PW-6 Operable Units (OUs)

Future CERCLA OUs and facilities with the potential to generate waste with TRU constituents greater than 100 nCi/g during CERCLA actions are summarized in Section 7.3 and Appendix E. These OUs and facilities include the following:

- 200-BC-1, B/C Cribs and Trenches OU
- 200-CW-5, PFP cooling water ditches
- 200-SW-2, Radioactive Landfills and Dumps Group OU
- 200-WA-1, West Inner Area OU
- 200-DV-1, Deep Vadose Zone OU
- 200-IS-1, Tanks/Lines/Pits/Boxes Waste Group OU
- 200-EA-1, East Inner Area OU
- 200-CP-1, Plutonium Uranium Extraction Plant (PUREX) Canyon and associated past-practice waste site including the PUREX Tunnels 1 and 2
- 224B Plutonium Concentration Facility
- 200-CR-1, Reduction and Oxidation Plant (REDOX) Canyon and associated past-practice waste site

Other RCRA actions with potential to generate waste with TRU constituents greater than 100 nCi/g, and are not within the scope of the M-091 milestones and not covered in this PMP include the Tank Farms Waste Management Areas (WMAs) that are covered under the M-045 Milestone series and 11 single-shell tanks. DOE expects to make a classification as the whether the material is TRU waste and to continue critical decision documentation development that will define the technology and infrastructure needed to retrieve, process, and package the waste for disposal. As more information becomes available, any interfaces or impacts to the M-091 scope will be addressed in this PMP.

1.3 Management Plan Overview

This revision of the PMP describes a revised strategy for the completion of the M-091 work scope. This revised strategy is currently being negotiated by the TPA stakeholders and has not been formally incorporated into the TPA (Ecology et al., 1989a). The milestones will be incorporated into the agreement via the change process, upon issuance of the approved work plan (including this PMP) and incorporated into the work schedule as part of the update process.

The revised strategy reflects the progress on the work scope, the limitations of funding, and the need to prioritize the treatment and processing of MLLW and TRUM waste. The strategy also emphasizes the need to provide the necessary capabilities to complete the work scope. Figure 1-4 is an illustration of the revised strategy. The revised strategy provides the basis for the proposed changes to the TPA (Ecology et al., 1989a) milestones and establishes a path forward and schedules for prioritizing, implementing, and monitoring the proposed milestones.

Key elements of the DOE revised strategy for the completion of the M-091 work scope are as follows:

- Prioritize the treatment and processing of MLLW and TRUM waste. Utilize commercial capabilities to accelerate the treatment and processing of MLLW and TRUM waste.
- Existing retrieval methods will be used where possible to retrieve the remaining RSW. The need for new or additional retrieval capabilities will be evaluated in an engineering study/alternatives analysis, which will consider lessons learned from past retrieval operations and from the future retrieval of waste from the 618-10 and 618-11 Burial Grounds. The engineering study/alternatives analysis will allow DOE to submit retrieval milestones by the end of fiscal year (FY) 2020. WRAP will continue to be used for TRUM waste characterization and certification, and loading of CH-TRUM waste into Transuranic Package Transporter Model 2 (TRUPACT-II) shipments to WIPP. The Central Characterization Project (CCP) will provide the capability for loading and shipping RH-TRUM waste to WIPP.
- Additional capabilities will be required to complete the retrieval, treatment, and processing of the legacy MLLW and TRUM waste. An engineering study/alternatives analysis will be prepared in FY 2016 to identify these additional capabilities. In subsequent years, DOE will submit milestones to provide these needed capabilities.

The organization of this PMP follows the DOE strategy, illustrated in Figure 1-4, to complete the M-091 work scope:

- Section 2 discusses the status and approach for the retrieval and designation of the remaining RSW.
- Section 3 discusses the status of treatment of TRUM Waste and MLLW.

- Section 4 discusses the status for the certification and shipment of TRUM waste along with a description of the approach for certification of waste for shipment to the WIPP.
- Section 5 discusses the approach to identify and provide necessary capabilities, including a schedule for the submission of target and final milestones.
- Section 6 provides a discussion of the storage capacity necessary for the storage of the M-091 wastes.
- Section 7 provides an estimate of the amount of waste generated from CERCLA cleanup activities. This waste is not within the scope of the M-091 milestones. It is described in this PMP to provide an overview of the waste disposition challenges included within the efforts to clean up the Hanford Site.
- Chapter 8 describes the DOE project control elements for the planning, managing and reporting performance necessary to complete the M-091 work scope.

M-091 TRUM/MLLW (Summary)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total Volume
TRUM/MLLW Repack	M-091-47A	M-091-47B															
Offsite/Onsite m^3	280	280	280	280	280	400	400	400	400	400	400	400	400	400	400	320	5,720
Alternate Capability m^3												430	600	600	600	86	2,316
																	8,036
Retrieval RSW (Trench and Caissons)						M-091-49A Submit Retrieval Milestones											
m^3											500	800	800	723	M-091-49 Retrieval Complete		2,823
Ship TRUM to WIPP						M-091-48A Submit Shipment Milestones											
m^3										740	740	815	1175	1200	1200	1112	6,982
																M-091-00	
Provide Needed Capabilities	Engineering Study / Alternatives Analysis																
	Submit Draft Report																
		Submit Target Milestones for Needed Capabilities															
			Submit Milestones for Needed Capabilities														
						CDR	Design	Construction/Startup									Necessary Treatment Processing Capability
											Mobilize Startup						
							Submit Retrieval Milestones					Trench Retrieval					
												Design	Start-up	Alpha Caisson Retrieval			

5-20-15 *M-091 Strategy*

Figure 1-4. DOE Strategy to Complete the M-091 Work Scope

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1.4 Status of Milestones

Existing M-091 Milestones and their targets are provided in Table 1-1. The table includes the major and interim milestones and associated target dates that support the accomplishment of the milestone.

Table 1-1. Status of Existing M-091 Milestones and Targets

M-091 Milestone	M-091 Milestone Title	Required Completion Date	Status
M-091-01A	Complete conceptual design for acquisition of capabilities/facilities/modifications necessary for retrieval, designation, storage, and treatment/processing of TRUM waste.	9/30/2016	To be missed
M-091-01B	Complete definitive design for acquisition of capabilities/facilities/modifications necessary for retrieval, designation, storage, and treatment/processing of TRUM waste.	9/30/2018	At risk
M-091-40	Complete retrieval and designation of CH-RSW.	9/30/2016	To be missed
M-091-40W-T01	Retrieve a minimum 250 m^3 CH-RSW in FY 2014. Any volume above the 250 m^3 shall count towards fulfillment of M-091-40X.	9/30/2014	To be missed
M-091-40X	Retrieve a total of 1,250 m^3 of CH-RSW in FY 2015.	9/30/2015	To be missed
M-091-41	Complete the retrieval and designation of RH-RSW.	12/31/2018	At risk
M-091-41A	Retrieve all non-caisson RH-RSW.	9/30/2016	To be missed
M-091-42	Complete treatment of small container CH-MLLW (in above ground storage as of 6/30/2009 and in retrievable storage).	9/30/2017	To be missed
M-091-43	Complete treatment of large container CH-MLLW and RH-MLLW (in above ground storage as of 6/30/2009 and in retrievable storage).	9/30/2017	To be missed
M-091-44	Complete treatment of large container CH TRUM waste and RH TRUM waste.	9/30/2030	At risk
M-091-44S	Certify a total of 300 m^3 of large container CH TRUM waste and/or RH TRUM waste	9/30/2018	To be missed
M-091-44T	Submit change package for annual milestones to treat or certify and ship large container CH-TRUM waste and RH-TRUM waste to complete the disposition of this waste.	9/30/2018	At risk
M-091-46	Complete the certification of small container TRUM (in above ground storage as of 6/30/2009 and in retrievable storage).	9/30/2017	To be missed
M-091-46D-T03	Certify 125 m^3 of small container CH-TRUM waste. Any volume above the 125 m^3 shall count towards fulfillment of M-091-46E.	9/30/2014	To be missed
M-091-46E	Certify 250 m^3 of small container CH-TRUM waste. Any volume above the 250 m^3 shall count towards fulfillment of subsequent milestones.	9/30/2015	To be missed

Table 1-1. Status of Existing M-091 Milestones and Targets

M-091 Milestone	M-091 Milestone Title	Required Completion Date	Status
M-091-46F	Certify 250 m^3 of small container CH-TRUM waste.	9/30/2016	To be missed
M-091-46H	Complete offsite shipment of all small container CH-TRUM waste (in above ground storage as of 6/30/2009 and in retrievable storage).	9/30/2018	To be missed

CH = contact-handled
FY = fiscal year
MLLW = mixed low-level waste
RH = remote-handled
RSW = retrievably stored waste
TRUM = transuranic mixed

Notification of TRUM certification under M-091-044 is to be provided at least annually. Delay in retrieving the suspect TRUM waste for the LLBGs (M-091-40 and M-091-41) causes a cascade effect in delay of subsequent milestones because waste is not available to complete these milestones (M-091-42, M-091-43, and M-091-46).

2 Retrieval and Designation of Retrievably Stored Waste (M-091-40 and M-091-41)

DOE has made substantial progress in retrieving RSW from the burial grounds that contained approximately 15,200 m^3 (537,000 ft^3) of RSW. Since retrieval operations began, DOE has successfully retrieved over 12,500 m^3 (441,000 ft^3) of RSW, leaving approximately 2,800 m^3 (98,900 ft^3) remaining to be retrieved. The RSW is in designated areas in LLBGs 218-E-12B, 218-W-3A, 218-W-4B, and 218-W-4C. Burial Ground 218-W-4B includes four alpha caissons containing RH-RSW (Section 2.3). The retrieval of RSW has been completed in the 218-W-4C LLBG. Descriptions and maps of these LLBGs are included in Appendix C.

The key elements of DOE plans for completing retrieval are as follows:

- Continue retrieving and characterizing the remaining intact drums of CH-RSW utilizing existing retrieval methods where feasible.
- Continue retrieving the remaining intact non-drum CH-RSW and non-caisson RH-RSW utilizing existing methods where feasible.
- Acquire the necessary new capability to retrieve the remaining RSW, including the alpha caissons. DOE will consider incorporation of lessons learned from the retrieval of TRU waste from the 618-10 Burial Grounds that have complex challenges similar to the alpha caissons.

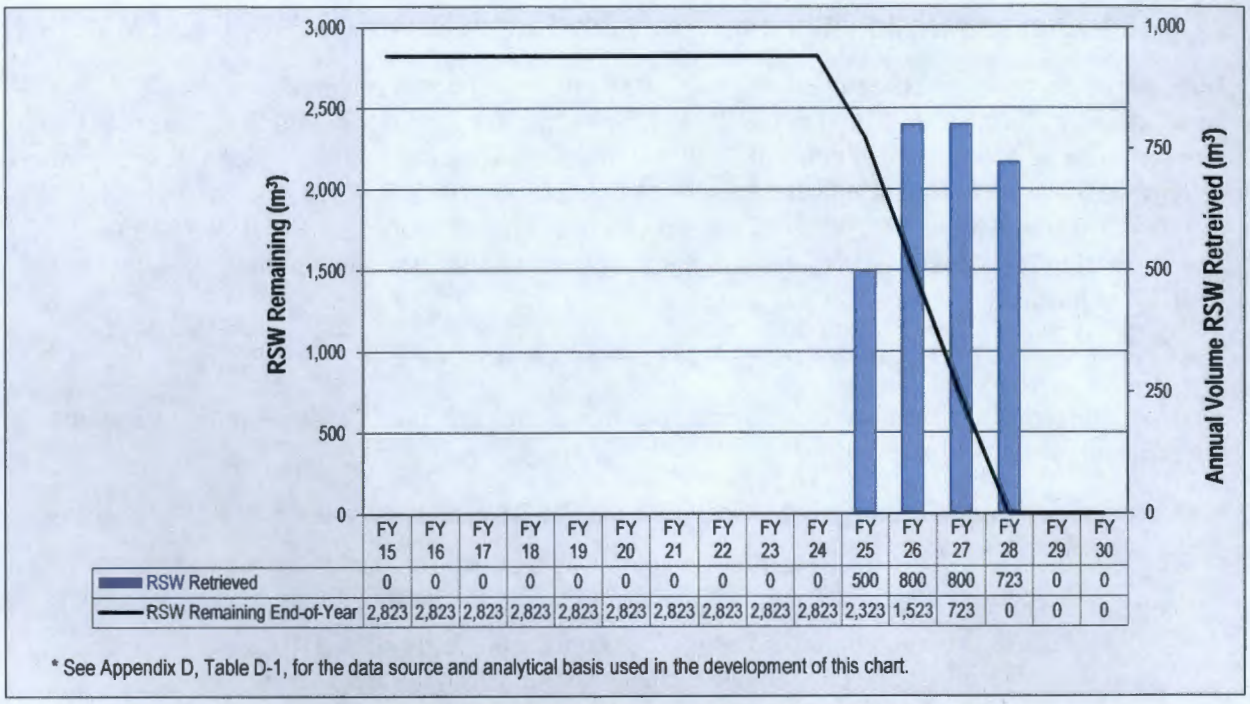
Retrieval has become more challenging as more frequent occurrences of degraded, failed, and contaminated containers or areas have been encountered. Containers with significant deterioration are placed in a safe configuration (e.g., overpacking in larger containers and building of confinement around degraded boxes) pending development of container-specific retrieval instructions. Containers determined to present unacceptable hazards to the workers will be documented, and a path forward identified. The containers will be retrieved per TPA (Ecology et al., 1989a) milestone requirements. Weather enclosures and containment systems may be used as required to support retrieval operations.

2.1 Status and Annual Volume Projections for Retrieval of Retrievably Stored Waste

Retrieval operation has been placed in a layup condition. During FY 2014, retrieval of RSW was not performed.

Figure 2-1 presents a summary of the RSW projected to be retrieved from 2015 through 2030. The bars represent the quantity of RSW that is projected to be retrieved during a fiscal year, and the line represents the cumulative volume remaining at the end of a fiscal year. The schedule of retrieval activities is based on the funding profile given in Figure 8-1, while evaluating other factors such as minimizing the lifecycle retrieval cost, optimizing retrieval versus capacity for repackaging, optimal WIPP shipment schedule, and offsite treatment capacity.

Under the projected annual funding profile, retrieval of RSW is not anticipated to occur during FY 2015 through FY 2024. Operation ramp-up of CH-RSW and non-caisson RH-RSW retrieval operation will begin in FY 2024, with retrieval of RSW resuming in FY 2025. Retrieval would be completed by the end of FY 2028. Design and construction of the alpha caisson retrieval project is scheduled to be completed by the end of FY 2026, with retrieval of the caisson RH-RSW to be completed by the end of FY 2028.



	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30
RSW Retrieved	0	0	0	0	0	0	0	0	0	0	500	800	800	723	0	0
RSW Remaining End-of-Year	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,323	1,523	723	0	0	0

* See Appendix D, Table D-1, for the data source and analytical basis used in the development of this chart.

Figure 2-1. Volume Projections for RSW and RH-RSW Retrieval

2.2 Retrieval Approach of Non-caisson Retrievably Stored Waste

The existing retrieval process and techniques, including the trench face characterization systems, will continue to be used to retrieve the remaining CH-RSW and non-caisson RH-RSW once retrieval operations resume. At the end of FY 2011, retrieval operations were placed in a layup condition (e.g., returning leased equipment, storing supplies and other equipment, stabilizing contaminated areas, and documenting facility conditions). During FY 2024, preparatory work for the restart of retrieval operations will begin, with restart of retrieval operations in FY 2025. Details for the redeployment of retrieval operations have not been established. The preliminary ramp-up cost is $27 million for a 12-month duration, with the majority of cost going towards hiring and training of staff. Additional information is provided in Appendix D.

The retrieval process begins with the development of a retrieval plan that addresses the following.

- Identification of the trench area(s)
- Characterization of the buried containers in the selected trench areas and identification of radiological, chemical, and industrial hazards
- Determination of hazard controls to be applied to retrieval operations
- Review of existing processes, techniques, equipment, tools, and procedures to determine if they are adequate and appropriate for the planned retrieval activity
- Identification of actions that need to be addressed prior to initiating retrieval activities

In addition, subsurface (geophysical) surveys are performed to identify underground container configuration and any obstruction that may be encountered during excavation activities. The information gathered during the planning process is documented in a retrieval plan.

2.2.1 Retrieval and Characterization of CH-RSW Drums

Approximately 12,000 drums of CH-RSW (as of October 1, 2014) remain to be retrieved from the 218-W-3A, 218-W-4B, and 218-E-12B LLBGs. In February 2011, retrieval of CH-RSW drums began in Trenches 17 and 27 of the 218-E-12B LLBG using the newly acquired Trench Face Retrieval and Characterization System. This system has since been demobilized as part of the current layup condition but is expected to remobilize once retrieval operations has resumed. Small containers of RH-RSW intermingled with CH-RSW drums were also being retrieved.

Excavation of the trench will be initiated following completion of site setup and preparation. Retrieval of the containers will be primarily performed using existing and proven handling processes. Due to the potential existence of higher radiological activity containers, new long-reach and remote equipment (e.g., crawler) was acquired to support the retrieval and handling activities (Figure 2-2).

Containers that have contamination on the outside of the container and/or poor integrity will be placed into a plastic drum bag or a 322 L (85 gal) drum overpack. Containers are then removed from the trench by forklift, crane, or conveyor system for characterization. The RH-RSW containers with higher radiological activity will be retrieved using the newly acquired remote-controlled crawler and/or crane with lifting attachments that allow for remote handling of containers. As these containers are retrieved, they will be placed in concrete-shielded overpacks. If RH containers are found that are believed to have poor integrity, they will be covered with lead blankets, soil, or other shielding to reduce radiological activity, and a plan will be developed for retrieving these containers.

The Trench Face Characterization System is housed in trailers and CONEX containers (i.e., large metal cargo type containers) that were staged at the 218-E-12B LLBG until retrieval activities were suspended, and the system was demobilized. The equipment is staged in or near the trench chosen for retrieval for the purpose of minimizing handling of the drums by bringing the equipment to the trenches and not having to transfer the drums to WRAP to be characterized. Once a drum (or low radiological activity RH container) has been removed from the trench, it is processed through the gamma assay system and/or neutron assay equipment to determine whether it is MLLW or TRUM waste. If the cesium levels in the containers are high enough that they flood the gamma assay detectors, the gamma assay results are indeterminate, or the containers are too large for the gamma assay equipment, they will be moved to the neutron assay system to determine whether the drum is TRUM waste (Chapter 3).

Once assayed, the TRUM drums are vented. The vented drums are then moved into the real-time radiography equipment, where an x-ray of the drum is performed to determine if it contains any WIPP-prohibited items. During the winter months, a drum-warming unit will be used to melt any liquids inside a drum prior to going into the real-time radiography equipment. Drums that do not contain WIPP-prohibited items will be repackaged onsite or offsite. If a WIPP-prohibited item is found, the item will be characterized and/or dispositioned and repackaged onsite, or it may be repackaged offsite (Chapter 4).

Figure 2-2. Example of Drums Being Removed from 218-E-12B Trenches

2.2.2 Retrieval of Non-drum CH-RSW and Non-caisson RH-RSW

Existing methods will continue to be utilized to retrieve the remaining containers of non-drum CH-RSW and non-caisson RH-RSW once retrieval operations resume. The current inventory of containers (as of October 1, 2014), not including drums of CH-RSW, consists of the following:

- 150 containers of CH-RSW, that are not drums, located in a trench to be removed and transferred to a treatment, storage, and/or disposal (TSD facility)
- 125 containers of RH-RSW located in a trench to be removed and transferred to a TSD

The excavation techniques for exposing non-drum containers of RSW and non-caisson RH-RSW in the LLBGs is similar to the excavation of drums as described in Section 2.2.1. The difference between the retrieval approaches comes during the removal of the non-drum containers from the trenches as described in this subsection.

The initial field activity comprises site setup and preparation. Retrieval and portable nondestructive assay equipment is staged in or near the trench chosen for retrieval. During the planning process, containers with the potential to be MLLW are identified, and assays are performed at the trenches using portable assay equipment. Container staging and work areas are defined and set up. Equipment setback distances are determined by engineering analysis to ensure trench slope stability is maintained. Weather enclosures may be used in selected retrieval activities. The excavation of the trench is initiated following completion of site setup and preparation.

During excavation, once the overburden is removed to the extent that the containers become visible, the container condition is evaluated. If the visible containers provide evidence of significant degradation, an appropriate protective covering is applied to protect the waste from the environmental conditions until it is time to retrieve the containers. Excavation activities will be monitored to identify any contamination that may be present and to minimize impacts to worker health and safety. Radiological measurements of the container are performed to measure the radiological activity rate and identify potential contamination.

Industrial hygiene sampling is also performed to monitor potential chemical hazards. If conditions are encountered that may require actions outside those in approved operating procedures, appropriate actions will be determined, documented, and taken to remediate the conditions.

Retrieval may include container repair, overpacking, application of fixatives for contamination control, and moving the containers to a staging location for final inspection, labeling, and surveys. A crane and/or forklift are used to remove or reposition containers in the trenches. Other equipment may be used in the retrieval activities, such as remote-controlled equipment that will accomplish similar tasks without exposing personnel to the immediate hazards of retrieval. Figure 2-3 illustrates an example of a container in good condition being lifted from the trench. Figure 2-4 illustrates an example of a large container that is degraded, requiring reinforcement and placement on a lifting base prior to being lifted from the trench. Figure 2-5 illustrates an example of a container that has failed, requiring the waste to be placed into a new container prior to being removed from the trench.

Lifting of a container directly from a trench

Another example of a container being lifted driectly out of a trench.

Figure 2-3. Examples of Large Containers in Good Condition Being Retrieved from LLBG

Excavation of container in trench

Reinforcing container with plywood

Placing container onto a lifting base

Lifting container from trench

Figure 2-4. Examples of Large Container in Degraded Condition Being Retrieved from LLBG

Excavation of container in trench

Removing container collapsed lid

Placing waste into new container prior to being removed from trench

Figure 2-5. Examples of Failed Container Being Packaged prior to Retrieval from LLBG

2.3 Retrieval of Caisson RH-RSW

Burial Ground 218-W-4B includes four alpha caissons containing high radiological activity RH-RSW. Based on available records, the four caissons contain a total of 5,567 containers (approximately 23.5 m^3 [830 ft^3]) that are primarily 3.8 L (1 gal) cans, with some 7.6 and 18.9 L (2 and 5 gal) cans. This waste was generated from post-irradiation examination of reactor fuel elements and other material in the 325 and 327 hot cell facilities in the 300 Area of the Hanford Site.

The alpha caissons are cylindrical, underground waste repositories used to store dry RH-RSW. The alpha caissons are located 4 m (14 ft) belowgrade and have a 1 m (3 ft) diameter loading chute where the RH-RSW was loaded into the caisson and a 0.3 m (1 ft) diameter ventilation shaft. Loading of this waste material into the alpha caissons occurred between 1970 and 1988. A fifth alpha caisson in 218-W-4B was never used and is empty. Figure 2-6 presents a schematic of an alpha caisson in the 200 West LLBG.

Removal of the waste from the caissons will be complicated by the offset inlet chute (Figure 2-7), the heaped and random arrangement of the containers (Figure 2-8), and the assumed breached containers from the impact of sliding and dropping into the caisson. Removal will be further complicated by the presence of solid waste (e.g., plastic sheeting, rope, wire, and rods) that has accumulated over the years of loading operations.

These alpha caissons are similar in design of those in the 618-11 Burial Ground (Figure 7-1), except that the 618-11 caissons are made with galvanized corrugated metal pipe with an open bottom, and the alpha caissons are enclosed concrete structures. The Alpha Caisson Waste mission need has been established to retrieve the RH-RSW from the caissons in the 218-W-4B LLBG. Options evaluated include retrieval of the RH-RSW individually in the trench or removing a caisson intact and storing it at a TSD facility (e.g., T Plant or CWC) until processing capability is available (see Section 4.2.3). During the design phase of the project that is scheduled to begin in FY 2025, lessons learned from the retrieval of the 618-11 Burial Ground caissons will be considered in choosing the final method of retrieval of the RH-RSW from the alpha caissons. A current retrieval approach for the vertical pipe units at the 618-10 Burial Ground would also be considered for application for the alpha caissons (Figure 2-9).

2.4 Post-retrieval Activities

Milestone M-091-40 requires that as RSW retrieval proceeds, DOE will sample and analyze trench substrates with the purposes of determining whether or not release of contaminants to the environment have occurred and, if so, the nature and extent of contamination. Sampling that has been performed is documented in the Administrative Record (AR).

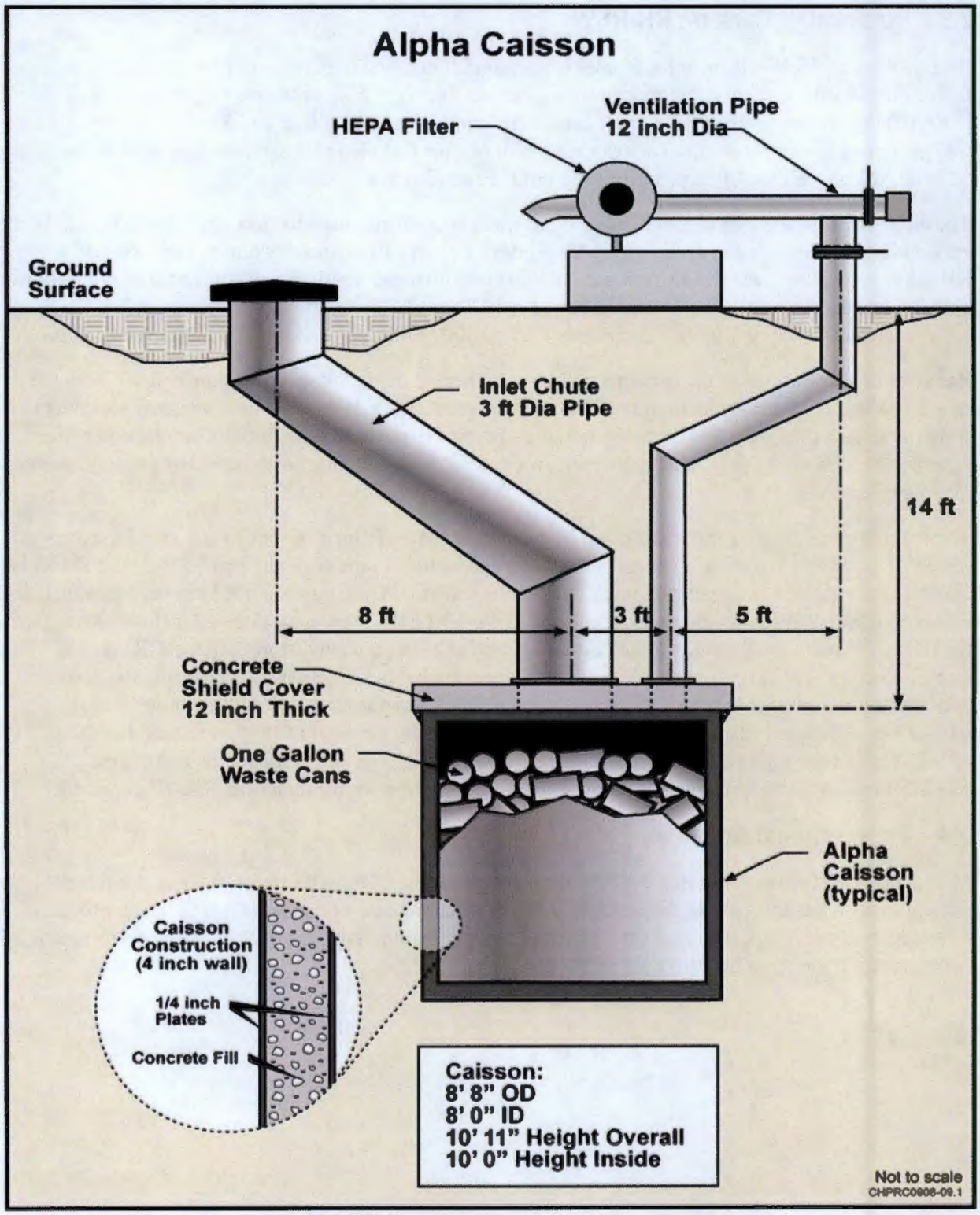


Figure 2-6. Schematic of an Alpha Caisson

Figure 2-7. Alpha Caisson (1987)

Figure 2-8. Waste Containers in Alpha Caisson 4 (1987)

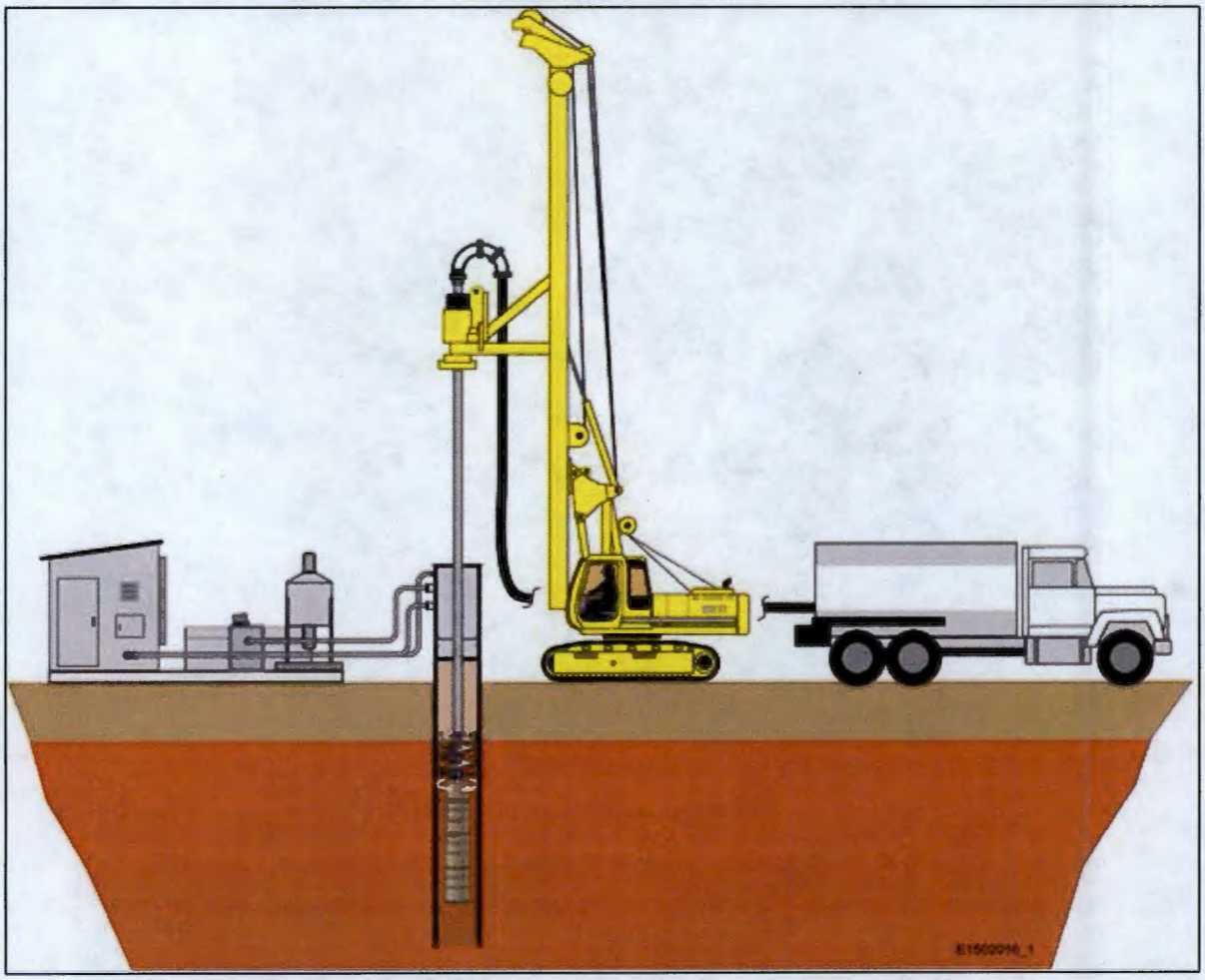


Figure 2-9. In Situ Size Reduction and Stabilization Over-Casing Contents

Once CH-RSW has been removed from the trenches in the LLBGs, information and photographs regarding as-left trench conditions will be documented, and sampling of the soil will commence per the sampling and analysis plans (SAPs) that have been developed to determine whether contaminants have been released from the burial grounds where CH-RSW has been and will be retrieved.

The SAPs for the four LLBGs are as follows:

- DOE/RL-2003-48, *218-W-4C Sampling and Analysis Plan*
- DOE/RL-2004-70, *218-W-4B Burial Ground Sampling and Analysis Plan*
- DOE/RL-2004-32, *218-E-12B Burial Ground Sampling and Analysis Plan*
- DOE/RL-2004-71, *218-W-3A Burial Ground Sampling and Analysis Plan*

Once all RH-RSW has been removed from the trenches in the LLBGs, information and photographs regarding as-left trench conditions will be documented.

For the purposes of this PMP, it is assumed that any soil remediation in the trenches where RSW is removed will be addressed as part of the 200-SW-2 OU CERCLA cleanup actions (M-016 Milestone series). There are opportunities to support the 200-SW-2 investigative process through implementation of the SAPs.

3 Treatment of TRUM Waste and MLLW

3.1 TRUM Waste

DOE has made considerable progress in disposing of TRUM waste by shipping over 4,200 m^3 (148,321 ft^3) to WIPP or the Advanced Mixed Waste Treatment Project (AMWTP) in Idaho for disposal. This section describes DOE's plan to prepare CH-TRUM and RH-TRUM waste for offsite shipment by continuing to utilize existing capabilities and acquiring new capabilities to treat, repackage, and, where necessary, size reduce the remaining containers.

The key elements of DOE's plan to prepare the TRUM containers for offsite shipment are as follows:

- Utilize offsite capabilities at Perma-Fix Northwest and onsite capabilities at T Plant and WRAP to repackage the small containers of CH-TRUM waste in aboveground storage as of June 30, 2009, and from retrieval operations into WIPP-certifiable containers. DOE will be evaluating the possibility of performing repackaging of the remaining RSW at retrieval areas when retrieval resumes.
- Utilize capabilities at Perma-Fix Northwest to repackage a portion of the large containers of CH-TRUM and non-caisson RH-TRUM waste in aboveground storage as of June 30, 2009, and from retrieval operations into WIPP-certifiable containers. New capability onsite will be acquired to repackage the remaining portion of large-container CH-TRUM and non-caisson RH-TRUM waste that cannot be repackaged at Perma-Fix Northwest.
- Acquire the necessary capability to repackage the retrieved alpha caisson RH-TRUM waste into WIPP-certifiable containers.

3.1.1 Status of Certifiable M-091 TRUM Waste Backlog

3.1.1.1 Certifiable CH-TRUM Waste

As of December 31, 2014, there was 523 m^3 (18,470 ft^3) of certifiable M-091 TRUM waste. This volume was all small-container CH-TRUM waste and consisted of 368 m^3 (12,996 ft^3) drums and 155 m^3 (5,474 ft^3) SWBs.

3.1.1.2 Certifiable RH-TRUM Waste

There was no certifiable RH-TRUM waste as of December 31, 2014.

3.1.2 Approach for Generating Certifiable Containers of TRUM Waste

This section addresses containers currently in aboveground storage and those containers remaining to be retrieved from the LLBGs (RSW). Figure 3-1 illustrates the simplified flow path of TRUM waste, starting with initially screening the waste to determine if it is TRUM waste or MLLW, determining whether the TRUM waste containers have prohibited items, repackaging the TRUM waste into WIPP-certifiable containers, and submitting the containers to CCP for certification. WIPP-compliant containers include 208 L (55 gal) drums and WIPP SWBs.

Drums of RSW that have been determined to be TRUM waste are x-rayed to determine whether a WIPP-prohibited item(s) is present. If a prohibited item(s) is found, the drum will be repackaged, either onsite or offsite. In the case where a drum is to be shipped offsite for remediation, the drum contents will be characterized onsite before the drum is shipped offsite.
Similarly, if capability is available, boxes of RSW that have been determined to be TRUM waste will be x-rayed to determine whether a WIPP-prohibited item(s) is present. If a prohibited item(s) is found, and the box is to be shipped offsite for repackaging, additional knowledge obtained from the x-ray is recorded

in the waste package operating record, and the additional knowledge is sent to the receiving offsite facility prior to shipment.

For boxes of RSW that have been determined to be TRUM waste where the capability to x-ray is not available, the waste record of the waste box will be reviewed and investigated to determine the probable contents inventory. This review and investigation will be documented in the operating record. If the box is to be shipped offsite for repackaging, all available process knowledge about the contents will be provided to the offsite facility prior to shipment.

Figure 3-2 presents a summary of the volume of TRUM waste projected to be repackaged into WIPP-certifiable containers. The bars represent the CH-TRUM and RH-TRUM waste projected to be certified during a fiscal year, and the line represents the remaining inventory to be certified at the end of a fiscal year. The projected values are based on existing suspect TRUM waste volumes. The volume of waste currently in aboveground storage that is either certified waste awaiting shipment to WIPP or certifiable waste awaiting certification by CCP is not included in Figure 3-2. Additional information is provided in Appendix D.

Under the anticipated annual funding profile, 280 m^3 (9,888 ft^3) of TRUM waste will be repackaged using commercial capabilities in FY 2015 through FY 2019, and then increasing to 400 m^3 (14,126 ft^3) in FY 2020 through FY 2029. An additional 430 to 600 m^3 (15,185 to 21,189 ft^3) per year is expected to be processed once the alternate capability becomes available in FY 2026.

Repackaging of the remaining small-container CH-TRUM waste is expected to occur at either an offsite facility, WRAP, or T Plant depending on the particular characteristic of the waste. When retrieval of the RSW is restarted, construction and operation of a future trench face processing system will be considered to remediate the waste and place it into WIPP-certifiable containers. Currently, retrieval operations are scheduled to recommence in FY 2025. Completion of the M-091 work scope is dependent on feed from retrieval.

To accomplish this M-091 Milestone work scope, DOE will utilize existing capabilities and acquire the necessary new capabilities as described in the following sections. Details and a schedule for redeployment of onsite repackaging of TRUM waste have not been established.

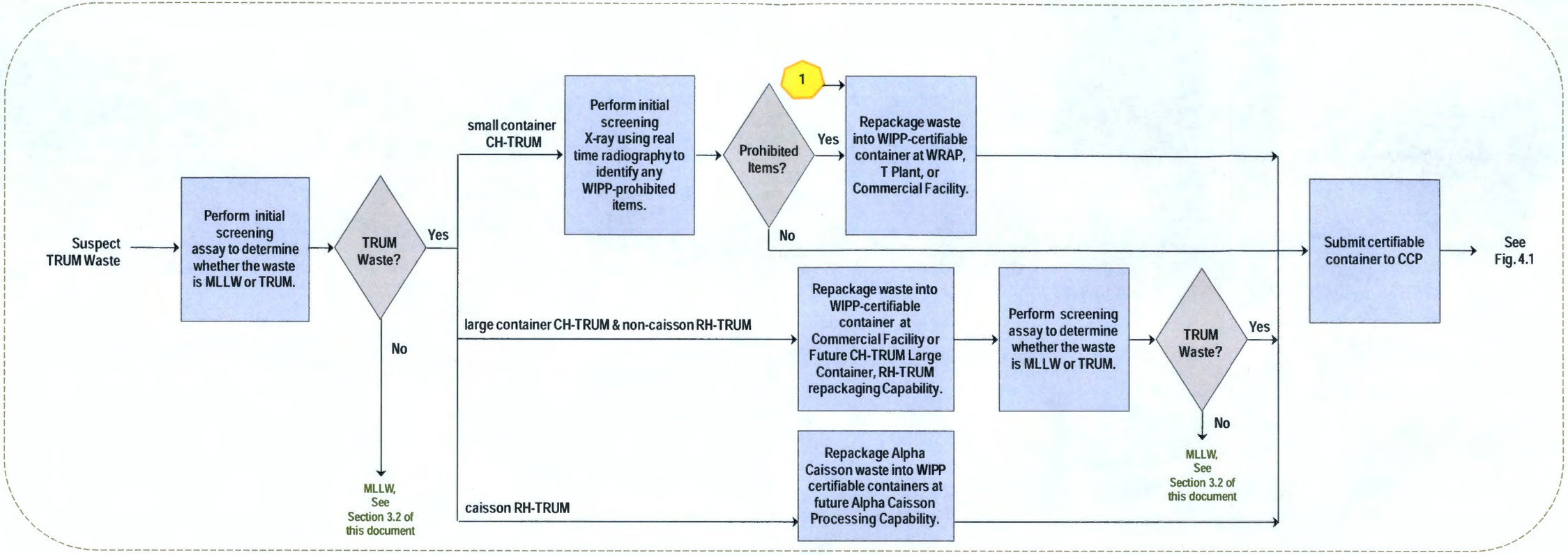


Figure 3-1. Screening of Waste Container and Generating WIPP-Certifiable Containers

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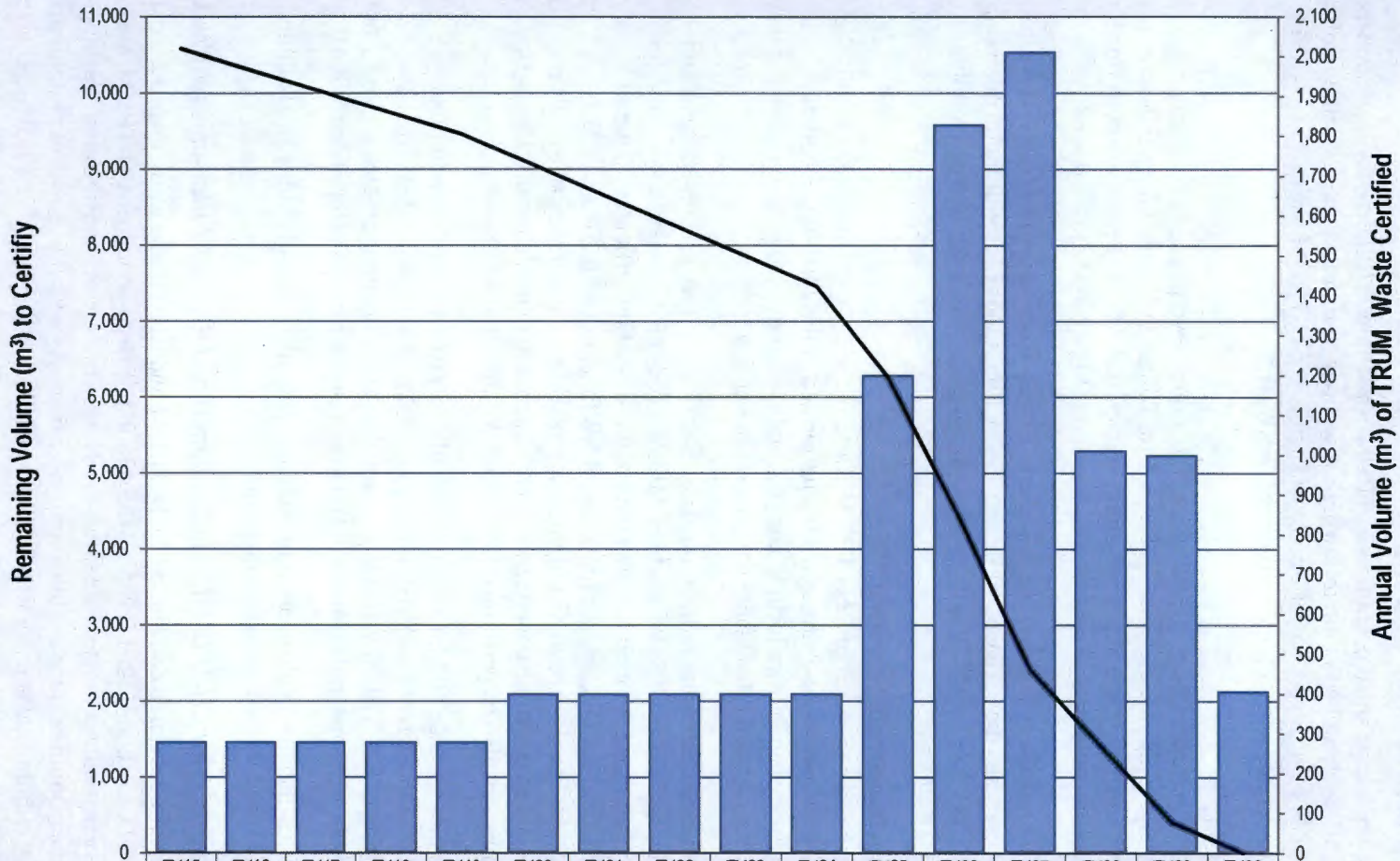


	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Annual Waste Certified	280	280	280	280	280	400	400	400	400	400	1200	1830	2012	1011	1000	406
Remaining TRUM to be Certified	10579	10299	10019	9739	9459	9059	8659	8259	7859	7459	6259	4429	2417	1406	406	0

* See Appendix D, Table D-3, for the data source, analytical basis, and underlying assumptions used in the development of this chart.

Figure 3-2. Certifiable Volume Projections of CH-TRUM and RH-TRUM Waste (M-091 Scope)

3.1.2.1 Processing Approach for Small Containers of CH-TRUM Waste

DOE has the capability to repackage small containers of TRUM waste into WIPP-certifiable containers onsite at T Plant and WRAP, as described in the following subsections, and has a contract with the offsite commercial facility, Perma-Fix Northwest, to perform repackaging of CH-TRUM waste. For TRUM waste, small containers are defined as 208 L (55 gal) drums or SWBs.

3.1.2.1.1 T Plant Processing

DOE can utilize the T Plant for treating (e.g., pH neutralization, liquid absorption, and macroencapsulation), venting, sampling, and repackaging waste. T Plant utilizes modular enclosure structures for TRUM waste sorting, processing, and volume reduction. These activities are performed in glove bags inside the enclosure structures to control contamination (Figure 3-3).

T Plant has the capability to repackage 208 and 322 L (55 and 85 gal) containers of CH-TRUM waste. T Plant modular enclosure systems have TRUM waste processing limitations (i.e., plutonium quantities, weight, and sharp items). The 2706-T Facility activities include staging, verifying, treating, venting, sampling, and storing CH-TRUM waste.

3.1.2.1.2 WRAP Characterization and Processing

DOE has the capability to characterize and process TRUM waste in the 2336W Building, which is the main WRAP building, with limited waste characterization performed in the 2404-WC Building. Characterization and processing capabilities include x-raying and assaying containers, repackaging waste treatment, sampling headspace gas and flammable gas, and drum venting.

Waste is characterized and examined using radiography (i.e., x-ray) to identify prohibited items and assayed to identify whether the waste is TRUM waste or MLLW. The WRAP assay unit is sized for 208 and 322 L (55 and 85 gal) drums. A mobile trailer houses the super-high-efficiency neutron coincidence (SuperHENC) assay unit for performing assay of SWBs along with 208 and 322 L (55 and 85 gal) drums. WRAP has also acquired a high-energy real-time radiography (HERTR) unit that uses x-ray technology which can penetrate concrete-lined containers and dense materials. Headspace gas and flammable gas sampling can also be performed in the 2336W and 2404-WC Buildings.

WRAP has the capability to repackage 208 L (55 gal) drums of CH-TRUM waste, with limited capabilities to process 322 L (85 gal) overpacks containing internal packages that potentially have integrity issues. Repackaging of CH-TRUM waste is performed in glove boxes to protect workers from exposure to potentially radioactive materials (Figure 3-4). Drum venting can be performed at WRAP.

WRAP treatment capabilities include amalgamation of mercury, neutralization for acidity or alkalinity, solidification of free liquids, and limited macroencapsulation.

3.1.2.2 Processing Approach for CH-TRUM (Large-Container) and RH-TRUM (Non-caisson) Waste

Currently, the capability to process large containers of CH-TRUM and RH-TRUM waste does not exist on the Hanford Site. As of December 31, 2014, 995 m^3 (35,138 ft^3) of large-container CH-TRUM waste had been repackaged into certifiable containers at Perma-Fix Northwest, located in Richland, Washington (Figure 3-5). Commercial capabilities are available to process containers with low grams of plutonium of CH-TRUM waste and low radiological activity RH-TRUM waste. It is anticipated that a high percentage of the large container M-091 waste will be processed commercially. For TRUM waste, a large container is defined as any container that is not a 208 L (55 gal) drum or smaller container or an SWB. Onsite and offsite transportation of waste is discussed in Section B1.8.

Enclosure structure located in T Plant canyon.

Repackaging of TRUM waste inside a glove bag that is located in the enclosure structure.

Figure 3-3. Repackaging of TRUM Waste at T Plant

Outside a glovebox at WRAP that is used to repackage of TRUM waste.

Repackaging of TRUM waste inside a WRAP glovebox.

Figure 3-4. Repackaging of TRUM Waste at WRAP

Figure 3-5. Repackaging of TRUM Waste at Perma-Fix Northwest

For the large containers of CH-TRUM and RH-TRUM waste that cannot be processed using commercial capabilities, a new capability will be acquired to repackage the remaining portion of these waste containers (see Section 5). Onsite and offsite transportation of waste is discussed in Section B1.8. The project for acquiring this capability is anticipated to begin in FY 2020 based on the current funding profile.

3.1.2.3 Processing Approach for RH-TRUM (Caisson) Waste

Retrieval of waste containers from the alpha caissons is discussed in Section 2.3. Current onsite capabilities are not adequate to repackage this waste into WIPP-certifiable containers. As a result, a new capability will be acquired through the Alpha Caisson Waste Processing Project that will perform the required processing and packaging of the waste to generate WIPP-certifiable containers. These certifiable containers will be shipped to CWC for storage while awaiting final certification by CCP and loading/shipping to WIPP. During conceptual design, the potential to integrate the processing of RH-TRUM waste retrieved from the alpha caissons and the future capability to treat non-caisson RH-TRUM waste (see Section 7) will be explored.

The project for processing the RH-TRUM waste from the alpha caissons is anticipated to begin in FY 2024 based on the current funding profile.

3.2 MLLW

Substantial progress has been made in recent years in the treatment and disposal of MLLW. Since 1997, over 14,000 m^3 (494,000 ft^3) of MLLW has been treated and disposed of. The majority of this MLLW has

been treated using commercial capabilities and disposed of onsite at either the mixed waste trenches (MWTs) or Environmental Restoration Disposal Facility (ERDF). As of February 2014, approximately 1,385 m^3 (48,911 ft^3) of MLLW remained to be treated and disposed of, 85 m^3 (3,002 ft^3) is in aboveground storage, and a projected 1,300 m^3 (45,900 ft^3) of RSW will assay as MLLW. The MLLW remaining that cannot currently be treated commercially is considered no-path-forward waste. Disposition of this waste is discussed in Chapter 6.

Current commercial facilities under contract include the following:

- Perma-Fix Northwest, located in Richland, Washington
- East Tennessee Material and Energy Corporation, Inc., located in Oak Ridge, Tennessee
- Perma-Fix Diversified Scientific Services, Inc., located in Kingston, Tennessee

3.2.1 Status and Annual Volume Projections for Treatment of MLLW

During FY 2014, no processing of small-container CH-MLLW or large containers of CH-MLLW and RH-MLLW was performed.

Figure 3-6 presents a summary of the volume of MLLW projected to be treated from FY 2015 through FY 2030. The projections are based on available inventory from retrieval operations where the RSW designates as MLLW.

Under the projected annual funding profile, treatment of legacy MLLW is not anticipated to occur during FY 2015 through FY 2024. The treatment of legacy MLLW will restart during FY 2025 once funding has become available and retrieval operations has resumed. Completion of the MLLW milestones is dependent on feed from retrieval. If retrieval is delayed, treatment of MLLW is also delayed, causing the milestones to be at risk of not being completed on schedule. Newly generated MLLW continues to be treated with in the one year storage prohibitions specified in 40 CFR 268.50, "Prohibition on Storage of Restricted Wastes."

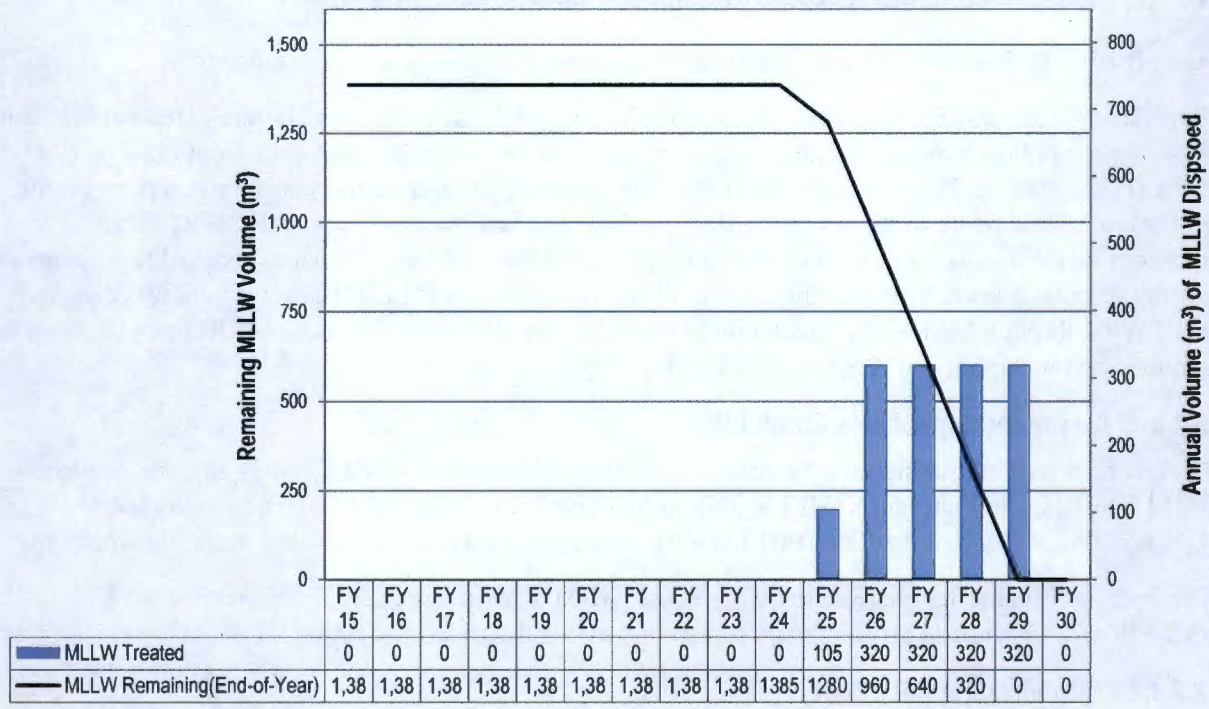
3.2.2 MLLW Characterization

This section addresses containers currently in storage and those to be retrieved from the LLBGs.

Drums of RSW that have been determined to be MLLW are x-rayed to determine whether a nonconforming item(s) is present. If a nonconforming item(s) is not found, the drum will be sent offsite for processing. If a nonconforming item(s) is found, the item(s) will be characterized and/or dispositioned onsite before being shipped offsite for processing.

Boxes of RSW that have been determined to be MLLW are x-rayed, if capability is available, to determine whether a nonconforming item(s) is present. If a nonconforming item(s) is not found, the box will be sent offsite for processing. If a nonconforming item(s) is found, the box will be shipped offsite for processing after additional knowledge obtained from the x-ray is recorded in the waste package operating record, and the additional knowledge is sent to the receiving offsite facility prior to shipment.

For boxes of RSW that have been determined to be MLLW where the capability to x-ray is not available, the waste record of the waste box will be reviewed and investigated to determine the probable contents inventory. This review and investigation will be documented in the operating record. If the box is to be shipped offsite for processing, all available process knowledge about the contents will be presented to the WDOE prior to the package being shipped to the offsite facility.



	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30
MLLW Treated	0	0	0	0	0	0	0	0	0	0	105	320	320	320	320	0
MLLW Remaining(End-of-Year)	1,38	1,38	1,38	1,38	1,38	1,38	1,38	1,38	1,38	1385	1280	960	640	320	0	0

* See Appendix D, Table D-2, for the data source, analytical basis, and underlying assumptions used in the development of this chart.

Figure 3-6. Volume Projections for Treatment of MLLW (M-091-42 and M-091-43)

3.2.3 Overview of MLLW Treatability Groups

The MLLW is categorized by the necessary treatment path to ensure that the waste, once treated, will meet LDR requirements for disposal. The following treatability groups are included in DOE/RL-2015-08, *Calendar Year 2014 Hanford Site Mixed Waste Land Disposal Restrictions Full Report*:

- MLLW-01 "LDR Compliant Waste," Treatment Path: Direct disposal without additional LDR treatment
- MLLW-02 "Inorganic Non-Debris," Treatment Path: Nonthermal (stabilization)
- MLLW-03 "Organic Non-Debris," Treatment Path: Thermal
- MLLW-04 "Hazardous Debris," Treatment Path: Nonthermal (macroencapsulation)
- MLLW-05 "Radioactive Lead Solids," Treatment Path: Nonthermal (macroencapsulation)
- MLLW-06 "Mercury Waste," Treatment Path: Mercury stabilization (that is, amalgamation or grout stabilization)
- MLLW-07 "RH and Large Container," Treatment Path: Multiple types of treatment (stabilization, macroencapsulation, thermal destruction, etc.)
- MLLW-08 "Unique Wastes," Treatment Path: No treatment capability

- MLLW-09 "Radioactive Batteries," Treatment Path: Macroencapsulation
- MLLW-10 "Reactive Metals," Treatment Path: Deactivation of reactive component

Pursuant to the *Hazardous and Solid Waste Amendments of 1984*, LDRs were promulgated beginning in 1986 for nonradioactive waste. The LDRs later became effective for mixed waste. Beginning in 1990, TPA (Ecology et al., 1989a) Milestone M-26-01 required a plan with subsequent yearly reports on the volume of mixed waste in storage at the Hanford Site. The last approved report (DOE/RL-2015-08) provides total waste volume for both the currently stored inventory and the waste forecast to be generated during the next 5 years by treatability group. This PMP addresses MLLW LDR Treatability Groups MLLW-02 through MLLW-10. Treatability Group MLLW-01, direct disposal of LDR compliant waste, requires no processing and is not included in this PMP.

3.2.4 Treatment Capabilities for MLLW

Commercial capabilities are used to treat/process inorganic nondebris (MLLW-02), organic nondebris (MLLW-03), hazardous debris (MLLW-04), radioactive lead solids (MLLW-05), mercury waste (MLLW-06), radioactive batteries (MLLW-09), and reactive metals (MLLW-10) in small containers.

Commercial capabilities are used to treat/process CH-MLLW in large containers and RH-MLLW (MLLW-07). Onsite and offsite transportation of waste is discussed in Section B1.8.

3.2.4.1 Stabilization (MLLW-02)

The treatment path for inorganic nondebris MLLW is commercial stabilization and is represented in LDR Treatability Group MLLW-02. Waste within this group consists of many different inorganic solids (e.g., particulates, absorbed liquids, sludges, resins, and soils) and lab packs that are contaminated with regulated metals and other inorganics.

The objective of stabilization is to immobilize the hazardous component through chemical and/or physical fixation into low-solubility materials and by encapsulation to reduce the potential for future releases. Usually, stabilization is accomplished by mixing the waste with Portland cement or pozzolanic materials at a preselected ratio, but stabilization can also include mixing with polymer materials. Pretreatment processes may be employed prior to stabilization (e.g., drying, shredding, screening, and chemical treatments).

Several commercial treatment facilities located in the United States can accept the majority of the Hanford Site's waste in Treatability Group MLLW-02. T Plant and WRAP have waste stabilization capability and could be used to supplement commercial facilities.

3.2.4.2 Thermal Treatment of Organics (MLLW-03)

The treatment path for organic nondebris MLLW is commercial thermal treatment and is represented in LDR Treatability Group MLLW-03. Waste within this group consists of many different inorganic and organic solids (e.g., particulates, absorbed liquids, sludges, resins, and soils) and lab packs that are contaminated with organic regulated dangerous waste constituents. The thermal treatment process destroys organic materials by oxidation, combustion, and/or pyrolysis.

Commercial treatment facilities are located in the United States that can accept the Hanford Site's waste in Treatability Group MLLW-03.

3.2.4.3 Macroencapsulation (MLLW-04, MLLW-05, and MLLW-09)

Waste within Treatability Group MLLW-04 meets the definition of hazardous debris as defined in 40 CFR 268.2, "Land Disposal Restrictions," "Definitions Applicable in This Part." The physical

characteristics include paper, plastic, wood, rubber, rags, and lesser quantities of metallic and inorganic waste components. This waste may include organic/carbonaceous waste constituents in excess of 10 percent as defined in WAC 173-303-040, "Dangerous Waste Regulations," "Definitions."

Waste within Treatability Group MLLW-05 meets the definition of the radioactive lead solids subcategory as described in 40 CFR 268.40, "Applicability of Treatment Standards." The physical makeup consists of many different forms of radioactive lead solids including bricks, sheets, shot-filled blankets, and lead-lined debris items where the lead comprises more than 50 percent of the waste matrix. The primary treatment path for MLLW debris and radioactive lead solids is commercial macroencapsulation.

Waste within Treatability Group MLLW-09 is, or contains, radioactively contaminated batteries that have the treatment requirements specified in 40 CFR 268.40 (i.e., D006, cadmium batteries; D008, lead acid batteries (drained); D009, mercury batteries; and D011, silver batteries).

The primary treatment path for MLLW debris, radioactive lead solids, and radioactively contaminated batteries is commercial macroencapsulation. Macroencapsulation consists of applying a surface coating of polymeric organics or using a jacket of inert inorganic materials (e.g., cement) to allow substantial reduction of surface exposure to potential leaching media. Portland cement-based grouts have mainly been used to macroencapsulate this waste on the Hanford Site. The waste is typically sent through one or more size-reduction steps (e.g., sorting, cutting/shearing, compaction, and super compaction) prior to macroencapsulation.

Commercial treatment facilities are located in the United States and can accept the Hanford Site's waste in the MLLW-04, MLLW-05, and MLLW-09 treatability groups. The T Plant facility has macroencapsulation capability and could be used to supplement commercial facilities. Onsite and offsite transportation of waste is discussed in Section B1.8.

3.2.4.4 Mercury Stabilization and Amalgamation (MLLW-06)

Radioactively contaminated mercury waste requires either stabilization or amalgamation. Commercial capability is available. The Hanford Site inventory of mercury-bearing waste is currently zero (represented in LDR Treatability Group MLLW-06).

3.2.4.5 RH and Large-Container MLLW (MLLW-07)

Waste that falls into the MLLW-07 Treatability Group includes very large packages that, when treated, pose a transportation concern and/or waste packages that have a significant radiological inventory that pose a worker protection concern. The waste will be limited to hazardous debris. Chemical stabilization and macroencapsulation under 40 CFR 268.45, "Treatment Standards for Hazardous Debris," will be utilized to render the waste LDR compliant. In addition, the mixed waste containers will meet the 90 percent full container requirements following treatment. Treatment would be limited to those technologies that can be employed for containerized mixed waste only.

Commercial facilities will be used to treat most CH-MLLW in large containers and some RH-MLLW. Waste within Treatability Group MLLW-07 consists of: (1) large containers of MLLW, (2) RH-MLLW packages, and (3) RH-MLLW that is shielded down to contact-handling levels for safe handling and storage. DOE has implemented significant commercial capability with firms in Washington and Utah to disposition a significant portion of this LDR treatability group.

3.2.4.6 Disposition Path for MLLW-08

Waste within Treatability Group MLLW-08 is a unique waste for which no permitted treatment capability exists in the United States, or the capability exists but the capability is very limited. There is one container of MLLW-08 that is scheduled to be dispositioned by June 30, 2015.

3.2.4.7 Deactivation (MLLW-10)

Reactive metals containing radioactive contamination require deactivation as the specified treatment technology under RCRA. Waste within Treatability Group MLLW-10 has water reactive materials, including sodium metal.

3.2.5 Disposal of MLLW

On the Hanford Site, MLLW is disposed at the MWTs and ERDF. The MWTs (LLBG 218-W-5, Trenches 31 and 34) are RCRA compliant, meet Subtitle C disposal requirements, and provide permanent disposal of low-level waste (LLW) and MLLW. They have a double-liner system with leachate collection. The combined capacity of the two MWTs is approximately 22,300 m^3 (787,517 ft^3). Approximately half of each disposal unit has been filled with waste.

ERDF is authorized to dispose of waste under CERCLA and meets substantive requirements for RCRA landfills (e.g., double liner, leachate collection). The landfill is used for disposal of environmental restoration waste being generated from cleanup activities. ERDF is designed to provide permanent disposal capacity to accommodate projected Hanford Site LLW and MLLW.

In 2007, an amendment to the ERDF ROD (EPA et al., 2007, *Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility*) was approved, authorizing treatment and/or disposal at ERDF of specific Hanford Site-only waste that is not covered in other existing Hanford Site CERCLA authorizations or RODs. Examples of Hanford Site-only waste include waste from surveillance and maintenance at Hanford Site facilities, environmental research and development activities, sample analyses, liquid effluent waste treatment, and environmental monitoring programs.

4 Certification and Shipment of TRUM Waste

This section presents DOE's plan to complete certification and shipment of TRUM waste by continuing to utilize existing capabilities and, where necessary, acquiring new capabilities to prepare and manage the remaining containers of CH-TRUM and RH-TRUM wastes for offsite disposal.

The key elements of DOE's plan to complete this scope are as follows:

- Utilize WRAP to support certification of TRUM waste and loading CH-TRUM waste for shipment to WIPP.
- Utilize CCP (Section 4.2.1) to certify and ship TRUM waste to WIPP (or AMWTP) until all TRUM waste has been shipped offsite.
- CCP will provide the capability to load and ship RH-TRUM waste to WIPP.

Figure 4-1 illustrates the simplified flow path of TRUM waste as it progresses through the CCP waste characterization, certification and shipment process.

4.1 Status and Annual Volume Projections for Certification and Shipment of TRUM Waste

During calendar year (CY) 2014, six large containers of CH-TRUM, totaling 214 m^3 (7,557 ft^3), were sent to Perma-Fix Northwest for repackaging. The T Plant and WRAP have been placed in a standby condition. During CY 2014, no shipment of TRUM waste to WIPP was performed.

4.2 Certification and Shipment of TRUM Waste to WIPP

WIPP has been unable to receive TRUM waste since the radiological incident that occurred on February 14, 2014. At this time (2015), it is too soon to speculate on when receipt operations will recommence, but it is known that the National TRU Program has prioritized removal of waste from a number other sites within the DOE Complex ahead of the Hanford Site.

Certification of TRUM waste will continue to be done by CCP, although details for redeployment of certification/shipping capability at the Hanford Site have not been established. As of 2015, this is anticipated to be in FY 2024.

Figure 4-2 presents a summary of the volume of M-091 TRUM waste projected to be shipped to WIPP. The bars represent the CH-TRUM and RH-TRUM waste projected to be shipped to WIPP during a fiscal year, and the line represents the remaining inventory to be shipped to WIPP at the end of a fiscal year. Shipments of TRUM waste to WIPP or AMWTP are expected to be completed by the end of CY 2030.

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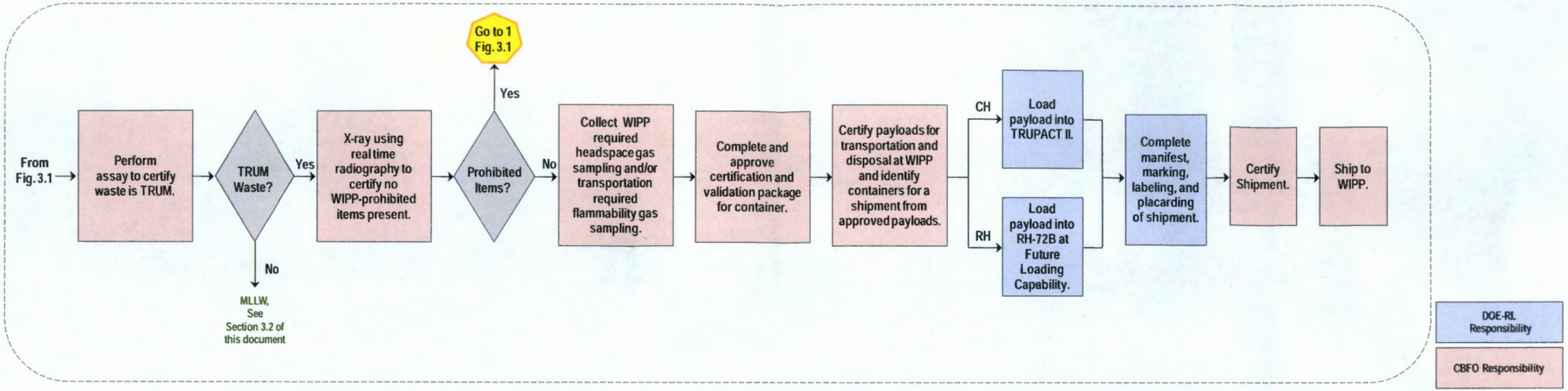

Figure 4-1. CPP Certification and Shipment of TRUM Waste Containers to WIPP

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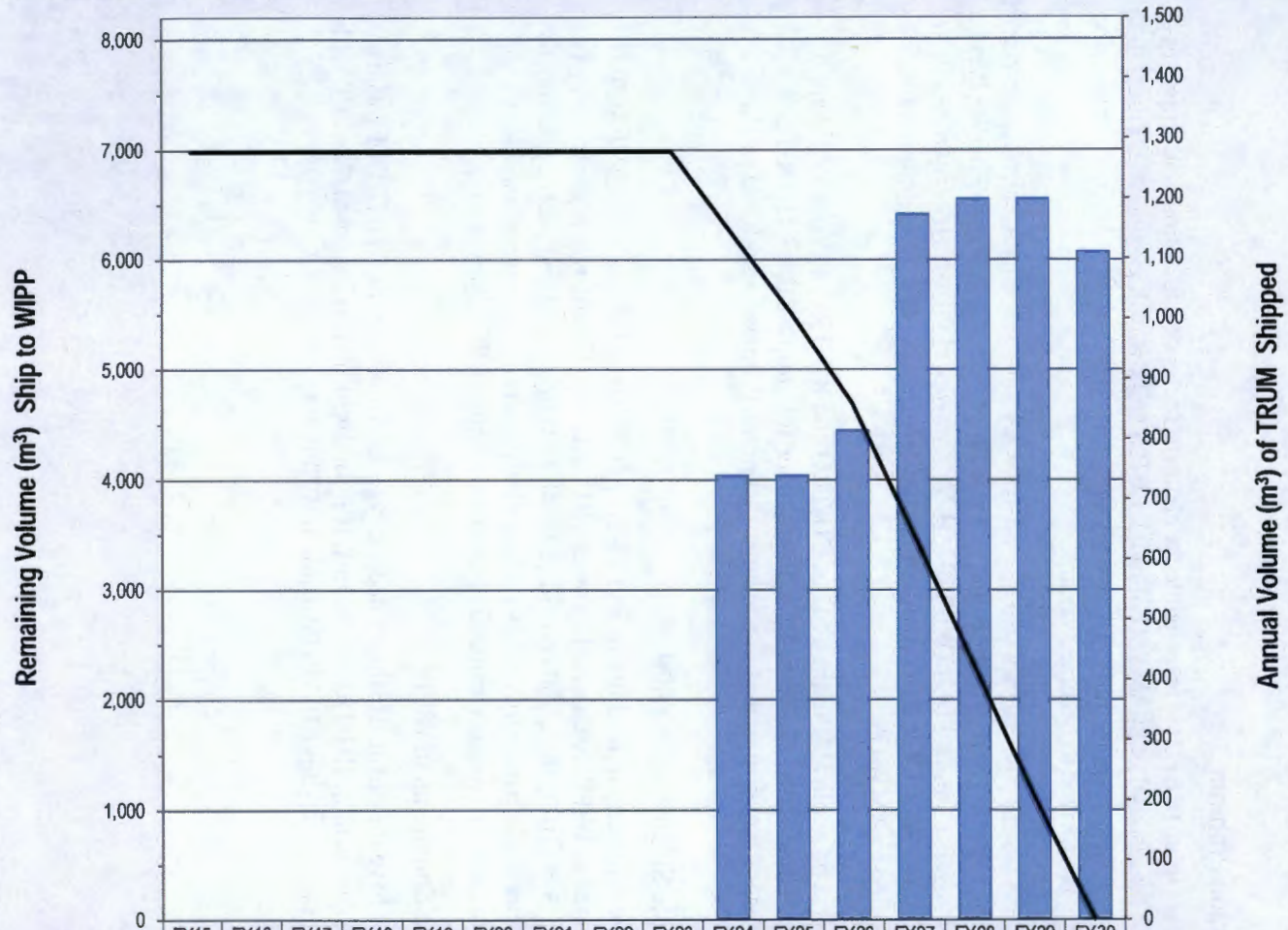

	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Annual Volume of M-091 CH&RH TRUM to be shipped										740	740	815	1,175	1,200	1,200	1,112
Remaining Volume to be Shipped	6982	6982	6982	6982	6982	6982	6982	6982	6982	6242	5502	4687	3512	2312	1112	0

* See Appendix D, Table D-3, for the data source, analytical basis, and underlying assumptions used in the development of this chart.

Figure 4-2. Projection of CH-TRUM and RH-TRUM Waste Shipments to WIPP

The following subsections describe the certification program for shipment of TRUM waste to WIPP for disposal.

4.2.1 CCP Certification Program

The DOE Carlsbad Field Office (CBFO) is responsible for characterization, certification, and shipment of the TRU waste to WIPP for disposal or to AMWTP through CCP. The flow path presented in Figure 4-1 shows the activities under CCP's responsibility. These activities at the Hanford Site have been suspended until 2024, when funding is expected to become available.

To support DOE in the packaging and disposal of TRU wastes, CCP provides characterization services in accordance with NM4890139088-TSDF, *Waste Isolation Pilot Plant Hazardous Waste Facility Permit, Attachment C, Waste Analysis Plan*, and DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*. CCP also provides intersite certification and transportation for containers to be transported to AMWTP.

The waste acceptance criteria applicable to the TSD of CH-TRU and RH-TRU waste at WIPP are defined in DOE/WIPP-02-3122. These criteria serve as DOE instructions for ensuring that CH-TRU and RH-TRU waste are managed and disposed of in a manner that protects human health and safety and the environment.

4.2.2 CH-TRUM Waste Shipments to WIPP

At WRAP, DOE has the capability to load drums and SWBs of CH-TRUM waste into TRUPACT-II containers that are shipped to WIPP. Each stainless steel TRUPACT-II (Figure 4-3) is approximately 2.4 m (8 ft) in diameter, 3 m (10 ft) high, and constructed with leak-tight inner and outer containment vessels. TRUPACT-II can hold up to fourteen 208 L (55 gal) waste drums or two SWBs. The TRUPACT-II containers are typically shipped three at a time to WIPP (Figure 4-4).

4.2.3 RH-TRU Waste Shipments to WIPP

DOE currently does not have the onsite capability necessary to load and ship the RH-TRUM waste to WIPP. To facilitate the shipment of RH-TRU waste to WIPP for disposal, it is expected that CCP will provide the capability to load and ship RH-TRUM waste to WIPP.

Figure 4-3. Loading a TRUPACT-II with TRUM Waste Drums at WRAP

Figure 4-4. TRUPACT-II Shipment of TRUM Waste to WIPP

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5 Provide Necessary Capabilities

The M-091 Milestone series address the retrieval, treatment/processing, shipment, and disposal of legacy MLLW and TRUM wastes. These milestones recognize the fact that the necessary capabilities to complete the milestones are currently not available.

The status of progress on the M-091 Milestones along with a summary of the needed capabilities is as follows:

- **Retrieval** – The LLBGs originally contained approximately 15,200 m^3 (536,783 ft^3) of RSW, of which an estimated 2,823 m3 (99,693 ft^3) remain. The remaining RSW is in located in three burial grounds (218-W-3B, 218-W-4A, and 218-E-12B). The remaining RSW is in both large and small containers and is a mixture of CH and RH waste. The retrieval of the remaining RSW will require the restart of existing capabilities, and possibly development of new technologies to complete trench retrieval, and the implementation on new capabilities for the retrieval from alpha caissons.

- **Treatment and Processing** – An estimated 8,036 m^3 (283,789 ft^3) of TRUM waste and MLLW still requires treatment and processing. This waste includes the waste in aboveground storage and the RSW that has yet to be retrieved. A commercial vendor has played and will continue to play a significant role in the treatment and processing of the waste. However, a significant portion of the waste that remains to be treated exceeds the vendor's current acceptance criteria. A new capability is required to treat an estimated 2,300 m^3 (81,224 ft^3) of waste that cannot be treated by commercial vendors.

- **Ship TRUM Waste** – An estimated 6,982 m^3 (246,567 ft^3) of TRUM waste remains to be shipped to WIPP. This includes both CH and RH wastes. Capabilities are needed load this waste into transport vehicles. CCP, which is managed by another DOE Prime Contractor, is responsible for the capabilities necessary to characterize and certify and ship TRUM waste to WIPP.

- **Disposal** – The disposal of the MLLW will occur at ERDF or the MWTs. The disposal of the TRUM waste will occur at WIPP. No additional disposal capabilities are necessary.

The M-091 Milestones contain a logical sequence to identify and provide the necessary capabilities to complete retrieval, treatment/processing, and shipment of the waste. Figure 5-1 provides an illustration of this sequence and includes the following major tasks:

- Engineering study/alternatives analysis
- Provide necessary treatment/processing capability
- Provide necessary retrieval capabilities

5.1 Engineering Study/Alternatives Analysis

The first step in the sequence to provide the needed capabilities to complete the M-091 Milestones is the preparation of an engineering study/alternatives analysis. As shown in Figure 5-1, the engineering study/alternatives analysis is scheduled to begin in FY 2016 and complete in FY 2019.

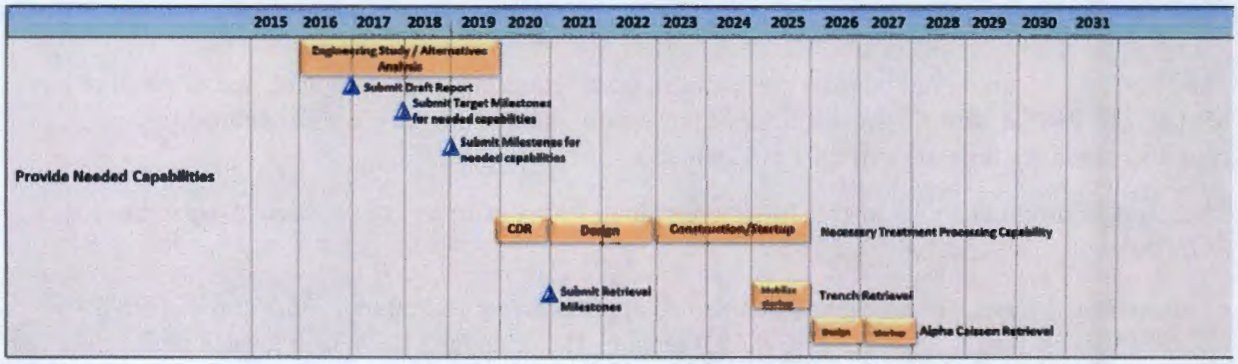

Figure 5-1. Alternate Capabilities Schedule

The following milestones will demonstrate progress on completion of the engineering study/alternatives analysis:

- **Submit Draft Report** – By the end of FY 2016, a report will be prepared that identifies the alternatives DOE will evaluate to provide the needed capabilities to complete the M-091 Milestones. This report will contain a description of the waste that requires retrieval, treatment/processing, characterization, and shipment to WIPP or to MLLW disposal. The description of the waste will include container type, size, dose rate, and location.

  The description of the waste along with disposal criteria will be used to identify the functions necessary to complete the M-091 Milestones. Example of necessary functions are nondestructive examination and nondestructive assay capabilities, which are crucial for the characterization of the waste for treatment/processing and disposal.

- **Propose Target Milestones** – Target milestones to provide the needed capabilities will be submitted at the end of FY 2017.

  The target milestones will consider the technical viability of each alternative along with its cost and schedule. The target milestones will consider DOE funding limitations, DOE safety requirements, and the necessary environmental permitting process.

  The characteristics of a limited number of containers will significantly affect the cost and schedule for the needed capabilities. For example, providing the capability for the largest or heaviest container will have a significant impact upon the cost. The engineering study will evaluate individual or groups of containers to identify treatment approaches that will minimize the cost and/or schedule impact of the alternatives.

- **Submit Alternate Capability Milestones** – Milestones to provide the needed capabilities will be submitted for the preferred alternative at the end of FY 2018.

  The milestones will support DOE's preferred alternative to provide the necessary capabilities to complete the M-091 Milestones. Necessary engineering work will continue into FY 2019 to implement the preferred alternative. This will include the preparation and issuance of a contract for the conceptual and final design of the necessary capabilities.

5.2 Provide Necessary Treatment/Processing Capability

The engineering study/alternatives analysis described in the previous section will select a preferred alternative to provide the needed capabilities to complete the M-091 Milestones. The needed capability

will be a major asset to DOE and will follow the requirements of DOE O 413.3b, *Program and Project Management for the Acquisition of Capital Assets*. Figure 5-1 provides an illustration of this process. This includes the preparation of a conceptual design and final design, followed by construction and startup. The figure shows a 6-year duration for the acquisition of a major asset. The duration for a project to provide the necessary capabilities will be developed during the engineering study/alternatives analysis. The durations shown in Figure 5-1 are considered very aggressive (short duration) but are necessary to complete the M-091 Milestones by December 2030.

5.3 Provide Necessary Retrieval Capabilities

The engineering study/alternatives analysis described earlier in this chapter will identify and evaluate alternatives for completing retrieval of the remaining RSW that cannot be retrieved using current (as of 2015) approaches. DOE will submit retrieval milestones at the end of FY 2020. These milestones will be based on the results of the engineering study/alternatives analysis and on the status of the project(s) to provide the necessary treatment-processing capability.

Figure 5-1 illustrates the schedule for providing the needed capabilities to complete the retrieval of the RSW. Key elements of DOE's current (2015) approach to completing the retrieval of the RSW are as follows:

- Use existing methods to retrieve the CH-RSW drums from the trenches. Existing methods include the Trench Face Retrieval and Characterization System described in Section 2.2.1.
- Use existing methods to retrieve the remaining large-container CH-RSW from the trenches.
- Identify and implement the needed capability to retrieve the alpha caissons. DOE will consider the lessons learned from the ongoing efforts to retrieve wastes from the 618-10 Burial Grounds, which have similar challenges.

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6 Storage Capacity

CWC, T Plant, WRAP, and LLBGs provide storage of containers managed under the M-091 Milestone series. Table 6-1 lists the permitted storage capacities as stated in the approved Part A permit. The design storage capacities are much larger. The maximum volume of waste that would require storage at one time is projected to be 14,000 m^3 (494,000 ft^3) with potentially an additional 3,000 m^3 (106,000 ft^3) from CERCLA cleanup activities (see Chapter 7). With a permitted storage capacity of 33,729 m^3 (1,191,128 ft^3), the need for additional storage capacity is not expected. As the out-year schedule for the management of waste containers is refined, the impact on storage capacity will be reevaluated.

Table 6-1. Facility Permitted Storage Capacity

Facility	OU	Permitted Capacity (m^3[ft^3])*
CWC	WA 89000 8967, Part III, OU 6, Revision 8, October 1, 2008	20,796 (734,404)
T Plant	WA 89000 8967, Part III, OU 9, Revision 12, October 1, 2008	946 (33,408)
WRAP	WA 89000 8967, Part III, OU 7, Revision 6, October 1, 2008	1,987 (70,170)
LLBG	WA 89000 8967, Part III, OU 17, Revision 14, October 1, 2008	10,000 (353,147)
		Total 33,729 (1,191,128)

*The permitted storage capacity is based on the latest Ecology-approved Part A capacity for the OU. It is recognized that DOE and regulator agreements may change this in the future.

CWC = Central Waste Complex
DOE = U.S. Department of Energy
Ecology = Washington State Department of Ecology
LLBG = low-level burial ground
OU = operable unit
WRAP = Waste Receiving and Processing Facility

The following assumptions were used to determine the adequacy of the current storage capacity:

- TRUM waste will remain in aboveground storage (as of June 30, 2009) until the waste is treated/processed and shipped to WIPP.
- RSW will be designated and stored at CWC awaiting treatment/processing.
- After treatment/processing, TRUM waste will be stored at CWC and WRAP awaiting final characterization, certification, and shipment to WIPP.

6.1 CWC Storage

CWC, located in the 200 West Area, provides storage for mixed waste. The following waste management activities are associated with storage:

- Loading and unloading of containers for shipments
- Transferring containers from one building or storage area to another area
- Relocating a container from storage for treatment
- Performing required facility, equipment, and container inspections

The storage areas provide space for various sizes of waste containers. Storage structures with physical features that provide for segregated storage areas are operated to maintain appropriate separation between containers of incompatible waste (incompatibility is defined in WAC 173-303-040).

Secondary containment has been incorporated into the design of the Flammable and Alkali Waste Storage Modules, the 2401-W Building, the 2404-WA Building, and the 2402-Series and 2403-Series Buildings. Any waste containers that are to be stored outside of the storage buildings and modules requiring secondary containment will be stored over spill containment pallets or equivalent devices meeting the requirements of WAC 173-303-630(7), "Use and Management of Containers." Liquid incompatible wastes will be segregated within these outside storage areas by separating the containers of incompatible waste on portable spill containment pallets or equivalent devices meeting the requirements of WAC 173-303-630(9).

6.2 T Plant Storage

T Plant storage structures and areas use a variety of engineered and administrative controls to provide segregation of and maintain appropriate separation between incompatible wastes. Storage of dangerous and/or mixed waste in various-sized containers could take place in the 221-T Canyon, 221-T Railroad Tunnel, 2706-T, 214-T Storage Building, other support structures and storage areas, or outdoor storage areas located within the boundaries of T Plant.

The storage and storage/treatment areas provide space for the management and storage of various sizes of waste containers. Storage structures with physical features that provide for segregated storage areas are operated and maintain appropriate separation between containers of incompatible waste (incompatibility is defined in WAC 173-303-040). Liquid incompatible wastes will be segregated within outside storage areas by separating the containers of incompatible waste on portable spill containment pallets or equivalent devices meeting the requirements of WAC 173-303-630(7)(9). The management of the containers is consistent with and performed in accordance with T Plant procedures and controls.

6.3 WRAP Storage

The 2336W Building is the main WRAP building and is divided into administrative, shipping and receiving, waste characterization, and processing areas. Storage of mixed waste occurs in the shipping and receiving area, characterization area, Room 152 of the administrative area, and the process area. Two large container storage buildings are part of WRAP (2404-WB, 2404-WC). The storage capacity at WRAP also includes outdoor storage that is intended to facilitate the WRAP waste management activities such as the loading and unloading of containers for shipment, transferring containers from one building to another area or TSD unit, or relocating a container for storage awaiting treatment or characterization.

These storage/treatment areas provide space for the management and storage of various sizes of waste containers. Storage structures and areas are operated to maintain appropriate separation between containers of incompatible waste (incompatibility is defined in WAC 173-303-040). Waste containers holding a dangerous waste that is incompatible with any waste or other materials stored nearby will be separated from the other materials or protected from them by means of portable spill containment pallets or equivalent devices meeting the requirements of WAC 173-303-630(7)(9).

6.4 LLBG Storage

The current MWTs (218-W-5 LLBG, Trenches 31 and 34) Part A (dated October 1, 2008) provides storage for various-sized containers of mixed waste.

7 TRU and TRUM Waste Generated from CERCLA Cleanup Actions

A goal of the Tri-Parties is to integrate the Hanford Site cleanup activities to the extent possible to enable efficient, effective management of waste. The Tri-Parties have agreed to integrate the plan for managing TRU and TRUM waste under the CERCLA cleanup actions, with the plan to manage similar waste forms under the M-091 Milestone work scope. As a result, this M-091 PMP addresses the acquisition of capabilities necessary to prepare TRU and TRUM waste within the scope of the M-016 Milestone series for disposal at WIPP. This PMP reflects retrieval decisions, projected waste volumes, and schedules for CERCLA cleanup actions authorized in RODs and action memoranda at the Hanford Site. The remedial actions for all non-tank farm and non-canyon OUs are to be completed by September 30, 2024, per Milestone M-016-00.

At this time (2015), it is expected that other TRU waste generated during Hanford Site cleanup activities (e.g., 618-10/11, PFP) will be compliantly packaged at the point of generation. If, at the time of conceptual design, this is not the case (e.g., K-Basin sludge), the scope of the new capability or the time to use the new capability may be expanded to accommodate the repackaging of other TRU waste beyond M-091 scope. Similarly, conceptual design of the alpha caisson processing capability will explore treatment of non-caisson RH-TRUM waste and incorporate the necessary accommodations if this is deemed appropriate.

Schedules for CERCLA cleanup actions are established through the following CERCLA decision documentation:

1. **Prepare Remedial Investigation and Feasibility Study.** The remedial investigation (RI) presents data collected during the investigation and other characterization activities (analogous to the RCRA facility investigation). The feasibility study (FS) develops and evaluates alternatives for remediation comparable to the RCRA corrective measures study.
2. **Prepare Proposed Plan.** This plan is based on the detailed information contained in the RI/FS reports.
3. **Receive Public Input.** The Tri-Parties will solicit input from the Tribal Nations and the public regarding the preferred remedial alternatives, which are described in the proposed plan.
4. **Select Preferred Alternative.** Comments received from the Tribal Nations and the public regarding the preferred alternatives will assist the Tri-Parties in selecting a final decision on the preferred alternatives that will be taken to clean up the contamination associated with the OUs described in the proposed plan.
5. **Prepare ROD.** After the Tri-Parties consider the comments received, a ROD will be issued identifying the final cleanup remedies selected for implementation, including a summary of the responses to comments.
6. **Post-ROD Activities.** The selected remedial alternative is implemented after the final ROD is approved. This stage may involve remedial design and design verification studies, construction, remediation process optimization, and operation and maintenance of the implemented processes (comparable to the RCRA corrective measure implementation stage).

The OUs and facilities that may generate TRU waste are at different stages in the CERCLA decision process.

Table 7-1 summarizes the OUs and/or facilities that will or will not be addressed in this PMP. Those to be included have the potential to generate waste with TRU constituents greater than 100 nCi/g during

CERCLA cleanup actions and are within the scope of the M-016, M-083, and M-085 Milestone series. The groundwater OUs and the tank farm WMAs are not addressed in this PMP.

Table 7-1. Summary of OUs and Facilities

OU or Facility	Comment
300-FF-2, PFP, 221-U Facility, 100 K Basins, 209E, 200-PW-1, and 200-PW-6	• Potential waste with TRU constituents greater than 100 nCi/g is generated during cleanup/closure actions at these OUs and facilities. • Approved CERCLA cleanup actions under RODs or action memoranda. • Addressed in this PMP (see Sections 7.1 and 7.2).
200-BC-1, 200-SW-2, 200-WA-1, 200-DV-1, 200-IS-1, 200-EA-1, 200-CP-1 (including the PUREX Tunnels 1 and 2), 224B, and 200-CR-1	• Potential waste with TRU constituents greater than 100 nCi/g is generated during cleanup/closure actions at these OUs and facilities. • Future CERCLA cleanup actions. • Only summary presented in this PMP (see Sections 7.3 and 7.4, and Appendix E).
100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-NR-1, 100-IU-2, 100-IU-6, 100-KR-1, 100-KR-2, 100-HR-1, 100-HR-2, 200-CW-1, 200-CW-3, 200-CW-5, 200-PW-3, and 200-CB-1	• No waste with TRU constituents greater than 100 nCi/g is expected to be generated during CERCLA cleanup actions at these OUs. • Not addressed in this PMP.
200-BP-5, 200-PO-1, 100-NR-2, 100-FR-3, 100-KR-4, 100-HR-3, and 100-FF-5, 200-UP-1, and 200-ZP-1	• No waste with TRU constituents greater than 100 nCi/g is expected to be generated during CERCLA cleanup actions at these groundwater OUs. • Not addressed in this PMP.
WMA Series	• Tank farm WMAs are covered under the M-045 Milestone series. • Not addressed in this PMP.

CERCLA= *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
OU = operable unit
PMP = project management plan
PUREX = Plutonium Uranium Extraction Plant
ROD = record of decision
TRU = transuranic
WMA = waste management area

7.1 Status of Approved CERCLA Cleanup Actions Generating TRU and TRUM Waste

DOE is currently implementing several major CERCLA cleanup actions on the Hanford Site in accordance with approved RODs and action memoranda that have or are projected to generate TRU or TRUM waste. Table 7-2 presents the forecast volumes of these cleanup actions that were provided from the projects in HNF-EP-0918, *Solid Waste Integrated Forecast Technical (SWIFT) Report FY2015 - FY2050, 2015.0*, and represents a forecast subject to time changes. The following subsections discuss these cleanup actions.

7.1.1 Plutonium Finishing Plant

The PFP represented the end of the process associated with plutonium production at the Hanford Site. The PFP is a complex consisting of multiple buildings. Ultimately, DOE will decontaminate and demolish all of these structures as Hanford Site cleanup continues. The long-term goal for PFP is to bring it down to slab-on-grade, which means that the buildings are all to be decontaminated and demolished, debris will removed, and only concrete floors of the various structures will be left. DOE is performing the PFP decontamination and decommissioning in accordance with DOE/RL-2005-13, *Action Memorandum for the Plutonium Finishing Plant Above-Grade Structures Non-Time Critical Removal Action.*

Table 7-2. TRU and TRUM Waste Forecast from CERCLA Cleanup Actions

	FY 2014		FY 2015		FY 2016		FY 2017		FY 2018		FY 2019		Total	
Generator	CH	RH	CH	RH	CH	RH	CH	RH	CH	RH	CH	RH	CH	RH
PFP[a]	282		361	197	1,394		170						2,207	197
100 K[a]				51									0	51
618-10/11[a]	11		8			104		193		193		193	19	683
200-PW-1, 200-PW-6 OUs													2,340[b]	

a. Projected volumes, in m^3, from SWITS.

b. Preliminary volume, in m^3, based on DOE/RL-2009-117, *Proposed Plan for the Remediation of the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*, and EPA et al., 2011, *Record of Decision Hanford 200 Area Superfund Site 200-CW-5 and 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units.*

CH = contact-handled
FY = fiscal year
OU = operable unit
PFP = Plutonium Finishing Plant
RH = remote-handled
ROD = record of decision
SWITS = Solid Waste Information and Tracking System

Removal of plutonium-contaminated process equipment continued as a top priority in readying the PFP Complex for demolition, with a particular focus on removal of glove boxes and associated piping and ductwork. TRU waste continues to be transferred from PFP to WRAP/CWC for future certification and shipment to WIPP. DOE is utilizing existing capabilities to disposition the TRU waste generated during the slab-on-grade activities. DOE continues with the use of standard large box-2 (SLB-2) containers; these reduce the amount of in situ size reduction of large items such as glove boxes, piping, and ductwork to be able to be placed directly into a WIPP-compliant container. It is expected that the remaining waste will be packaged in WIPP-certifiable containers at the point of generation, and no new capabilities will be required.

7.1.2 100 K Basin

According to the 100-K ROD Amendment (EPA, 2005, *Amendment to the Interim Remedial Action Record of Decision for the 100 K Area K Basins*), the sludge will be treated, packaged for disposal, interim stored pending shipment, and shipped to a national repository for disposal. Sludge from the 105-KW Basin originated primarily from the 105-KE Basin floor and pits, fuel canisters, and fuel washing. DOE plans to package the sludge into transport casks, transfer them to T Plant, and place them into interim storage until

a new treatment and packaging facility is available. K Basin remediation is being performed in accordance with EPA, 2005.

DOE has completed the technology evaluation report and has selected warm water oxidation as the technical baseline for sludge treatment with size reduction and Fenton's Reagent processes as potential enhancements. When funding allows, DOE will pursue a treatment and packaging siting study. One of the first activities will be establishment of the siting criteria to be utilized for the overall siting study. The technical approach being taken by the project (e.g., the scope of the siting study), and the decision process being used, will be reviewed. The design of the treatment and packaging system is not mature enough to determine whether the solidification and packaging system could be used for packaging of other RH-TRU/TRUM sludge (e.g., U Plant Tank D-10 contents).

During K Basin cleanup, an estimated 10 m^3 (353 ft^3) filter media (sand, garnet) with TRU constituents greater than 100 nCi/g may also be generated.

7.1.3 209E Critical Mass Laboratory

DOE used the 209E Critical Mass Laboratory from 1961 through 1983. The radioactive nature of the work that was done in this building has resulted in some parts of the building becoming contaminated. It was designed to provide a heavily shielded reactor room where quantities of plutonium and uranium in solution could be brought to near critical configurations under carefully controlled and monitored conditions. DOE completed the CERCLA cleanup actions at the 209E Building in accordance with DOE/RL-2010-102, *Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Area Tier 2 Buildings/Structures*, and DOE/RL-2011-10, *Removal Action Work Plan for the 209E Critical Mass Laboratory*.

The 209E Building has been demolished to slab-on-grade, and underground tanks/equipment containing TRU waste were excavated and removed. The TRU waste was sized reduced and packaged into WIPP-certifiable containers. The WIPP-compliant containers are being stored at CWC for the interim prior to shipment to WIPP.

7.1.4 U Plant

TRUM waste generated during the CERCLA cleanup actions at U Plant is a tank heel. During FY 2011, DOE removed Tank D-10, located in Cell 30 of the 221-U Facility, from the canyon and transferred it to CWC for interim storage until capability is available to repackage the waste in a WIPP-certifiable container, as described in DOE/RL-2010-106, *90% Design Remedial Design Report Addendum for the Disposition of Tank D-10 from Cell 30 within the 221-U Plant Canyon Facility*. The tank heel contains approximately 1,893 L (500 gal) of solid and liquid that has been designated as RH-TRUM waste. U Plant decontamination and decommissioning is being performed in accordance with Ecology et al., 2005, *Record of Decision 221-U Facility (Canyon Disposition Initiative) Hanford Site, Washington.*

DOE will disposition the Tank D-10 heel at the future large-package/RH capability. There is a possibility that the tank heel could be dispositioned at the same future facility used to disposition the K Basin sludge; however, design of this treatment and packaging system is not mature enough (as of 2015) to determine whether the solidification and packaging system could be used for packaging of other RH-TRUM sludge.

7.1.5 618-10 and 618-11 Burial Grounds (300-FF-2)

Two of the most challenging CERCLA cleanup actions at the Hanford Site will be the 618-10 and 618-11 Burial Grounds, which are part of the 300-FF-2 OU. Incomplete operational records and history associated with past waste disposal practices of the 300 Area waste streams complicate these actions. The burial grounds contain waste that was generated by the 300 Area of the Hanford Site which was used

for developing and manufacturing reactor fuel and conducting laboratory research during the Hanford Site's plutonium production mission.

TRU wastes were disposed in trenches, as well as vertical pipe units and caissons. The vertical pipe units were constructed by welding three to five bottomless drums together and were buried vertically about 3 m (10 ft) apart. The caissons were constructed of galvanized corrugated metal pipe (3 m [10 ft] high, 2.4 m [8 ft] diameter) and buried approximately 4.6 m (15 ft) underground. DOE is performing the 618-10 and 618-11 Burial Ground remediation in accordance with EPA/ROD/R10-01/119, *EPA Superfund Record of Decision: Hanford 300-Area, Benton County, Washington*.

DOE has begun remediation of the 618-10 and 618-11 Burial Grounds. Equipment at WRAP will be utilized for the characterization of the waste containers removed from the 618-10 Burial Ground. Initially, the WRAP high-energy x-ray equipment can be used to penetrate the approximately 100 concrete-lined drums being removed to determine whether liquids are present. Existing WRAP procedures will be used to manage the drums at WRAP compliantly. DOE has also begun conducting demonstrations of the vertical pipe unit remediation and is exploring options for removing the caissons, which will present more of a challenge. The TRU waste will be sent to CWC for interim storage prior to disposition at WIPP. The expectation is that the waste coming out of the caissons will be RH-TRU waste. DOE will continue to explore integration of TRU waste disposition activities.

DOE has a milestone to clean up both burial grounds by the end of FY 2018.

7.1.6 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 OUs

The ROD for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 OUs (EPA et al., 2011, *Record of Decision Hanford 200 Area Superfund Site 200-CW-5 and 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*) was signed by the Tri-Parties in October 2011. The selected remedy of these OUs addresses soils and subsurface disposal structures, two settling tanks, and associated pipelines contaminated primarily with plutonium and cesium. The amount of waste disposed of is a limiting factor because the plutonium waste generated at the 200-PW-1 and 200-PW-6 OU waste sites are expected to include TRU waste that will be disposed of at WIPP, which has limited capacity.

From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. Operations at the Hanford Site included nuclear fuel manufacturing, reactor operations, fuel reprocessing, chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Large volumes of liquid wastes were generated from the processing of plutonium at various facilities in the 200 Area. This process wastewater was discharged to waste sites in the 200-PW-1, 200-PW-3, and 200-PW-6 OUs. The processes were intended to recover as much plutonium as possible prior to discharge of the waste liquids, but the waste streams still contained low levels of plutonium and other contaminants. Cooling water and steam condensate were discharged to the 200-CW-5 OU waste sites. The cooling waste and steam condensate systems were designed to isolate those systems from potential contamination sources but, occasionally, became contaminated because of minor leaks due to corrosion pinholes or cracks and process upsets. The liquid waste that contained low levels of plutonium and other contaminants discharged to the waste sites in these OUs infiltrated into the ground and contaminated the underlying soil. Over time, this facilitated the accumulation of contaminants to form localized areas of concentrated contaminants.

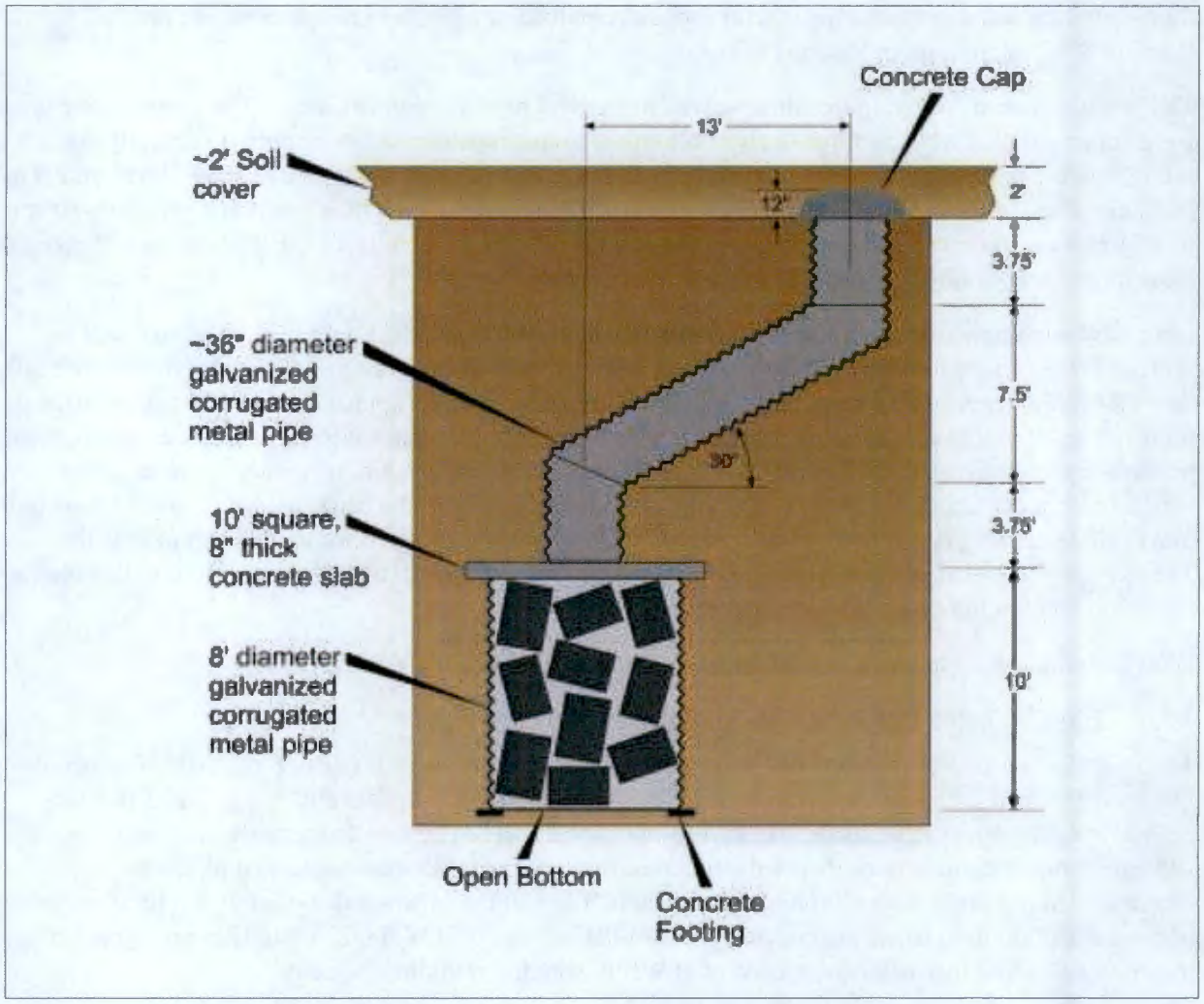


Figure 7-1. Schematic of a Caisson in the 618-11 Burial Grounds

Removal, treatment (as needed), and disposal (RTD) of soil and debris to the specified depths or specified cleanup levels will be used to address plutonium-contaminated soils and subsurface structures and debris. This consists of: (1) removing a portion of the contaminated soil, structures, and debris; (2) treating these removed wastes as required to meet disposal requirements at ERDF or waste acceptance criteria for offsite disposal at WIPP, and (3) disposal at ERDF or WIPP. The selected pipelines associated with these OUs will also be excavated and disposal at ERDF. Cleanup levels have been selected that are protective of groundwater and the current and reasonably expected future industrial land use.

- Three 200-PW-1 OU waste sites (216-Z-1A, 216-Z-9, and 216-Z-18), also known as the High-Salt Waste Group, will use the RTD approach to excavate contaminated soils and debris located to a minimum of 0.6 m (2 ft) below the bottom of the disposal structure, with disposal at ERDF or WIPP, as appropriate. After the excavations are filled, an evapotranspiration barrier will be constructed over the remaining waste in these waste sites.

- The 200-PW-6 OU and four 200-PW-1 OU waste sites (216-Z-5, 216-Z-1&2, 216-Z-3, and 216-Z-12), also known as the Low-Salt Waste Group, will use the RTD approach to excavate contaminated soils and debris to a depth of 6.7 to 10 m (22 to 33 ft) below ground surface, with

disposal at ERDF or WIPP, as appropriate. After excavations are filled, an evapotranspiration barrier will be constructed over the remaining waste in these waste sites.

Conceptually, the RTD approach consists of the following steps: (1) remove and stockpile clean overburden for use in backfilling; (2) remove contaminated soils and debris using conventional excavation technology, and place in waste containers; (3) dispose waste at ERDF or WIPP; (4) backfill excavation with clean fill and compact; and (5) construct an evapotranspiration barrier as necessary, and replant surface with native vegetation.

The 241-Z-361 Settling Tank is an underground, reinforced-concrete structure with a 0.95 cm (3/8 in.) steel liner. The tank has inside dimensions of 7.9 m (26 ft) long and 4 m (13 ft) wide. The bottom slopes, resulting in an internal height variation between 5.2 and 5.5 m (17 and 18 ft). The top of the tank is 0.6 m (2 ft) below grade. The tank served as the primary solids settling tank for low-salt liquid from PFP from 1949 to 1973, and then was taken out of service in May 1973, when discharge of contaminated waste streams to the ground from the PFP was discontinued as a matter of policy. All available information indicates that the settling has not leaked.

The 241-Z-8 Settling Tank is a cylindrical tank that is 12.1 m (40 ft) long and 2.4 m (8 ft) in diameter. It is constructed of steel or wrought iron plate and oriented horizontally at about 1.8 m (6 ft) below grade. The tank was in service from 1955 to 1962, receiving pH neutral effluent waste from back flushes of the PFP feed filters.

The sludge removal and tank stabilization of the two settling tanks require the following:

- Removal of sludge from the tanks to the extent necessary to facilitate removal of the tanks.
- Packaging of the sludge to meet waste disposal criteria for disposal at WIPP.
- Screening of waste in container to confirm it meets the requirements for disposal at WIPP. Waste in containers that does not meet WIPP disposal criteria will be treated if necessary and sent to ERDF for disposal.
- It is expected that the tanks will be removed, and the excavation areas will be sampled in accordance with the SAP, backfilled, and revegetated. The sludge and tank debris are expected to be TRU waste.

Associated pipelines covered under the 200-PW-1 and 200-PW-6 OUs are expected to be TRUM and will be shipped to WIPP for disposal. The pipelines are constructed of various materials, primarily stainless steel or vitrified clay.

An estimated 2,200 m^3 (77,692 ft^3) of TRU soil/rock/gravel waste is anticipated to be generated during the RTD of these OUs, and an estimated 140 m^3 (4,944 ft^3) of TRU sludge is anticipated to be generated from the two settling tanks. It is expected that any TRU waste generated during the remediation of the 200-CW-5, 200-PW-1, and 200-PW-6 OUs will be packaged in WIPP-certifiable containers at the point of generation, and no new capabilities will be required. Remedial actions for the 200-PW-1 and 200-PW-6 OUs are expected to be completed by September 30, 2024, under TPA (Ecology et al., 1989a) Milestone M-016-00.

7.2 CERCLA TRU and TRUM Shipments to WIPP

Figure 7-2 presents a summary of the volume of CERCLA TRU/TRUM waste projected to be shipped to WIPP. The projected annual shipping rate of the CERCLA waste is based on available inventory and annual shipping capacity (see Appendix D). The total volume is based on approximately 1,000 m^3 (35,315 ft^3) currently in aboveground storage, primarily from PFP and 300 Area cleanup activities, plus

the waste forecast given in Table 7-2. At this time (2015), no impacts to the M-091 work scope are anticipated as a result of certification and shipment of CERCLA TRU/TRUM waste to WIPP. Potential impacts are evaluated as waste volume projections are updated.

7.3 Status of Future CERCLA Cleanup Decisions with the Potential to Generate TRU and TRUM Waste

Table E-1 in Appendix E describes the OUs and facilities with the potential to generate waste with TRU constituents greater than 100 nCi/g during CERCLA cleanup actions. To date (as of 2015), no regulatory cleanup decisions have been made for these OUs. A range of plausible alternatives and reasonable upper-bound cleanup volumes has been estimated. Completion schedules will be established with the CERCLA remedial action work plans. Table E-1 in Appendix E gives the waste unit name, waste type, estimated volume, and schedule. The volume projections are based on currently available information and will be updated as the CERCLA process for a given OU progresses. The sources of the estimated volumes are referenced in the table.

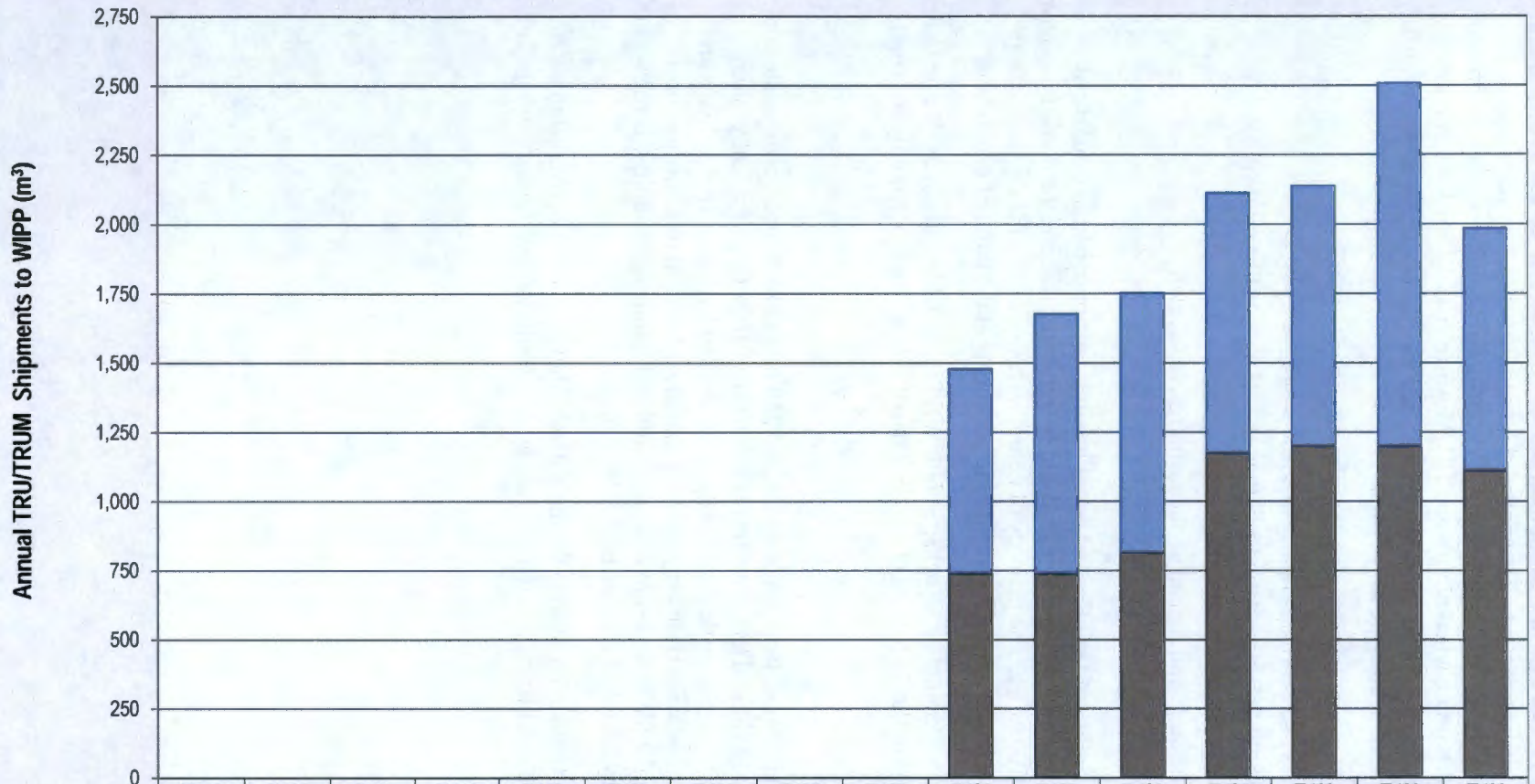
Although a significant volume of material with TRU constituents greater than 100 nCi/g has been identified, the majority of the CERCLA decisions have not been made regarding cleanup. This results in a significant level of uncertainty regarding the remedy selection and potential volumes and time of TRU waste generation.

7.4 Summary of Disposition Approaches per Waste Form

The form of waste with the potential for TRU constituents greater than 100 nCi/g generated during CERCLA cleanup actions fall into three general categories: (1) soil/gravel/rock, (2) debris, and (3) sludge. The following subsections outline the waste disposition approach of each of these categories.

7.4.1 Soil, Gravel, and Rock

During the CERCLA cleanup actions of contaminated cribs, trenches, and tile fields, an upper-bound estimate of 4,170 m^3 (147,262 ft^3) of soil/gravel/rock waste could be generated that has a potential to have TRU constituents greater than 100 nCi/g. This estimated volume is based on current available data and is dependent on the area and depth of soil excavated in accordance with the CERCLA RODs. It is expected that this waste would be packaged in WIPP-certifiable containers at the point of generation.



	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
M-091 Scope										740	940	940	940	940	1,310	875
CERCLA Scope										740	740	815	1,175	1,200	1,200	1,112

* See Appendix D, Table D-4, for the data source, analytical basis, and underlying assumption used in the development of this chart.

Figure 7-2. Projection of CH-TRU/TRUM and RH-TRU/TRUM Waste Shipments to WIPP under CERCLA Work Scope

Cleanup actions could include: (1) removal and stockpiling of clean overburden for use in backfilling once the contaminated area has been removed; (2) removal of contaminated soil/gravel/rock using conventional excavation technology and placement into WIPP-certifiable containers (SWB or drums); and (3) assay of containers to determine whether they are TRUM waste or LLW/MLLW. The TRUM waste containers will be certified by CCP and shipped to WIPP, and the LLW/MLLW containers will be shipped to ERDF. Specific cleanup actions are as follows:

1. Remove and stockpile clean overburden for use in backfilling.
2. Remove contaminated solids and debris, and place in waste containers.
3. Haul waste containers to assay/screening station and then to ERDF or WIPP for disposal.
4. Backfill excavation with clean fill, and compact.
5. Construct ET barrier as necessary, and replant surface with native vegetation.

7.4.2 Debris

During the CERCLA cleanup actions of facilities and burial grounds, an upper-bound estimate of 36,500 m^3 (1,288,985 ft^3) of contaminated debris waste could be generated that has the potential to have TRU constituents greater than 100 nCi/g. The majority of debris waste generated during the cleanup actions at facilities would be packaged into WIPP-certifiable containers at the point of generation.

There may be occasions that waste cannot be repackaged into WIPP-certifiable containers. Waste in this category could include a portion of the 34,510 m^3 (1,218,709 ft^3) of debris waste potentially removed from the 200-SW-2 Landfills.

7.4.3 Sludge

During the CERCLA cleanup actions of facilities, an estimated 280 m^3 (9,888 ft^3) of sludge waste could be generated that has a potential to have TRU constituents greater than 100 nCi/g. Typically, sludge removal from tanks would employ a power fluidics system to loosen and homogenize the sludge and transfer to WIPP certifiable drums or SWBs at the point of generation. Material (e.g., cement or absorbents) would be added to the SWB to absorb residual liquid and stabilize the sludge. These waste containers would be certified by CCP and shipped to WIPP.

The design of the treatment and packaging system for the K Basin sludge is not mature enough (as of 2015) to determine whether the solidification and packaging system could be used for packaging of other TRU sludge.

8 Project Control Elements

The following sections identify DOE's project control elements for the planning, managing, and reporting performance necessary to complete the M-091 Milestone work scope. These project control elements are consistent with DOE O 413.3B and related project management activities.

8.1 Funding Profile and Project Work Breakdown Structure

The funding profile to support activities necessary to complete the M-091 Milestone series is given in Figure 8-1. This funding profile is based on the FY 2014 through FY 2018 Plateau Remediation Contract baseline. Funding for FY 2019 through FY 2031 is based on the Hanford Lifecycle Scope, Schedule, and Cost Report, under M-036-01, which reflects all of those actions necessary for DOE to meet all applicable environmental obligations including those under the TPA (Ecology et al., 1989a). The funding profile does not include the funding necessary to support the CERCLA cleanup actions discussed in Chapter 7.

Work that is part of this PMP is broken down into discrete, defined units of scope. DOE uses this breakdown for planning, estimating, and scheduling performance measurement of work. This breakdown, known as the work breakdown structure (WBS), is developed to organize, define, and display work to be performed in completing a project. The specific element numbers and descriptions are as follows.

WBS 013.01 Project Management—This scope includes safety, health, and quality technical support, and oversight is performed to support implementation of key programs such as the Integrated Safety Management System, Corrective Action Management, Occurrence Reporting, and Quality Assurance Program. This scope also includes support management and staff to the overall project to provide waste support services to Hanford Site generators, human relations, buyer/procurement staff, and project controls (e.g., schedulers/cost analysts). Technical support includes environmental and nuclear/criticality safety engineering from centralized organizations to support development and implementation of regulatory permits, safety bases, procedure reviews, hazard analysis generation, and criticality safety evaluation report development.

Strategic planning and integration is another critical scope element that provides onsite interface between DOE contractors and subcontractors to ensure that mission needs are met. Also included in this scope is the maintenance of the transportation and packaging program, in accordance with applicable requirements for onsite and offsite shipments of regulated waste and materials and nonregulated materials.

WBS 013.04 MLLW Treatment—This scope provides for M-091-42 MLLW and M-091-43 MLLW treatment. Processing includes thermal and nonthermal treatment. Activities consist of managing offsite commercial MLLW treatment/disposal contracts, shipping MLLW packages that have been determined to be LDR compliant to the MWTs or ERDF for disposal, and treatment of selected waste containers.

WBS 013.05 TRU Retrieval—This scope provides for retrieval of suspect TRU waste from the LLBG (218-W-4C, 218-W-4B, 218-E-12B, and 218-W-3A). Included is redeployment of the trench face retrieval and characterization system, a new trench face processing system for the retrieval/processing CH-RSW, and the retrieval of the caisson RH-RSW. Retrieval consists of the following activities:

- Removing soil over RSW containers within the trenches
- Removing the RSW containers from the trenches
- Assaying all containers and venting the containers as required
- Designating waste

WBS - Scope	Lifecycle Cost	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
013.01 - Project Management - PBS RL-13	237,482	13,192	13,060	14,673	16,244	17,360	16,457	16,917	17,269	17,710	18,090	18,602	19,039	11,850	5,161	5,300	5,383	5,527	5,647
013.04 - Mixed Low Level Waste Treatment	21,151	0	0	0	0	0	0	1,535	7,890	8284	339	350	358	388	388	411	397	401	410
013.05 - TRU Retrieval	150,451	0	0	0	0	0	17,061	39,050	45,079	29,528	17,413	2,320	0	0	0	0	0	0	0
013.06 - TRU Repackaging	302,073	2,667	0	1,513	13,484	6,224	68,751	39,968	39,044	11,828	12,419	13,040	13,692	14,377	15,096	15,851	16,643	17,475	0
013.07 - Waste Receiving and Processing Facility (WRAP)	56,578	2,611	2,951	3,126	3,571	3,279	9,523	9,956	12,066	9,494	0	0	0	0	0	0	0	0	0
013.08 - T-Plant	657,166	8,386	13,340	16,700	14,393	15,006	19,177	13,348	13,617	14,040	14,371	56,727	67,056	61,764	62,666	64,501	65,575	67,341	69,158
013.09 - Central Waste Complex	124,330	8,574	7,493	7,895	8,818	9,231	7,781	8,005	8,410	8,398	8,632	8,851	4,533	4,888	4,732	4,874	4,909	5,043	3,263
013.10 - Environmental Restoration Disposal Facility (ERDF)	30,391	0	0	0	0	0	2,596	2,660	11,629	2,263	1,263	1,289	1,322	1,349	1,378	1,407	3,020	106	109
013.12 - Integrated Disposal Facility	79,078	332	341	360	397	413	2,534	2,471	2,531	2,581	2,644	4,777	14,500	25,397	7,488	3,030	3,039	3,058	3,186
013.15 - TRU Disposition	348,182	0	0	0	0	0	31,437	25,469	25,558	24,600	24,474	25,137	25,715	26,307	26,912	27,530	28,052	28,811	28,180
013.21 - Mixed Waste Trenches (MWTs)	17,754	575	591	621	685	710	3,692	1,928	630	662	695	729	766	804	844	886	931	977	1,026
TOTAL	2,024,636	36,338	37,776	44,888	57,594	52,224	179,009	161,307	183,722	129,388	100,340	131,823	146,981	147,124	124,665	123,790	127,949	128,740	110,979

dollars in $000s
* See Appendix D, Table D-5, for the basis of this figure.

Figure 8-1. RL-0013 Annual Funding Profile

- Shipping the containers to the appropriate TSD facility
- Sampling of the LLBG trenches

WBS 013.06 TRU Repackaging—This scope provides repackaging of TRU/TRUM waste at WRAP, T Plant, local commercial facility (i.e., Perma-Fix Northwest) and, if necessary, new onsite capability for large-container CH-TRU/M waste and RH-TRU/TRUM waste such that it can be certified to meet the WIPP waste acceptance criteria.

WBS 013.07 WRAP—This scope provides activities for the safe operation of WRAP and maintaining WRAP in a minimum safe condition.

WBS 013.08 T Plant—This scope provides activities for the safe operation of T Plant and maintaining the T Plant in a minimum safe condition. This WBS also includes modifications to T Plant necessary to receive and store the K Basin sludge.

WBS 013.09 CWC/LLBGs—This scope provides for the safe operation of CWC and maintaining CWC in a ready-to-serve condition and the safe operation of LLBGs.

The LLBGs contain two lined MWTs (218-W-5 LLBG, Trenches 31 and 34) that are within the boundaries of the LLBGs. Operations and maintenance of these trenches is included in WBS 013.21.

WBS 013.10 ERDF—This scope provides activities to support ERDF expansion, construction of interim covers, and long-term stewardship (leachate management and monitoring).

WBS 013.12 IDF—This scope provides for a minimum level of required maintenance of the facility prior to initiation of operations and operational startup activities.

WBS 013.15 TRU Disposition—This scope includes support to CCP certification activities and shipment of TRU waste to WIPP and AMWTP. It is expected that CCP will be providing the capability to load/ship RH-TRUM waste to WIPP.

WBS 013.21 Mixed Waste Trenches—This scope provides activities for the safe operation of the MWTs and maintaining the MWTs in a ready-to-serve condition.

8.2 Project Schedule and Critical Path Analysis

Appendix F presents the M-091 Milestone series logic-tied lifecycle schedule. The following tasks are included on the schedule:

- Acquisition of new capabilities to retrieve the alpha caisson RH-RSW, treat/process the remaining waste, and load RH casks for shipment to WIPP. Within DOE, projects typically progress first by performing an alternative study that evaluates and selects a preferred alternative; second, a conceptual design phase, which is an iterative process to define, analyze, and refine project concepts and alternatives; third, a definitive design phase where the design of the project is finalized; fourth, the construction phase; and fifth, the startup phase.
- Annual preparation of the PMP (Milestone M-091-03).
- Retrieval of CH-RSW and RH-RSW (Milestones M-091-40 and M-091-41). Retrieval operations will generate CH and RH wastes in a variety of packages, which feed into the treatment and processing of MLLW and TRUM waste. Delay in retrieval of RSW will cause a delay in subsequent milestones.
- The treatment/processing of CH-MLLW and RH-MLLW (Milestones M-091-42 and M-091-43). Waste for treatment and processing is from the RSW retrieval operations and waste in storage.

- The processing and shipment of CH-TRUM and RH-TRUM waste (Milestones M-091-44 and M-091-46). Waste for processing is from the RSW retrieval operations and waste in storage.

8.3 Project Constraints

The following subsections identify constraints and uncertainties associated with the ability to accomplish the M-091 Milestone work scope.

8.3.1 Budget

The schedule of activities presented in this PMP is based on the assumption that funding levels are available as given in Figure 8-1. However, there is a high degree of uncertainty in this funding profile. Given preliminary budget levels and site priorities, work will be curtailed that supports the M-091 Milestone series.

Ecology has proposed the following integrated 5-year priorities for 2010 through 2015 (Ecology, 2010, "United States Department of Energy (USDOE) Federal Fiscal Year 2011 and 2012 Hanford Budget Proposals and Ecology Priorities"):

1. Build and prepare to operate the Waste Treatment Plant.
2. Retrieve tanks on the consent decree schedule (10 tanks in C Farm by 2014), including submission of the C Farm Closure permit modification application.
3. Meet groundwater milestones for the River Corridor and Central Plateau.
4. Complete River Corridor cleanup, including soil sites, reactors, K Basins, and 618-10 and 618-11 Burial Grounds.
5. Complete PFP cleanup.
6. Complete retrieval, certification, and shipment of TRU by the proposed TPA (Ecology et al., 1989a) milestone dates.
7. Complete Outer Central Plateau area soil sites by the proposed dates, including closure of the Solid Waste Landfill and the Nonradioactive Dangerous Waste Landfill.
8. Complete remedial investigations and cleanup decisions for Central Plateau soils by the proposed TPA (Ecology et al., 1989a) milestone dates.
9. Complete closure of the canyons and demolition of the remaining Central Plateau buildings.

The T Plant and WRAP have been placed into a minimum safe condition. Programs including MLLW treatment and disposal, TRUM waste characterization and shipping, and retrieval of RSW have been temporarily suspended.

This sharp reduction in waste generation (M-091 Milestone work scope and other Hanford Site cleanup work) will also impact the ability of commercial facilities, which rely heavily on M-091 Milestone feed, to maintain trained and experienced staff. If adequate feed is not available, the vendors may be forced to close operations entirely. With the loss of commercial capability, DOE may be required to develop these capabilities onsite in the future at considerable expense.

Based on current funding levels (as of 2015), there is insufficient funding to meet all M-091 Milestone obligations on schedule. Focus on the completion of cleanup along the Columbia River Corridor coupled with future funding uncertainty formed the basis for the recently renegotiated milestones. Target

(unenforceable) milestones were established for M-091 Milestone work in FY 2012 through FY 2014, and enforceable milestones were agreed to for FY 2015 and FY 2016 as the River Corridor cleanup is completed, and funding is made available to refocus on MLLW and TRUM retrieval.

8.3.2 Delay in Retrieval Operations

Retrieval of CH-RSW and RH-RSW supplies the inventory to the MLLW treatment and TRUM waste repackage/shipment milestones. Failure to meet the schedule for these milestones is possible if retrieval is delayed. Once funding is available, a recovery schedule will be established.

8.3.3 New Technology Being Acquired

The majority of waste under the scope of the M-091 Milestone series can be managed using existing technologies and processing methods. However, current technologies and processing methods are not adequate to retrieve and process the alpha caisson RH-RSW, process the large container CH-TRUM and RH-TRUM, or load waste into the RH-72B cask for shipment of RH-TRUM waste to WIPP. Additionally, commercial capabilities are being relied upon to support completion of the milestones.

8.3.3.1 Retrieval and Processing of RH-RSW in Alpha Caissons

The alpha caissons in the 218-W-4B Burial Ground contain waste containers that have a much higher level of radioactivity than previously retrieved. The mobile hot cell design that is being considered for the retrieval and processing of the alpha caisson waste is based upon expected radiation levels to be encountered as calculated from available waste records. There is a risk that the actual waste containers hold higher quantities of fission material than indicated in the waste records. This could result in modification being required to the designed retrieval and processing modules with corresponding cost and schedule impacts. To reduce the impact, a review of all available waste records has been performed. The systems will be designed with the flexibility to handle various containers and number/volume of product (output) containers.

Also during design development, alternate processing paths will be explored to address the worst-case scenario through administrative controls and sound operational practices to ensure worker safety. During the development of the design, workers from operations, radiological safety, and nuclear safety organizations will be involved to ensure adequate controls are in place for the worker safety.

Because this technology has not previously been used at the Hanford Site and because the caisson waste has a much higher radiological activity than experienced with offsite use of the mobile hot cells, there is a probability that unanticipated startup and implementation problems will be encountered. These problems could impact productivity, with resulting cost and schedule impacts. To mitigate this risk, cold testing and training of mobile hot cells using mock-up caisson to simulate field conditions will be performed.

Another approach being explored is retrieving the alpha caissons intact and shipping to TSD (e.g., T Plant or CWC) for interim storage until capability is available for processing. Further analysis for this approach is needed to evaluate the risks involved (e.g., alpha inventory in the facility, high radiological activity rate waste handling, and interfaces between other projects such as K Basin Sludge Treatment Project).

DOE has begun exploring options for the removing the caisson waste in the 618-11 Burial Ground. Lessons learned from this activity may be applied to the retrieval of the alpha caissons in the 218-W-4B Burial Ground.

8.3.3.2 Repackaging of RH-TRUM Waste

The RH-TRUM waste containers have a much higher level of radioactivity than previously repackaged CH-TRUM waste containers. The new onsite repackaging capability will be designed to remotely remove

the waste from the current container, size reduce and sort waste, treat nonconforming items, and package and support certification from CCP to generate a WIPP-compliant container. The majority of the RH-TRUM waste containers will be received in metal and/or concrete overpacks. These containers will need to be opened, and the waste will be repackaged or size reduced into WIPP-certifiable containers. The surface radiological activity rate of the waste can be as high as 50,000 mrem/hr.

Similar to the alpha caisson project, during the development of the design of the RH-TRUM repackaging capability, workers from operations, radiological safety, and nuclear safety organizations will be involved to ensure that adequate controls are in place for worker safety. Because this technology for repackaging and size reducing waste has not previously been used at the Hanford Site and because the RH-TRUM waste has a much higher radiological activity than experienced with repackaging CH-TRUM waste, there is a probability that unanticipated startup and implementation problems will be encountered. These problems could impact productivity with resulting cost and schedule impacts. To mitigate this risk, cold testing of and training on remote equipment using mock-up containers to simulate actual conditions will be performed.

8.3.3.3 RH-TRUM Waste Loading into Canister and RH-72B Cask

Loading of RH-TRUM waste containers into canisters and RH-72B casks, as discussed in Section 4.3.3, has not been performed on the Hanford Site. However, it is successfully performed at other DOE sites, and those sites will be consulted, during the design of the RH-TRUM waste loading facility at the Hanford Site, to incorporate lessons learned.

8.3.4 Higher Contamination Levels than Expected

There is a risk that RSW retrieval operations will be impacted by higher-than-expected contamination levels, container degradation, or container location. RSW retrieval is moving into the higher-risk trenches where waste records may be less complete, and waste packaging may be more degraded than encountered to date. Although retrieval planning considers the most likely waste contamination/exposure scenario in developing the retrieval approach, there is a possibility that contamination levels (radiological or chemical) may be greater than expected, or that container degradation may be more significant than expected, requiring in-trench overpacking prior to retrieval. There is also a risk that some containers will be buried at depths that require shoring trench boxing during retrieval. These retrieval complexities would result in schedule impacts.

8.3.5 Increase in RSW Volume

There is a risk of RSW retrieval operations encountering waste that is either not identified in records or is comingled with non-RSW due to inaccurate records or soil contamination. Based on inspections of recently excavated waste containers in the trenches and handling the waste at the point of generation, the volume of waste to be retrieved is uncertain due to difficulty in identifying the RSW containers in trenches where the waste is not clearly marked. Inability to identify the containers may result in increased volumes of waste to be retrieved before determining that the RSW waste sought has been retrieved. The volumes and characteristics of RSW waste to be processed are based upon existing records. Waste not identified in the records or inaccurate records could result in unexpected waste volumes or characteristics.

8.3.6 Increase in Volume of TRUM Waste To Be Shipped to WIPP

Volumes could increase if smaller quantities of waste must be placed into the waste packages to meet the WIPP requirements. Having additional size reduction, as an example, increases the amount of processing time and increases the number of shipments to WIPP. The WIPP acceptance criteria allows for a limited number of waste packages that exceed a surface contact radiological activity of 100 R/hr. Much of the RH-RSW waste that will be generated as part of the alpha caisson retrieval could exceed the 100 R/hr

activity limit. This could result in the need for additional size reduction and separation into separate waste containers or incorporation of shielding into the waste package, thus increasing the total number of RH-TRUM packages and, therefore, increasing the number and duration of shipments to WIPP.

8.3.7 Final Certification and Shipment

Final certification and shipment of TRUM waste to WIPP is dependent on support from CCP and WIPP. CCP has been contracted by CBFO to characterize and certify TRU waste that is being packaged at the Hanford Site. Shipments to WIPP are dependent upon a number of factors, including availability to shipping casks, shipping priorities established by CBFO, WIPP approvals of new waste forms, and the availability of CCP resources to certify wastes. These factors could impact the ability to meet planned shipping schedules and cause prolonged storage at CWC.

8.4 Key Deliverables/Products

Key deliverables/products that will be developed in support of the M-091 work scope include the submittal of annual revisions of this PMP on June 30 each year until the M-091 Milestones are completed. The PMP will include the funding profile, which includes a lifecycle projection of annual funding required to accomplish project scope in accordance with the top-level WBS and schedule (see Figure 8-1). The PMP will detail project objectives, work schedules, expected outputs, integration with other programs and projects, and project management alternatives consistent with established agreement and other project constraints.

8.5 Performance Measurement

DOE conducts a performance measurement of the M-091 Milestones to provide an objective assessment of work accomplishments and progress against the baseline plan (scope, schedule, and budget) to manage the baseline effectively and to provide data for management decision making and reporting. The project performance is measured by comparing the amount of work planned with actual accomplishments to determine whether cost and schedule performance is as planned. DOE monitors the project performance monthly by comparing the budgeted cost for work performed to the actual cost of work performed.

8.6 Project Interface Control

DOE controls project interfaces through contract requirements, statements of work, interface control documents, and/or memoranda of agreement/understanding. These documents define the interface and/or service, roles and responsibilities, accountabilities, and authorities.

Interface among the M-091-00 Milestone TRUM waste and MLLW activities and other projects, including waste generating programs for inventory tracking and capacity configuration purposes, is essential for successful project execution. The following waste activities, projects, facilities, and organizations require integration for successful project execution:

- CH2M HILL Plateau Remediation Company
- Mission Support Alliance, LLC
- Hanford Site waste generators of TRU/TRUM waste
- CCP and WIPP
- MWTs 31 and 34
- WRAP
- T Plant

- CWC
- RSW retrieval
- ERDF
- Commercial processing facilities

All Hanford Site generators of TRU solid waste that is destined for disposal at WIPP are required to meet the requirements of HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria.* The requirements include the responsibility of the generator to provide TRU waste that is WIPP certifiable and acceptable knowledge to support waste certification at the point of generation.

For TRU waste that cannot be packaged into WIPP-certifiable containers at the point of generation, the future large-container CH-TRUM and RH-TRUM capability being acquired under the M-091 scope could also be used to repackage this waste, along with WRAP, T Plant, or commercial facilities. At this time (as of 2015), it is assumed that TRU waste generated during Hanford Site cleanup activities (e.g., 618-10/11, PFP) will be compliantly packaged at the point of generation. If, at the time of conceptual design for the future capability under M-091, this is not the case, the scope of the new capability may be expanded to accommodate the repackaging of other TRU waste beyond M-091 scope.

The annual sitewide solid waste forecast includes Hanford Site generator TRU/TRUM waste projections. At this time (as of 2015), no impacts to the M-091 work scope are anticipated as a result of the additional volume of CERCLA TRU/TRUM waste to be certified and shipped to WIPP. Potential impacts are evaluated as waste volume projections are updated.

8.7 Reporting

TPA reporting requirements are described in Chapter 4, "Agreement Management," of the TPA (Ecology et al., 1989a). The primary interface for reporting and notification is from DOE Project Managers to their regulatory counterparts or through the Interagency Management and Integration Team. DOE typically provides a status on the M-091 Milestones to the Ecology Project Manager on a monthly basis, which is documented in the AR. In addition, monthly M-091 Milestone Project Manager meetings are held. The roles and responsibilities for the Project Manager and the Integration Team are contained in TPA Sections 4.1 and 4.2, respectively (Ecology et al., 1989a).

8.8 Change Management

TPA (Ecology et al., 1989a) and baseline change management are discussed in the following subsections.

8.8.1 TPA Change Management

TPA (Ecology et al., 1989a) change management is described in the TPA Action Plan, Section 12.0, "Changes to the Agreement" (Ecology et al., 1989b). The appropriate authority level for approval of a change is based on the content of the change. All changes will be processed using the change control form provided in Section 12.3.1, "Change Control Form," of the TPA Action Plan (Ecology et al., 1989b).

Changes to the M-091 Milestone PMP will be in accordance with the TPA Action Plan, Section 9.0, "Documentation and Records," and Section 9.3, "Document Revision" (Ecology et al., 1989b). Changes will be documented in the AR. Changes or revisions to the PMP may also result in the need to modify TPA milestones. Such changes are subject to the requirements of Section 12.0, "Changes to the Agreement," of the TPA Action Plan (Ecology et al., 1989b).

DOE will submit revisions to this PMP as required by the M-091 Milestones. The PMP revision will include DOE plans and schedules for addressing all requirements set forth in the M-091 Milestone series.

Each revision of the M-091-03 Milestone PMP will, after approval by Ecology, supersede previous M-091-03 Milestone PMPs.

DOE will submit the PMP revision to Ecology for review and approval as primary documents pursuant to the TPA Action Plan, Section 9.2.1 (Ecology et al., 1989b). DOE will implement the PMP, as approved.

8.8.2 Baseline Change Management

DOE maintains a contract budget log under configuration control and management that reconciles to the current contract target costs. Changes are controlled and formally reviewed and approved. DOE requires the contractor to maintain a baseline change process that is approved by DOE.

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Appendix A

Glossary

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Terms

DOT	U.S. Department of Transportation
LLW	low-level waste
MLLW	mixed low-level waste
RSW	retrievably stored waste
SLB2	standard large box 2
SWB	standard waste box
SWIFT	Solid Waste Integrated Forecast
SWITS	Solid Waste Information and Tracking System
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUM	transuranic mixed
WIPP	Waste Isolation Pilot Plant

A1 Glossary

Specialized words used in the waste management plan are defined in this appendix.

Caissons, as used within the M-091 Milestone series (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*), are the four caissons containing retrievably stored waste (RSW) in the 218-W-4B Burial Ground.

Certification, as used within the M-091 Milestone series, is defined as follows:

- All activities necessary for waste to be packaged, in order to meet the Waste Isolation Pilot Plant (WIPP) acceptance criteria, are completed. The volume of waste certified is the volume of waste given to the Central Characterization Project for certification verification. If subsequent WIPP certification reveals that the waste cannot be shipped to WIPP, this waste will not count toward meeting the milestone volume requirements (and will be subtracted from meeting such requirements) until such time as it has been determined to meet the WIPP waste acceptance criteria.
- The transuranic mixed (TRUM) waste has been shipped to Idaho, which may also count toward certification based upon actual shipment to Idaho and contingent upon the waste not returning to Hanford Site.
- The waste has been treated to meet land disposal restriction treatment standards.

Contact-Handled waste is a waste container with a surface dose rate less than or equal to 200 mrem/h.

Designation is the process of determining whether a waste is regulated under the dangerous waste lists (WAC 173-303-080, "Dangerous Waste Regulations," "Dangerous Waste Lists," through 173-303-082, "Dangerous Waste Sources"), characteristics (WAC 173-303-090, "Dangerous Waste Characteristics"), or criteria (WAC 173-303-100, "Dangerous Waste Criteria"). The process for designating wastes is described in WAC 173-303-070, "Designation of Dangerous Waste." Waste that has been designated as dangerous may be either dangerous waste or extremely hazardous waste. These regulations allow the use of acceptable knowledge, surrogate sampling, and other measures for designation to minimize radiation exposure to workers and to reduce costs.

Low-Level Waste (LLW) is defined as radioactive waste that is not spent fuel, high-level waste, transuranic (TRU) waste, byproduct material, or naturally occurring radioactive material.

Mixed Waste is a waste that contains a nonradioactive hazardous component and, as defined by 10 CFR 20.1003, "Standards for Protection Against Radiation," "Definitions," source, special nuclear material, or byproduct material subject to the *Atomic Energy Act of 1954*.

Retrievably Stored Waste (RSW), as used within the M-091 Milestone series, is or was believed to meet the TRU waste criteria when it was placed in the 218-W-4B, 218-W-4C, 218-W-3A, and 218-E-12B Burial Ground trenches after May 6, 1970. RSW does not include waste in containers that have deteriorated to the point that they cannot be retrieved and stabilized (e.g., placed in overpacks) in a manner that would allow them to be transported and designated without posing significant risks to workers, the public, or the environment. With respect to any such containers, and with respect to any release of RSW, how to move forward will be determined through the cleanup process set forth in the *Resource Conservation and Recovery Act of 1976*; RCW 70.105, "Hazardous Waste Management;" and/or the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as appropriate. Those processes may result in additional requirements for the remediation of such wastes.

The Atomic Energy Commission (U.S. Department of Energy predecessor agency) initially defined TRU waste as "waste with known or detectable contamination of transuranium nuclides." In March 1970, the Atomic Energy Commission directed field sites to segregate TRU waste and place it in retrievable storage that would allow the waste to be retrieved within 20 years. Before this date, this waste was disposed as LLW.

In 1973, the TRU waste segregation limit was established at 10 nCi/g of TRU isotopes. In 1982, the limit was changed to 100 nCi/g. This limit was enacted by Congress in 1992. Because of the changing definition of TRU waste, waste generated and stored between 1970 and 1982 could contain less than the current threshold of 100 nCi/g for defining TRU waste. This waste has been termed suspect TRU waste because some of it will be designated as LLW following radiological characterization.

Remote-Handled (RH) waste is a waste container with a surface dose rate greater than 200 mrem/h. The RH waste volumes are based on the sum of all containers listed in Solid Waste Information and Tracking System (SWITS) with a cumulative contact dose rate greater than 200 mrem/h, and/or have a SWITS shielding code of lead, steel, or concrete, and/or coded in SWITS as RH.

Small and Large Containers have different meanings, depending on whether they are used in reference to mixed low-level waste (MLLW) or TRUM waste. When referring to MLLW, small containers are less than 10 m^3 (353.2 ft^2), including 208.2 L (55 gal) drums. When referring to TRUM waste, small containers are 208.2 L (55 gal) drums or small containers, even if overpacked in 321.75 L (85 gal) drums and WIPP standard waste boxes (SWBs). A large container is anything that is not defined as a small container, and vice versa.

Standard Large Box 2 (SLB2) is a steel rectangular container with an external width of 2.5 m (8.2 ft) and an external length of 4.3 m (14 ft). The internal cavity dimensions are 1.8 m (6 ft) wide, 2 m (6.6 ft) tall, and 2.8 m (9.2 ft) long. The SLB2 was qualified in 2004 as meeting the U.S. Department of Transportation (DOT) requirements for specification 7A Type A packaging.

Standard Waste Box (SWB) is a 1.8 m^3 (63.57 ft^3) steel container that is approximately 0.94 m (3.1 ft) in height, 1.8 m (5.9 ft) in length, and 1.4 m (4.6 ft) in width. The SWB was qualified in 1988 as meeting DOT requirements for specification 7A Type A packaging.

Solid Waste Integrated Forecast (SWIFT) database contains estimates of future waste volumes and characteristics forecast by waste-generating units. The waste generating units provide basic information that is incorporated into the SWIFT database. This forecast is updated annually and published in the SWIFT report.

Solid Waste Information and Tracking System (SWITS) is a Hanford Site database containing records of waste containers stored at Hanford and contains data (e.g., volume; container information; and radiological, physical, and dangerous waste characteristics) about each container of stored waste considered within the scope of the M-091 Milestone series. SWITS is a dynamic database that is updated frequently to reflect waste receipts, processing, and shipment volumes; as a result, data presented in this revision of the Project Management Plan may differ from previous versions.

Transuranic (TRU) waste meets the definition, in the *Waste Isolation Pilot Plant Land Withdrawal Act*, Pub. L. 102-579 (Section 2.18), of radioactive waste containing more than 100 nCi of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

A2 References

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Appendix B

Applicable Regulatory Requirements

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Terms

CAA	*Clean Air Act of 1990*
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	record of decision
TRU	transuranic
WDOH	Washington State Department of Health

B1 Applicable Regulatory Requirements

Mixed waste management activities will consider the requirements described in the following sections, as well as any other applicable regulations or U.S. Department of Energy (DOE) requirements.

B1.1 *Clean Air Act of 1990* (42 USC 7401, et seq.)

The Hanford Site air operating permit has been issued in accordance with Title V of the *Clean Air Act of 1990* (CAA) and is implemented through federal and state programs under 40 CFR 70, "State Operating Permit Programs," and WAC 173-401, "Operating Permit Regulation." The permit is intended to provide a compilation of applicable (CAA) requirements for both radioactive emissions and criteria/toxic emissions at the Hanford Site. Current air permitting documentation is expected to address existing mixed waste management activities. New air permitting documentation will be needed for alpha caissons, retrievably stored waste retrieval, and future large container and remote handling capabilities. Activities addressed by the Project Management Plan will be reviewed against the permitting documentation, as necessary, to ensure that mixed waste management activities are addressed.

B1.2 *Hazardous Materials Transportation Act of 1975* (49 USC 5101, et seq.)

Hazardous material transportation requirements include employee training programs; performance standards; and preparation of shipping papers to identify and track hazardous materials, design of packaging and containers, marking, and labeling. Specific requirements will be followed that relate to mixed waste management activities and the shipment mode used (i.e., rail, aircraft, vessel, and public highway). Offsite shipments of hazardous materials must comply with the implementing regulations of 49 CFR 105, "Transportation," "Hazardous Materials Program Definitions and General Procedures;" 49 CFR 106, "Rulemaking Procedures;" 49 CFR 107, "Hazardous Materials Program Procedures;" and 49 CFR 171, "General Information, Regulations, and Definitions," through 49 CFR 180, "Continuing Qualification and Maintenance of Packaging," administered by the U.S. Department of Transportation (DOT). Onsite waste movements must comply with DOE requirements, including DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*.

B1.3 *National Environmental Policy Act of 1969* (42 USC 4321, et seq.)

DOE/EIS-0391, *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)*, was issued for public comment in October of 2009, and public comment closed in March 2010. A record of decision (ROD) has been issued (78 FR 240, "Record of Decision for the Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington"). DOE/EIS-0286F, *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement Richland, Washington*, continues to be relied upon for purposes of M-091 milestone activities.

B1.4 *Resource Conservation and Recovery Act of 1976* (42 USC 6901, et seq.), as Amended by the *Hazardous and Solid Waste Amendments of 1984*

Federal regulations, implementing the *Resource Conservation and Recovery Act of 1976* (RCRA) and RCRA corrective action, address the requirements for hazardous wastes, including treatment, storage, disposal, and transportation (40 CFR 260, "Hazardous Waste Management System: General" through 40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs").
The U.S. Environmental Protection Agency (EPA) has authorized the Washington State Department of Ecology (Ecology) to administer the State's statute and regulations (RCW 70.105, "Hazardous Waste Management;" WAC 173-303, "Dangerous Waste Regulations"), in lieu of federal RCRA regulations.

B1.5 *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (42 USC 9601, et seq.)

The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) addresses spill cleanups and hazardous substances left at past practice waste sites. DOE performs investigation and response actions for release of hazardous substances at the Hanford Site as the lead agency delegated authority under CERCLA Section 104, "Response Authorities," by Executive Order 12580, *Superfund Implementation*. In 1989, pursuant to CERCLA Section 120, "Federal Facilities," DOE executed an agreement with EPA and Ecology governing execution of CERCLA response actions and measures to bring Hanford into compliance with RCRA treatment, storage, and disposal unit and corrective action requirements. The agreement is called the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*). Either EPA or Ecology will assume responsibility as lead regulatory agency for various response actions at the Hanford Site.

In September 2006, DOE submitted an M-016-93 implementation work plan to EPA proposing the acquisition of capabilities necessary to prepare transuranic (TRU) mixed waste generated by CERCLA cleanup actions at the Hanford Site for disposal at the Waste Isolation Pilot Plant. This work plan reflected retrieval decisions, projected waste volumes, and schedules from all CERCLA cleanup actions authorized in RODs and action memoranda at the Hanford Site and will provide for updates and revisions as new information becomes available (i.e., after all 200 Area RODs are issued). As part of the approval process for RODs and action memoranda, EPA and the DOE Richland Operations Office will obtain Ecology concurrence to ensure that wastes from CERCLA operable units for which Ecology is the lead regulatory agency, are properly planned.

B1.6 *Washington State Hazardous Waste Management Act of 1976* (RCW 70.105)

The *Washington State Hazardous Waste Management Act of 1976* authorizes Ecology to regulate the treatment, storage, disposal, and transportation of dangerous waste in Washington State. Mixed waste is dangerous waste that is mixed with radioactive elements. Chemical characteristics of mixed waste are regulated under RCRA and WAC 173-303, while radioactive characteristics are regulated by DOE under the *Atomic Energy Act of 1954*. Ecology has promulgated dangerous waste regulations in WAC 173-303. Mixed waste generation activities are subject to generator requirements. Mixed waste management activities that cannot utilize generator provisions must be conducted according to dangerous waste permits under WAC 173-303 in order to operate.

B1.7 "Washington Clean Air Act" (RCW 70.94)

Ecology's Nuclear Waste Program regulates air toxicity and criteria pollutant emissions from the Hanford Site. Ecology promulgates and enforces the regulations under RCW 70.94, "Washington Clean Air Act." Ecology's implementing requirements (e.g., WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460, "Controls for New Sources of Toxic Air Pollutants") specify review of new source emissions, permitting, applicable controls, reporting, notifications, and compliance with general standards for applicable sources of Hanford Site emissions.

The Washington State Department of Health (WDOH) Radiation Protection Division regulates radioactive air emissions statewide, as authorized by EPA and Washington State legislative and regulatory authority. WDOH implements the state requirements, adopts and implements the federal requirements under WAC 246-247, "Radiation Protection—Air Emissions," and enforces the federal requirements under authority delegated by EPA. Before beginning any work that would result in creating a new or modified source of radioactive airborne emissions, a notice of construction application must be

submitted for review and approval by WDOH, resulting in issuance of an operating license. Typical license requirements for radioactive air emission sources include ensuring adequate emission controls, emissions monitoring/sampling, and annual reporting of emissions.

B1.8 Department of Transportation

Onsite transportation of waste is managed by DOE in accordance with DOE/RL-2001-36. Transportation of waste offsite is regulated by DOT. A Memorandum of Understanding between the Western Governors' Association and DOE requires that DOE conduct TRU waste shipments through the western states in accordance with the protocols contained in WGA and DOE-CBFO, 2003, *WIPP Transportation Safety Program Implementation Guide*. Shipments within the same DOE site, or other TRU waste shipments as agreed to between DOE and the states, are not included. Shipments of TRU waste to commercial firms using road closures are acceptable.

The type of packaging required to transport the waste depends, in part, on the total quantity of radioactivity, form of the materials, and concentration of radioactivity. DOE is responsible for determining the appropriate container for the material it is transporting. DOE ensures that each waste package being transported offsite meets DOT regulations for design, material, manufacturing methods, and testing.

B2 References

40 CFR 70, "State Operating Permit Programs," *Code of Federal Regulations*. Available at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=b9f71e37c7ac95548244e7c19bfa1665&tpl=/ecfrbrowse/Title40/40cfr70_main_02.tpl.

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Appendix C

Descriptions of Low-Level Burial Grounds with Retrievably Stored Waste

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Terms

LLBG	low-level burial ground
RSW	retrievably stored waste

C1 Descriptions of Low-Level Burial Grounds with Retrievable Stored Waste

Retrievably stored waste (RSW) is in designated areas of low-level burial grounds (LLBGs) 218-E-12B, 218-W-3A, 218-W-4B, and 218-W-4C (Figure C-1). These LLBGs are located in the LLBG *Resource Conservation and Recovery Act of 1976* treatment, storage, and/or disposal unit. These LLBGs are also included in the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* 200-SW-2 Radioactive Landfills and Dump Group Operable Unit.

The following sections provide background information on each LLBG.

C1.1 218-W-4B

The 218-W-4B LLBG is located in the central portion of the 200 West Area of the Hanford Site. The trenches are 175 m (575 ft) long and 3.7 m (12 ft) deep. Figure C-2 shows the trenches in the 218-W-4B LLBG.

The LLBG received miscellaneous radioactive solid waste from the 100, 200, and 300 Areas and offsite shipments from 1967 to 1990. Solid waste at the site consists of rags, paper, cardboard, plastic, pumps, tanks, process equipment, and other miscellaneous high dose rate transuranic waste.

The site contains RSW in Trenches T7, TV7, and T11 and four alpha caissons. Trench T7 is divided into two sections that were designed to receive RSW. The east end of the trench is referred to as TV7, a diamond shaped structure made up of a concrete lined "V" bottom and metal cover. The cement floor of Trench TV7 is a barrier to waste constituent migration, similar to the asphalt pad used in the remainder of Trench T7, with the exception of a known preferred direction of migration along the cement surface.

In the fall of 1972, the first asphalt pad was built in the remainder of Trench T7. Drums were arranged in modules, typically 12 drums wide by 12 drums deep by 4 drums high. Flame retardant plywood sheets were placed to separate the layers of drums and other packages. When modules were completed, they were covered with tarps and plywood sheets.

From 1970 to 1972, Trench T11 received waste drums and boxes that were stacked horizontally and "direct buried" in the ground without tarps or plywood to separate the soil overlying the waste. Other containers, such as concrete or steel burial boxes, ductwork, stainless steel tanks, and a culvert, were placed in this trench.

C1.2 218-W-4C

The 218-W-4C LLBG is located inside the 200 West Area of the Hanford Site and consists of 15 trenches ranging from 91 to 219 m (300 to 719 ft) long. Figure C-3 shows the trenches in the 218-W-4C LLBG.

In the 218-W-4C LLBG, Trenches T1, T4, T7, T20, and T29 contained RSW. This waste is placed in modules on asphalt pads that contain drums and other packages, including boxes and steel and concrete casks. Drums were arranged in modules, typically 12 drums wide, by 12 drums deep, by 4 drums high. Flame retardant plywood sheets were placed to separate the layers of drums and other packages. When modules were completed, they were covered with tarps and plywood sheets. The contact-handled RSW has been removed from this LLBG.

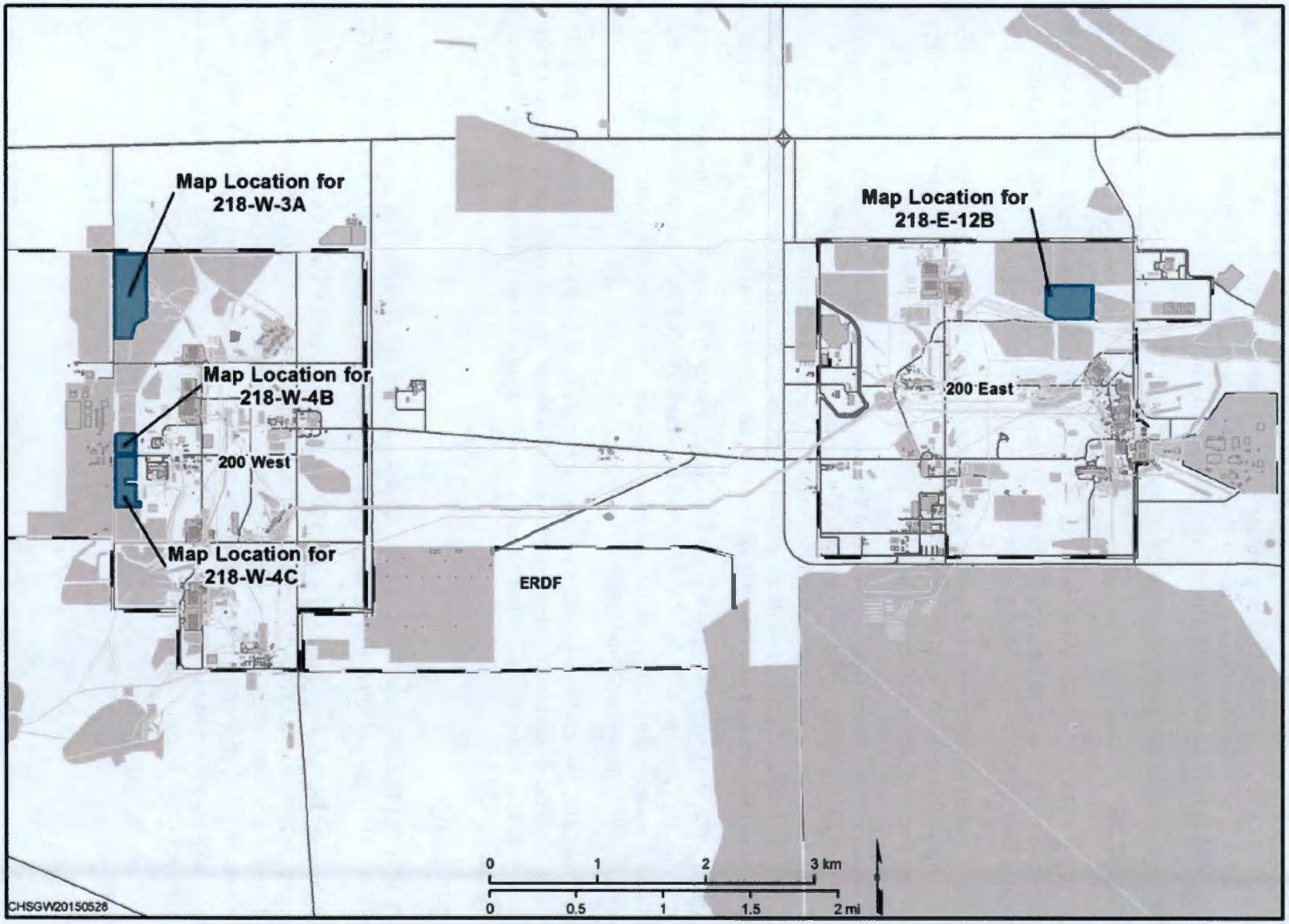

Figure C-1. Map Locations for Low-Level Burial Grounds 218-W-3A, 218-W-4B, and 218-W-4C, and 218-E-12B

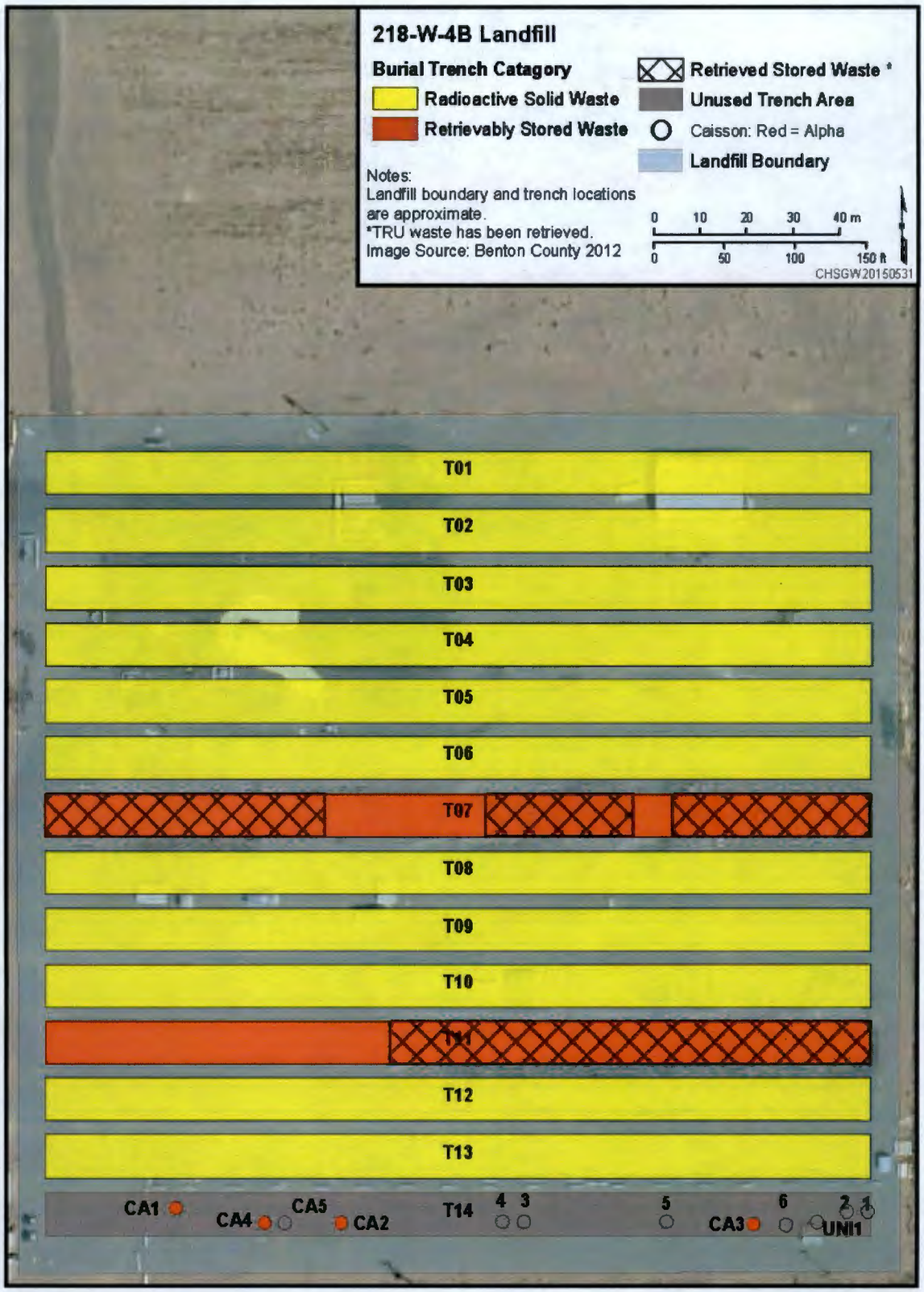

Figure C-2. Trenches in Low-Level Burial Ground 218-W-4B

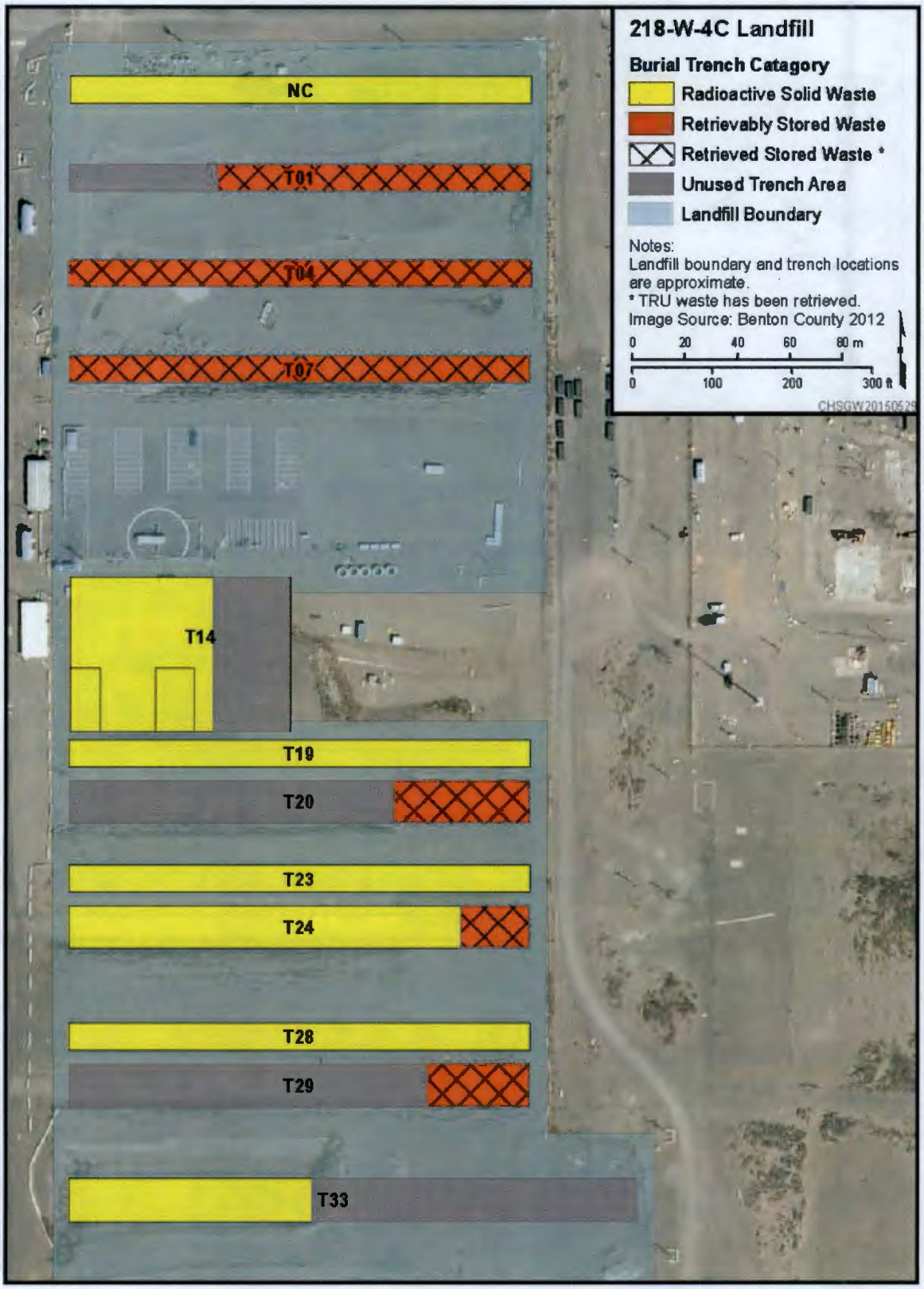

Figure C-3. Trenches in Low-Level Burial Ground 218-W-4C

C1.3 218-W-3A

The 218-W-3A LLBG is located inside the 200 West Area of the Hanford Site. Figure C-4 shows the trenches in the 218-W-3A LLBG. The 218-W-3A LLBG began operating in 1970 and contains solid, dry industrial waste. The RSW is located in 14 trenches: T1, T4, T5, T6, T6S, T8, T9S, T10, T15, T17, T23, T30, T32, and T34.

The 218-W-3A LLBG has no asphalt pads and used only earthen bottom (potentially gravel fill) trenches. Drums were stacked horizontally in earthen trenches from 1970 until approximately 1974. The waste drums were buried directly in the ground without tarps or plywood to separate the soil overlying the waste. Direct contact with the soil increased the probability that containers have corroded and might be breached. The actual date when tarp coverage was initiated has not been established. Later, drums were stacked vertically and placed on plywood, and the completed module waste was covered with nylon tarps and plywood before soil emplacement. RSW in boxes made of various materials (e.g., plywood, concrete, metal, and fiberglass reinforced plywood) were also placed in this burial ground. The 218-W-3A LLBG received RSW until 1987.

C1.4 218-E-12B

The 218-E-12B LLBG is located inside the 200 East Area of the Hanford Site. Figure C-5 shows the trenches in the 218-E-12B LLBG. The RSW is located in two trenches: T17 and T27.

The 218-E-12B LLBG began operating in 1967. The RSW originated from the Plutonium-Uranium Extraction Facility and was placed in 218-E-12B LLBG Trenches T-17 and T-27 between May 1970 and October 1972.

Drums were stacked horizontally in earthen trenches from 1970 to 1972. The waste drums were directly buried in the ground (i.e., not on asphalt pads as they were in the 218-W-4C LLBG) without tarps or plywood to separate the soil overlying the waste. Direct contact with the soil increased the probability that the containers have corroded and might be breached.

C2 References

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at:.

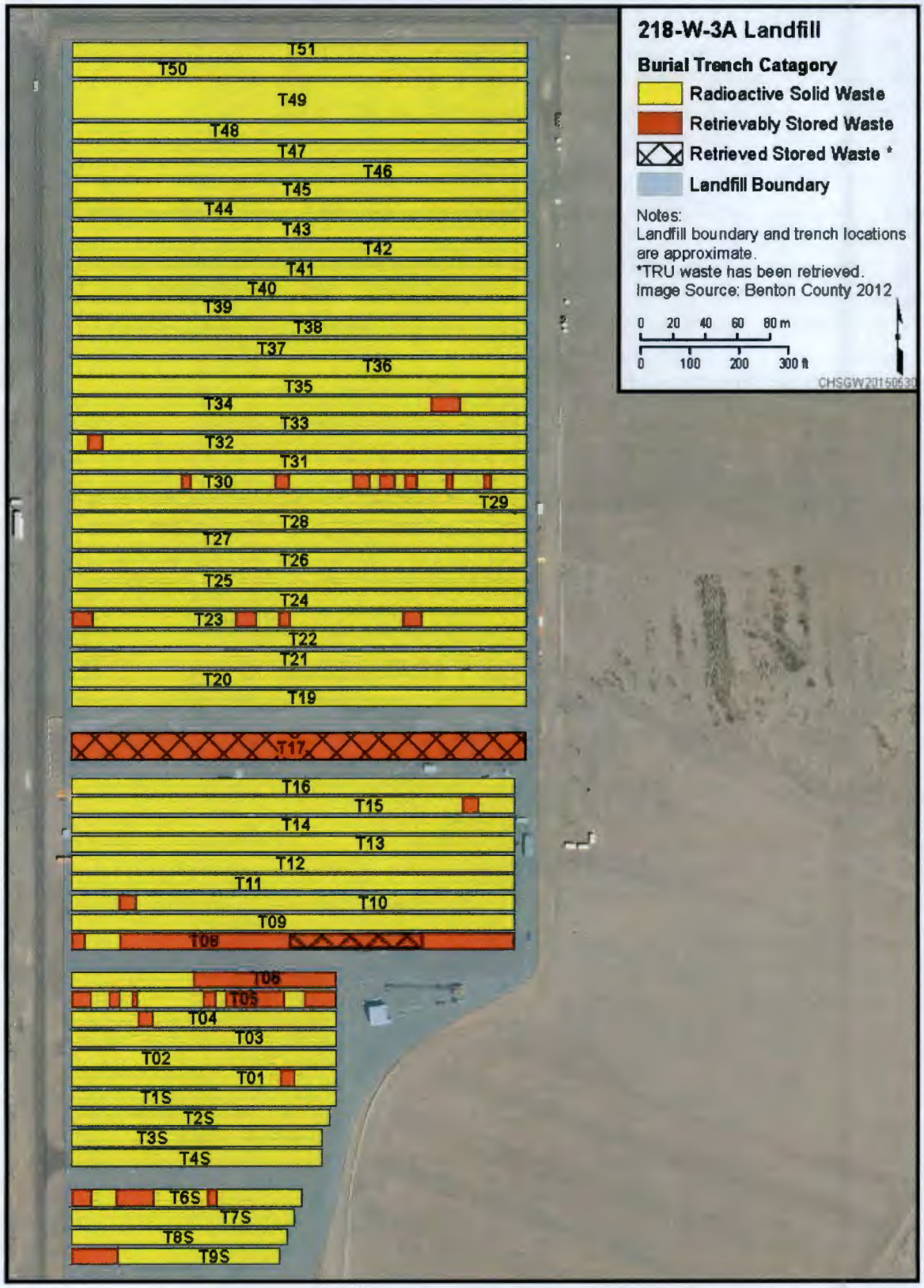

Figure C-4. Trenches in Low-Level Burial Ground 218-W-3A

Figure C-5. Trenches in Low-Level Burial Ground 218-E-12B

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Appendix D

Basis for Figures

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Table D-5. Basis for Figure 8-1 ..... D-4

Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH	contact-handled
DOE	U.S. Department of Energy
FY	fiscal year
MLLW	mixed low-level waste
PMP	Project Management Plan
RH	remote-handled
RSW	retrievably stored waste
SWITS	Solid Waste Information and Tracking System
TRU	transuranic
TRUM	transuranic mixed waste
WIPP	Waste Isolation Pilot Plant

D1 Tables

Tables D-1 through D-5 describe the data sources, analytical bases, and underlying assumptions for certain figures included in the main text of this document.

Table D-1. Basis for Figure 2-1

	Data Source, Analytical Basis, and Underlying Assumptions
Data Source	• RSW consists of suspect TRUM waste in 218-W-3A, 218-W-4B, 218-W-4C, and 218-E-12B Burial Grounds. • The volume of RSW is as of October 1, 2013 as reported in SWITS. • Volumes are internal volumes of a waste container (e.g., a 55 gal drum has an internal volume of 0.208 m^3 and an external volume of 0.257 m^3). • SWITS is a dynamic database and is updated frequently to reflect updated information. As a result, data presented in this revision of the PMP may differ from previous volumes as follows: – The volume of RSW retrieved is based on the actual volume measured when the container is removed from the trench. In some instances, the dimension of a container in SWITS is found not to represent the actual dimensions of a container retrieved. In these instances, SWITS will be updated with the actual volume removed, and this volume will be used to count towards the Tri-Party Agreement (Ecology et al., 1989) M-091-41 Milestone. For example, when the culverts (cylinders) are retrieved, the original volume in SWITS was based on a rectangular container. SWITS was updated with the actual volume of the cylinder. – For failed containers that are repacked in the trench prior to retrieval, the waste volume reported in SWITS will be the volume counted towards the milestone.
Analytical Basis	• Projected annual volumes are based on the funding profile given in Figure 8-1. • Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• Continue retrieving and characterizing the remaining drums of RSW, and use existing retrieval methods that have been supplemented with the recently implemented Trench Face Retrieval and Characterization System. • Continue retrieving the remaining non-drum CH-RSW and noncaisson RH-RSW using existing methods. • Acquire the necessary new capability to retrieve the alpha caissons.

Table D-2. Basis for Figure 3-3

	Date Source, Analytical Basis, and Underlying Assumptions
Data Source	• Inventory as of October 1, 2013 is reported in SWITS. • Volumes are internal volumes of a waste container (e.g., a 55 gal drum has an internal volume of 0.208 m^3 and an external volume of 0.257 m^3). • Volumes are given as pretreated volumes.
Analytical Basis	• Projected annual volumes are based on the funding profile given in Figure 8-1, and availability of inventory from RSW retrieval operations is as discussed in Chapter 2.

Table D-2. Basis for Figure 3-3

	Date Source, Analytical Basis, and Underlying Assumptions
	• Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• After retrieval and assay, a significant portion of the RSW will be designated as non-TRU waste based on the change in the definition of TRU waste (to 100 nCi/g from the former definition of 10 nCi/g), which occurred after the waste was placed into retrievable storage in the trenches. Based on this change in definition, waste records, and field experience, the following percentages of MLLW and TRUM waste were derived (operational experience may make it necessary to change these assumptions in future revisions of this PMP): – CH-RSW in small containers is 48 percent CH-MLLW. – CH-RSW in large containers is 32 percent CH-MLLW. – Noncaisson RH-RSW is 50 percent RH-MLLW. – Alpha caisson RH-RSW is 0 percent MLLW. • MLLW small containers are defined as containers less than 10 m^3, including 55 gal drums. • An MLLW large container is defined as any MLLW container that is not defined as an MLLW small container. • Commercial facilities are available and have sufficient capacity to treat MLLW.

Table D-3. Basis for Figures 3-2 and 4-2

	Data Source, Analytical Basis, and Underlying Assumptions
Data Source	• Inventory as of December 31, 2014 is based on SWITS data sorts. • The volume of an RSW container is as reported in SWITS; volumes will be adjusted based on actual volumes removed during waste retrieval operations. • Volumes are internal volumes of a waste container (e.g., a 55 gal drum has an internal volume of 0.208 m^3 and an external volume of 0.257 m^3).
Analytical Basis	• Projected annual volumes are based on the funding profile given in Figure 8-1: – Projections used throughout this PMP are based on level loaded workoff rates. – FY 2015 to FY 2018, 280 m^3 of large and small container CH-TRUM waste will be repackaged at a commercial facility per annum. – FY 2019 through FY 2029, 400 m^3 of large and small container CH-TRUM waste will be repackaged at a commercial facility per annum. – Additional necessary repack facilities to process waste containers that could not be shipped offsite will be operational by FY 2026. Production will ramp up to 600 m^3 per annum by the second year. Work on M-091 TRUM waste will be completed by the end of FY 2030. – There is 2,800 m^3 of suspect CH-TRUM remaining to be retrieved from the burial grounds. CH-TRUM retrieval operations are anticipated to commence in FY 2025, completing in FY 2027. RH-TRUM retrieval from alpha caissons is expected to start in FY 2027 with completion in FY 2028. – Starting in FY 2024 and continuing to 2030, 3 to 4 shipments of M-091 CH-TRUM waste are shipped to WIPP per week at 9.25 m^3 per shipment; 40 weeks per year (minimum 740 m^3 per year).

Table D-3. Basis for Figures 3-2 and 4-2

	Data Source, Analytical Basis, and Underlying Assumptions
	– Starting in FY 2026 and continuing to 2030, 3 to 4 shipments of M-091 RH-TRUM waste are shipped to WIPP per week at 0.624 m^3 per shipment; 40 weeks per year (minimum 74 m^3 per year). – Number of shipments to WIPP per week is dependent on priority across the DOE Complex. • Certified and shipped volume is the treated volume. During repackaging of CH-TRUM waste, it has been found that for every 4 drums repackaged, 5 drums of certified waste are generated, on average, resulting in a factor increase of 1.25. This factor is also assumed valid for noncaisson RH-TRUM waste. Volume increases can result from activities such as repackaging performed to generate compliant packages ready for final characterization, certification, and shipment to WIPP. For caisson RH-TRUM waste, a factor increase of 10 was used because the waste in a single container will need to be redistributed in several certified containers to minimize dose rates and maintain isotopic distribution. • Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• After retrieval and assay, a significant portion of RSW will be designated as non-TRU waste based on the change in the definition of TRU waste (to 100 nCi/g from the former definition of 10 nCi/g), which occurred after the waste was placed into retrievable storage in the trenches. Based on this change in definition, waste records, and field experience, the following percentages of MLLW and TRUM waste were derived (operational experience may make it necessary to change these assumptions in future revisions of this PMP): – CH-RSW in small containers is 52 percent CH-TRUM waste. – CH-RSW in large containers is 68 percent CH-TRUM waste. – Noncaisson RH-RSW is 50 percent RH-TRUM waste. – Alpha caisson RH-RSW is 100 percent RH-TRUM waste. • Based on experience of repackaging large container CH-TRUM waste commercially, it is assumed that 45% of the original volume of the waste will remain as TRUM. The balance will be void space and MLLW. This assumption will be refined in future revisions of the PMP. • Retrieval will be done by the end of FY 2028. • Shipments of small container CH-TRUM waste (M-091-46 Milestone) will be completed at the end of FY 2030. • Onsite large container CH-TRUM and RH-TRUM waste processing (M-091-44) will begin in FY 2026 and continue through FY 2030. • Commercial capability will be available to process a portion of large container CH-TRUM and RH-TRUM waste. • Shipments of CH-TRUM waste from the repackage of large container CH-TRUM waste will begin in FY 2024 and continue through FY 2030. • Shipments of RH-TRUM waste to WIPP will begin in FY 2026 and continue through calendar year 2030.

Table D-4. Basis for Figure 7-2

Data Source, Analytical Basis, and Underlying Assumptions	
Data Source	• Inventory in aboveground storage as of 12/31/2014 is based on SWITS data sorts. • Projected waste volumes from Table 7-2.
Analytical Basis	• Total annual TRU/TRUM waste shipments to WIPP from the Hanford Site are as follows: – CH: 9.25 m^3/shipment, 5 to 7 shipments/week, 40 weeks/yr (maximum 2,385 m^3/yr) – RH: 0.624 m^3/shipment, 3 to 5 shipments/week, 40 weeks/yr (maximum 125 m^3/yr) • Due to rounding, the total may not equal the sum of individual values.
Underlying Assumptions	• Shipments of TRUM waste under the M-091 milestones take priority over CERCLA TRU/TRUM shipments to WIPP.

Table D-5. Basis for Figure 8-1

Underlying Assumptions
• FY 2014 escalated dollars. • Based on CH2M HILL Plateau Remediation Company baseline and DOE/RL-2013-02, *2014 Hanford Lifecycle Scope, Schedule and Cost Report*. Out-year (FY 2019 and beyond) funding given in DOE/RL-2013-02 was adjusted, as appropriate, to account for work scope not included in FY 2014 to FY 2018 baseline. Funding levels are subject to change as planning is refined. • Dollars shown in FY 2031 are for activities to meet the M-091 Milestones series that will be complete by December 31, 2030 (first quarter of FY 2031). • Work breakdown structure 013.04 for FY 2019 to FY 2030 is funding for the treatment of MLLW dropout during the repackaging of large container CH-TRUM waste. • Funding has been identified for Environmental Restoration Disposal Facility expansion in FY 2021. • Funding profile for CERCLA activities discussed in Chapter 7 is not included. • Other activities include management reserve, fee, and assessments. • Production rates: 10 drums/week/line/shift at Waste Receiving and Processing Facility, 17 drums/week/line/shift at T Plant, 50 drums/week at Commercial Facility. Number of shipments to WIPP per week is specified by the DOE Carlsbad Field Office and is dependent on priorities throughout the DOE complex.

D2 References

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

DOE/RL-2013-02, 2014, *2014 Hanford Lifecycle Scope, Schedule and Cost Report*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0086536.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=81.

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Appendix E

Out-Year CERCLA Cleanup Actions

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Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions E-3

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Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CMS	corrective measures study
FS	feasibility study
LLW	low-level waste
MLLW	mixed low-level waste
OU	operable unit
PUREX	Plutonium Uranium Extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RD/RA	remedial design/remedial action
REDOX	reduction oxidation
RFI	RCRA facility investigation
RI	remedial investigation
TBD	to be determined
TRU	transuranic
TSD	treatment, storage, and/or disposal

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E1 Introduction

Appendix E categorizes the Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions and the scheduled actions.

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Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-BC-1	The 216-B-53A Trench is 18.3 by 3 m (60 by 10 ft) at the base. The site received waste from the liquid release at the Plutonium Recycle Test reactor in the 300 Area during which secondary cooling waste became contaminated with plutonium and mixed fission products. Of all the specific retention trenches in the BC Cribs and Trenches area, only the 216-B-53A Trench is considered to have the potential to contain concentrations of transuranic constituents greater than 100 nCi/g. **Reference:** DOE/RL-2009-36, *BC Cribs and Trenches Excavation-Based Treatability Test Report.*	216-B-53A, Trench	Soil, Rock, Gravel	38 m^3 (1,342 ft^3)	*M-015-91B*: Submit FS Report(s) and Proposed Plan(s) for the 200-BC-1/ 200-WA-1 OUs (200 West Inner Area) by 12/31/2015. (To be missed). *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs by 9/30/2024. (At Risk)
200-SW-2	There are 24 landfills assigned to the 200-SW-2 OU. These landfills consist of excavated trenches that received either LLW or MLLW. The majority of the waste disposed in the 200-SW-2 landfills originated from the processing facilities located in the 200 East and 200 West Area, with some of the waste originating from the 100 and 300 Areas, as well as from offsite sources. There are collocated waste sites within the footprint of several 200-SW-2 landfills. These waste sites include 3 ponds, a burn pit, and a ditch. Before 1970, LLW was disposed in the same landfill trenches as waste that contained transuranic elements and/or mixed fission products. After 1970, waste that was designated as TRU waste was segregated in either specified low-level burial ground trenches or underground concrete caissons within the landfills for future retrieval. Retrieval of this TRU waste (currently known as retrievably stored suspect TRU waste) is accomplished under Tri-Party Agreement (Ecology et al., 1989) Milestones M-091-40 and M-091-41, as discussed in Chapter 3 of this Project Management Plan. Prior to 1960, detailed inventory records were not maintained and specific information about the early landfills often is not available. **References:** DOE/RL-2004-60, *200-SW-2 Radioactive Landfills Group Operable Unit RCRA Facility Investigation/Corrective Measures Study/Remedial Investigation/Feasibility Study Work Plan.* Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order.* Solid Waste Information Tracking System.	218-E-12B, Landfill	Debris	120 m^3 (4,238 ft^3)	*M-015-93B*: Submit RFI/CMS, RI/FS, and Proposed Corrective Action Decision/ Proposed Plan for the 200-SW-2 OU by 12/31/2016. (At Risk) *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs by 9/30/2024. (At Risk)
		218-E-5, Landfill		140 m^3 (4,944 ft^3)	
		218-W-1, Landfill		7,100 m^3 (250,734 ft^3)	
		218-W-2, Landfill		8,200 m^3 (289,580 ft^3)	
		218-W-2A, Landfill		280 m^3 (9,888 ft^3)	
		218-W-3, Landfill		5,900 m^3 (208,357 ft^3)	
		218-W-3A, Landfill		60 m^3 (2,119 ft^3)	
		218-W-4A, Landfill		12,000 m^3 (423,776 ft^3)	
		218-W-4B, Landfill		710 m^3 (25,073 ft^3)	
		Total		**34,510 m^3 (1,218,709 ft^3)**	
200-WA-1	200 West Inner Area (200-WA-1) is defined as other sites in the 200 West Area not included in 200-CR-1; 200-IS-1; 200-PW-1,-6; 200-BC-1; 200-CW-5; or 200-SW-2 are within the new 200-WA-1 OU. **References:** DOE/RL-2003-64, *Feasibility Study for the 200-TW-1 Scavenged Waste Group, the 200-TW-2 Tank Waste Group, and the 200-PW-5 Fission-Product Rich Waste Group Operable Units.* DOE/RL-2005-61, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units.* DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Area Central Plateau Operable Units.* From Table 2-15 in RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Wasted-Environmental Impact Statement.*	216-S-1, & -2, Crib	Soil, Gravel, Rock	1,700 m^3 (60,035 ft^3)	*M-015-91B*: Submit FS Report(s) and Proposed Plan(s) for the 200-BC-1/ 200-WA-1 OUs (200 West Inner Area) by 12/31/2015. (To be missed) *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs by 9/30/2024. (At Risk)
		216-Z-7, Crib		590 m^3 (20,836 ft^3)	
		241-T-361	Sludge/Liquid	88 m^3 (3,108 ft^3)	

Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-DV-1	The 200-DV-1 OU includes waste sites with deep vadose zone contamination that may be a potential threat to groundwater and cannot be remediated using typical surface techniques (e.g., excavation and capping). The vadose zone is defined as the unsaturated region of soil between the ground surface and the water table. **References:** Estimated volumes taken from Table 2-15 in RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Wasted-Environmental Impact Statement.* DOR/RL-2011-102 Draft A, *Remedial Investigation/Feasibility Study and RCRA Facility Investigation/Corrective Measures Study Work Plan for the 200-DV-1 Operable Unit.*	216-T-3, Injection/Reverse Well	Soil, Rock, Gravel	<10 m^3 (353 ft^3)	*M-015-110A*: Submit RFI/CMS and RI/FS work plan for the 200-DV-1 OU by 3/31/2015. (Completed, 3/18/15). *M-015-110B*: Submit CMS, FS, and Proposed Plan/Proposed Corrective Action Decision for 200-DV-1 by 9/30/2015. (To be missed). *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs by 9/30/2024. (At Risk)
		216-B-5, Injection/Reverse Well		60 m^3 (2,119 ft^3)	
		216-B-7A & -7B, Crib		430 m^3 (15,185 ft^3)	
		216-T-32, Crib		460 m^3 (16,245 ft^3)	
		216-T-18, Crib		590 m^3 (20,836 ft^3)	
		216-T-5, Trench		TBD	
		216-T-7, Tile Field		TBD	
		216-T-6, Crib		290 m^3 (10,241 ft^3)	
		Total		**1,840 m^3 (64,979 ft^3)**	
200-IS-1, 200-EA-1	200 East Inner Area (200-EA-1) and 200-IS-1 sites not included in one of the canyon OUs will remain in the 200-IS-1 OU. Other waste sites not included in 200-CS-1, 200-CP-1, 200-PW-3, or 200-SW-2 are reassigned to the new 200-EA-1 OU. The 200-IS-1 OU includes pipelines, diversion boxes, catch tanks, related structures, and RCRA TSD tanks. Potential source of TRU waste is residual sludge/liquid within the structures. Associated pipelines and structures (e.g., diversion boxes, catch tanks, vaults, and storage tanks) are expected to be LLW. The 241-CX-72 Storage Tank is located at the former Hot Semiworks Facility, east of B Plant in the 200 East Area. The 200-EA-1 OU includes the 241-B-361 Settling Tank, which was used for waste originating in B Plant. **References:** Volume of residual sludge in Tank 241-CX-72 from DOE/RL-2002-14, *Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group Operable Unit RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes: 200-IS-1 and 200-ST-1 Operable Units.* Volume of residual sludge in 241-B-361 from Table 2-3 in DOE/RL-2003-64, *Feasibility Study for the 200-TW-1 Scavenged Waste Group, the 200-TW-2 Tank Waste Group, and the 200-PW-5 Fission-Product Rich Waste Group Operable Units.* DOE/RL-2010-114, *200-IS-1 Operable Unit Pipeline System Waste Sites RFI/CMS/RI/FS Work Plan.* RHO-RE-ST-30 P, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste-Environmental Impact Statement.*	241-CX-72, Storage Tank	Sludge/Liquid	9 m^3 (318 ft^3)	*M-015-92A*: Submit an RFI/CMS and RI/FS work plan for the 200-EA-1 OU (200 East Inner Area) by 6/30/2015. (To be Missed) *M-015-92B*: Submit CMS, FS, and Proposed Corrective Action Decision(s)/ Proposed Plan(s) for the 200-EA-1 and 200-IS-1 OUs (Central Plateau 200 East Inner Area) by 12/31/2016. (At Risk) *M-016-00*: Complete remedial actions for all non-tank farm and non-canyon OUs by 9/30/2024. (At Risk) *M-037-10*: Complete unit-specific closure requirements according to the closure plan for 241-CX Tank System (241-CX-70/71/72) by 9/30/2020. (On schedule)
		241-B-361, Settling Tank		180 m^3 (6,357 ft^3)	
		Diversion Boxes, Catch Tanks		TBD	
		Total		**189 m^3 (6,674 ft^3)**	

Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-CP-1, PUREX Tunnel #1 and Tunnel #2	The PUREX Plant consists of the main fuels reprocessing building (202-A) and a number of ancillary buildings. WHC-IP-0977 (Section 4.0) describes the many process vessels, chemical storage tanks, and other types of equipment that are potential candidates for removal and processing as solid waste. The volume of potential solids waste is estimated at 9,660 m^3 (341,140 ft^3) of which it is estimated that 8 percent is TRU. The PUREX Plant is designated as a Tier 1 facility. Final disposition to be addressed using the CERCLA remedial action coordinated with RCRA closure. Completion schedules to be established with the RI/FS work plans and RD/RA work plans and closure conditions/schedules established in the Hanford Facility Dangerous Waste Permit. **Reference:** WHC-IP-0977, *Estimation of PUREX Equipment and Materials That are Candidates for Removal and Waste Processing During PUREX Plant Closure.* The two PUREX tunnels (Tunnel #1 and Tunnel #2) were used for interim storage to shelter failed or obsolete process equipment. The process equipment, bulky and highly radioactive, could not be removed from the PUREX Plant. Tunnel #1 is filled to capacity with eight railcars that contain approximately 590 m^3 (20,835 ft^3) of unsegregated radioactive waste. Section 3.1 of WHC-IP-0977 describes the equipment stored in Tunnel #1. It is estimated that approximately 45 percent of the waste could be classified as TRU, while the remainder is LLW. Tunnel #2, which currently holds 28 railcars, contains approximately 2,200 m^3 (78,000 ft^3) of unsegregated radioactive waste. Approximately 35 percent of the unsegregated radioactive waste is estimated to be TRU. **References:** HNF-SD-EN-WAP-007, *PUREX Storage Tunnels Waste Analysis Plan.* WHC-IP-0977, *Estimation of PUREX Equipment and Materials That are Candidates for Removal and Waste Processing During PUREX Plant Closure.*	PUREX Complex	Debris	750 m^3 (26,486 ft^3)	*M-085-02*: Submit a change package to establish a schedule for submittal of the RI/FS Work Plans for the 200-CB-1, 200-CP-1, and 200-CR-1 Operable Units and a schedule for submittal of the Removal Action Work Plans for 224-B and 224-T Plutonium Concentration Facilities by 9/30/2015. (On schedule). *M-085-00*: Complete response actions for the canyon facilities/associated past practice waste sites, other Tier 1 Central Plateau facilities not covered by existing milestones, and Tier 2 Central Plateau facilities by TBD.
		PUREX Tunnel #1		270 m^3 (9,535 ft^3)	
		PUREX Tunnel #2		780 m^3 (27,545 ft^3)	
		Total		**1,800 m^3 (63,566 ft^3)**	
224-B	The 224-B Building, located in the 200 East Area of the Hanford Site, was used to purify and concentrate diluted plutonium nitrate solution that was the product of the 221-B Building bismuth-phosphate process. The building consists of a single canyon-type building, constructed of reinforced concrete and concrete block. There are six hot cell areas within the 224-B Building. Majority of the radioactive inventory exists within the process cell equipment and piping. The 224-B Building is designated as a Tier 1 Facility based on the fact that an engineering evaluation/cost analysis has already been developed and not on the results of the graded approach process. Final demolition of the 224-B Building will be in accordance with DOE/RL-2004-36. **References:** DOE/RL-2000-06, *Engineering Evaluation/Cost Analysis for the 224-B Plutonium Concentration Facility.* DOE/RL-2004-36, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility.* SD-DD-TRP-002, *Radiological Characterization of the 224-B Hot Cells.*	224-B	Debris	TBD	*M-085-02*: Submit a change package to establish a schedule for submittal of the RI/FS Work Plans for the 200-CB-1, 200-CP-1, and 200-CR-1 Operable Units and a schedule for submittal of the Removal Action Work Plans for 224-B and 224-T Plutonium Concentration Facilities by 9/30/2015. (On schedule) *M-085-00*: Complete response actions for the canyon facilities/associated past practice waste sites, other Tier 1 Central Plateau facilities not covered by existing milestones, and Tier 2 Central Plateau facilities by TBD.

Table E-1. Operable Units and Facilities with Potential to Generate Waste with Transuranic Constituents Greater Than 100 nCi/g during CERCLA Cleanup Actions

Operable Unit/ Site Name	Description	Potential Waste with Transuranic Constituents Greater Than 100 nCi/g			Schedule
		Waste Unit Name	Waste Form	Volume	
200-CR-1	The REDOX Facility, also called the 202-S Process Canyon Building or S Plant, is a chemical separation facility constructed in 1952 to employ an advanced organic solvent extraction process as a replacement for the B and T Plants. Irradiated rods were transferred to the REDOX Facility where plutonium was extracted and transferred as plutonium nitrate to Z Plant for final processing. As with other canyon buildings, the REDOX Facility is constructed entirely of concrete, and its process equipment is contained in cells. The REDOX Canyon and Service Facility is designated as a Tier 1 facility. Final disposition of the REDOX Facility is to be addressed using CERCLA remedial action. Completion schedules to be established with RI/FS work plans and RD/RA work plans. **Reference:** BHI-00176, *S Plant Aggregate Area Management Study Technical Baseline Report*.	REDOX	Debris	TBD	*M-085-02*: Submit a change package to establish a schedule for submittal of the RI/FS Work Plans for the 200-CB-1, 200-CP-1, and 200-CR-1 Operable Units and a schedule for submittal of the Removal Action Work Plans for 224-B and 224-T Plutonium Concentration Facilities by 9/30/2015. (On schedule) *M-085-00*: Complete response actions for the canyon facilities/associated past practice waste sites, other Tier 1 Central Plateau facilities not covered by existing milestones, and Tier 2 Central Plateau facilities by TBD.

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Appendix F

Critical Path Schedule

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This appendix contains the critical path schedule, as required in the Tri-Party Agreement (Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, 1989, *Hanford Federal Facility Agreement and Consent Order*).

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M-091 TRUM/MLLW (Summary)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total Volume
TRUM/MLLW Repack	M-091-47A	M-091-47B															
Offsite/Onsite m³	280	280	280	280	280	400	400	400	400	400	400	400	400	400	400	320	5,720
Alternate Capability m³												430	600	600	600	86	2,316
																	8,036
Retrieval RSW (Trench and Caissons)						M-091-49A Submit Retrieval Milestones											
m³											500	800	800	723			2,823
															M-091-49 Retrieval Complete		
Ship TRUM to WIPP						M-091-48A Submit Shipment Milestones											
m³										740	740	815	1175	1200	1200	1112	6,982
																M-091-00	
Provide Needed Capabilities		Engineering Study / Alternatives Analysis															
			Submit Draft Report														
				Submit Target Milestones for Needed Capabilities													
					Submit Milestones for Needed Capabilities												
						CDR	Design		Construction/Startup			Necessary Treatment Processing Capability					
											Mobilize Startup						
							Submit Retrieval Milestones					Trench Retrieval					
												Design	Start-up	Alpha Caisson Retrieval			

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